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Intelligent Software Agents for Electronic Health System

A Thesis
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بسم الله الرحمن الرحيم

﴿اللَّهُ لاَ إِلَٰهَ إِلاَّ هُوَ الْحَيُّ الْقَيُّومُ لاَ تَأْخُذُهُ سِنَةٌ وَلاَ نَوْمٌ لَّهُ مَا فِي السَّمَاوَاتِ وَمَا فِي الأَرْضِ مَن ذَا الَّذِي يَشْفَعُ عِنْدَهُ إِلاَّ بِإِذْنِهِ يَعْلَمُ مَا بَيْنَ أَيْدِيهِمْ وَمَا خَلْفَهُمْ وَلاَ يُحِيطُونَ بِشَيْءٍ مِّنْ عِلْمِهِ إِلاَّ بِمَا شَاء وَسِعَ كُرْسِيُّهُ السَّمَاوَاتِ وَالأَرْضَ وَلاَ يَؤُودُهُ حِفْظُهُمَا وَهُوَ الْعَلِيُّ الْعَظِيمُ﴾

صدق الله العلي العظيم

سورة البقرة – الآية255

DEDICATION

To that one who left an impact in my soul to be the strength and motivation to succeed

To that one who his love had been given to me

To that who I keep him close to my heart.

To that who soul in heaven, I owe to him

My husband (may God have mercy on him)

To those who are implanted in my heart friendliness and love

To those who instilled in me the virtues of perseverance and commitment.

My Father and my Mother

To everyone who is educated me a single letter

My teachers

To those who as dewdrop for a flower of my life

To those who are my heartbeat

My children

To Who Shared My Sorrow and My Joy

To The Lamps of Love and Tenderness

My Brothers, My Sisters,

To that who helped me and encouraged me

To My Friends

With love and affection, I devote my efforts to this thesis

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In the name of Allah, Most Gracious, Most Merciful

Initially and foremost, I thank ALLAH the almighty, who gave me the reconcile to complete my thesis. Only due to His blessing, I could finish it successfully.

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Abstract

Nowadays, health care systems (patient monitoring and diagnosis systems) have become the focus of researchers' attention. Where research addresses the areas of electronic health (E-health) to develop and improve health care systems and to reduce the effort and time on health users (physicians, nurses) and to follow up the condition of patients, especially the elderly, and as a result of that most hospitals are out of capacity, Intelligent software has been used agent in this field.

The main purpose of this thesis is to know; how we can implement and evaluate intelligent software for E-Health to help physicians, nurses, and health practitioners daily to collect and track patient data to improve care decisions. How we can do that in run-time under dynamic and non-deterministic environment conditions.

So, in this thesis we have implemented a model-based system such as the Extensible Beliefs Desires and Intentions (EBDI) model as architecture for situated autonomic software agents in run-time under dynamic and non-deterministic environment's conditions. We have formalized EBDI agent in E-Health as observer to follow up the condition of a patient connected to sensors) such as (a thermometer, a glucose meter, an oxygen meter, etc.) This agent filters the data (input file) and identifies which of these readings is normal or abnormal and sends the patient's information to the administrative agent, which represents another kind of EBDI agent.

In addition, the system works on proposes a plan commensurate with the reading of the sensors and requires the intervention of the human doctor in emergency cases.

This study has been suggested designing a monitoring system to follow up (monitoring) the health status of patients based on a multi-agent-system (MAS) with the process of Clustering (by using K-mean Algorithm) Where the system is

designed to support warnings and alerts in abnormal health conditions and to call the doctor’s intervention in emergencies (when it is necessary).

two ways have been used to evaluate the proposed system, first way by using case study with real data and comparing agent's behavior with real data. In the second way ,we formalize Reward function somehow to calculate Reward values that represent like scores for agent's behavior. In both previous ways the proposed system proved excellent behavior working correctly 100%.

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List of Abbreviations

Abbreviations	Full-Form
AC	Autonomic Computing
ACI	Autonomic Computing Initiative
ACL	Agent communication language
Act	Action
AGALZ	Autonomous agent to monitoring Alzheimer patients
AI	Artificial intelligent
B	Beliefs
BDI	Beliefs Desired Intentions
BOID	Beliefs-Desires-Obligations-Intentions
BP	blood pressure
Br	Buffer reader
D	Desires
DB	Data base
Del	Deliberation
DSS	Decision support system
DT	Decision theory
EBDI	Extensible Beliefs Desired Intentions
E-Health	Electronic – Health
HER	Electronic Health Record
GUI	Graphical User Interface
HR	Heart rate

I	Intentions
ICT	Information and communication Technology
Info.	Information
IT	Information technology
JADE	Java Agent Development framework
JDK	Java Development Kit
MAS	Multi-agent system
MLR	Meta-Level –Reasoning
MS.	Mille second
POMDP	Partial Observable Markov Decision Processes
PR	Pulse Rate
RMTDP	Role-based Markov Team Decision Problem
RR	Respiratory Rate
RS	Reconsideration strategy
URL	Uniform Resource Locator

Chapter 1 - Introduction

Chapter One

Introduction

1.1. Overview

The field of medical care is characterized by complexity, dynamism, and variety. Different challenges occur in healthcare (increasing cost of care, population growth, and lack of caregivers). The intelligent applications with Agent Technology can provide better health care than the conventional medical system.

The characteristics of Intelligent Agents (proactivity, sociability, autonomy) are a good choice to solve many problems In this regard since the key success factor is the natural mapping of real-life medical issues into electronic life. The controversy about how best to model human decision-making is continuing. The modeled entities must be provided with only those relevant characteristics in the given scenario of the real humans they represent must be provided with the modeled species and not less or more. Therefore, the question is, "What is a good model of human?" (And its decision making) [1].

A significant number of models and architectures have been developed that aim to reflect human decision-making. Despite their shared purpose, each has subtly different objectives and, as a result, incorporates multiple assumptions and simplifications. Therefore, it is important to be aware of these differences when selecting an agent decision-making model. Since the main issue and core point of focus for all human efforts are human health which is considered as human capital. Therefore, much of the focus and concern of people are also geared at health care and social well-being.

Computation or computerization is one of the innovations that have demonstrated its effect on human life by delivering assistive, collaborative, and automated healthcare systems [1].

The Multi-Agent Systems (MAS) are the natural option for unpredicted and open environments described by heterogeneous systems and their interactions, enterprise-wide span, effectively operating in dynamically changing environments, rapidly growing data quantity, the use of intelligent agents has added value to their main functionality.

In literature, the use of intelligent software agents has been suggested to deal with a variety of issues associated with medical and the health-related such as decision support systems, senior citizen care, self-care, and automatic health monitoring access to patient's records and treatment information, taking into account the confidentiality of patient records, societal, legal, concerns issues.

The design and the implementation of health care services is one of the challenges and difficulties. Agent-based systems are one of the most current architectures. The development design, implementation, and deployment paradigms for distributed and dynamic systems, and can work independently, often in unpredictable environments. [2]

1.2. Situated Agent

In recent years, the concept of software agents has become an essential area of research in both Artificial Intelligence (AI) and computer science. The range of applications varies from small systems for personalised email filters to large and complex systems such as air-traffic control [1,2]. Intuitively, agents are systems that can reason and decide their course of action, for instance, satisfy their (design) objectives and/or goals [3, 4]. An agent is said to be rational if it chooses to act in its own best interests, given a belief set it has about the world [5].

One goal of the AI community is to engineer computer programs that can act as autonomous, rational agents, and can independently make rational decisions about what actions to perform.

However it is not enough to have programs that think of good actions to perform regardless of their environment's state – hence, agents behaviour needs to be situated and aligned with their environment state [5].

Definition 1 . *Situated Autonomic software can be envisaged as a system which acts and/or reacts autonomously to external stimuli, generated from sensing its environment.*

As illustrated by Figure 1.1, the agent takes sensory input from its environment and reacts if required based on given action groundings or policies. The environment that an agent occupies may be physical (in the case of robots) or a software environment (in the case of a software agent). In the case of a physical embodied agent, actions will be physical such as moving objects around. The sensor input received by an agent can include video feeds. However, in the case of software agent actions will be software commands such as UNIX and Windows commands, which removes a file, and sensor input will be obtained by performing command such as 1*s* which obtains a directory listing [6].

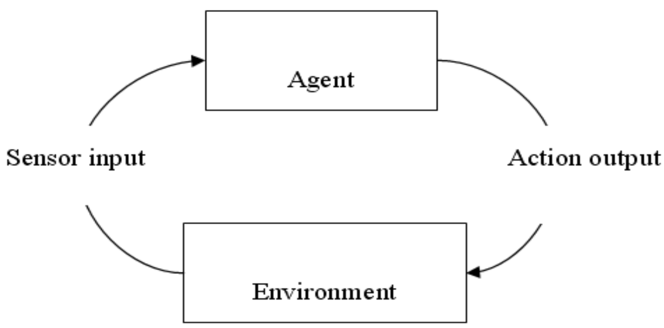

Figure 1.1: The agent takes sensory from the environment and produces as output actions that affect it.[6]

In almost all realistic applications, agents have at best partial control over their environment. In other words, while they are performing actions that change their environment, they cannot control completely their environment behaviour. Therefore, it makes sense to divide the environment, conceptually at least, into those parts that the agent controls, those parts it partially controls, and those parts over which it has no control [5].

1.3. Motivation

Situated autonomic software can be envisaged as a system which acts and/or reacts autonomously to external stimuli, generated from sensing its environment, which is achieved independently of external human intervention.

The motivation for this work is to understand the theoretical and practical foundation of automated generation and refinement of the system's observer models.

Because of the health care field dynamic, various challenges face in healthcare (population growth cost of care, and lack of caregivers). Therefore, an intelligent deliberative software agent that acts rationally can deliver the best health care than the traditional medical system. To: enable surgeons, nurses, and health professionals to gather and track patient data regularly, optimize treatment choices, maximize hospital quality, and help them control procedures.

1.4. Research Hypothesis

The three main components that underpin agent's rational behavior are deliberation (to denote deciding what to do), means-ends reasoning (to denote how to do it), and some control mechanism. All these processes are time and resource constrained. Current models have assumed that the means-ends reasoning process takes place completely offline in the form of precompiled simple plans. However, the agent may as well be endowed with the capability to construct its plans.

Here assumed that the agent uses simple plans, and a given agent is concerned mainly with deciding what to do rather than how to do it. The online problem that the agent then faces is whether to spend precious time and scarce resources either on deliberating on deciding what to do or on acting upon its current intentions. Here assumed that the control mechanism can be implemented as a meta-level mechanism over means-ends reasoning and deliberation in order to control them.

1.5. Problem Statement

1. To introduce an intelligent deliberative software agent for Electronic Health (E-Health) to monitor patient cases in run-time under dynamic and non-deterministic environment conditions,
2. To help physicians and nurses in their job (on a daily basis to collect and track patient's data to improve care decisions) could do that in run-time under dynamic and non-deterministic environment conditions?

1.6. Aims and Objectives

This work aims to implement and evaluate intelligent software agents for E-Health, which will help physicians, nurses, and health practitioners on a daily basis to collect and track patients’ data to improve care decisions, augment hospital productivity, and assist them in procedures tracking.

The objectives of this thesis; to implement a model base system such as Extensible Beliefs Desires and Intentions (EBDI) model as an architecture for situated autonomic software agent in run-time under dynamic and non-deterministic environment's conditions.

1.7. Research Contributions

In this thesis, the EBDI model has been formalized that outperforms all deliberative situated agents in dynamic environments in E-Health. The EBDI model defines the degree of commitment and the intention reconsideration of the agent that guarantees the best policy in a dynamic environment.

a model(multi-Agent-System) has been built that can implement a software intelligent agent(EBDI model) for E-health to work as monitoring for patient's state which gives an alarm where there is a problem at any input file (oxygen, blood glucose, and temperature, blood pressure and the pulse Rate, etc. and any other input based on E-health.) (filtering a piece of information that an agent percept it from an environment). And the model can suggest the appropriate treatment plan for the patient depending on the information of the alarm received from the patient side by using the clustering technique (K-mean algorithm) with the membership function.

The proposed system was evaluated by using two ways: the first way is by using a case study with real data and comparing the agent's behaviour with real data. In a second way, the Reward function is formalized by somehow calculating Reward values that represent like scores for agent's behaviour. In both previous ways, the proposed system proved excellent behaviour working correctly 100%.

1.9. Related Works

The current survey involves important previous related research to the thesis objectives:

In2019, Obied, and et al.[2]: this study introduced an EBDI-POMDP agent in this research as a meta-level rationale to rethinking its intention; them algorithm in big looks at the tradeoff between deliberation and intervention in the main, to explore how an agent allows taking such a choice effectively. For instance, how they implement the EBDI-POMDP agent in ALN as a centralized meta-manager in the double auction. Use an argument and/or observer of EBDI-POMDP, so the observer system looks as is a different consideration as a meta-system to reason on the topology of the entire system. In the sense of social reputation, EBDI-POMDP as a societal agent also even, EBDI-POMDP agent as a social reputation advisor in the light of the social reputation. A theoretical decision system in which a buyer can require other advisors (buyers) to collect information about the credibility of a seller, and ultimately ,the process of purchase is done.

In 2019, Sánchez, and et al. [3]: This study has indicated an effective EBDI system named ABC-EBDI has been suggested. It is the first change to the simulation of the ABC model of Ellis's practical intelligent human agents, a well-known psychological model, Ellis’s ABC model, to the simulation of realistic human intelligent agents. The major contributions and features are as follows: it is an EBDI in which the affective aspect takes feelings, mood, and personality into account and affects cognitive processing in all its phases (Beliefs, Desires, and Intentions). This places the structure between the most sophisticated EBDIs the purpose of this research is to enhance the modeling of intelligent agents which return realistic human behavior. In this way, BDI schemes have been used successfully and have developed into EBDI frameworks in which affective dimensions are considered in recent years.

In 2017, Obied [4]: In this research, the researcher expanded the TILE WORLD studies he was previously conducted and shows fascinating EBDI-POMDP agent developments as increasing dynamism is integrated with the Self-Organizing approach to identify changes to reduce uncertainty in complex environments as this paper discusses experiments that analyze the effectiveness of dynamic sensing policy when it is necessary to process sensor information over time. This research shows that some of the predicted characteristics and it distinguishes between sensing policy and sensing expense also discusses studies that analyze the effectiveness of dynamic perception policy when it is essential to process sensor information along time it is clear distinguishes between sensing policy and sensing cost since This research describes experiments checked the efficacy of dynamic sensing policy when the time cost of processing sensor information is significant.

In 2016, Singh, L. Padgham, and B. Logan [5]: This study provides a mechanism that enables cognitive agents of Belief-Desire-Intention (BDI) to be situated in an ABM structure. Architecturally, this implies that in the BDI system, the '\brains' of an agent can be modeled in the usual approach, whereas the '\body' resides in the ABM system. The design is feasible because the ABM in the simulation will still have non-BDI agents, and the BDI site will include agents that do not have a physical equivalent (such as an organization). The model addresses the integration issue challenge of combining event-based BDI structure with time-stepped ABM structure. Their structure is modular and enables integration of the BDI structure with the ABM systems. And all integrations and implementations are accessible to the modeling community for use.

In 2016, Males and et al. [6]: In this research, a structure of an expanded BDI (EBDI) agent with autonomous agents and a framework of the EBDI agent are presented, which provide the concept of combining an entity with mental attitudes is created and autonomous entities are given, Therefore, they are ingrate these kinds of agents to created, a synergy from their variety in result producing human-like agents with extension that allow in unforeseen circumstances allow a computationally efficient solution. The structure includes a beliefs unit, a desires unit, a decision-making unit, an integration unit, and a set of autonomous entities.

To reflect the mental attitudes of EBDI agents (beliefs, desires, and intentions) . A downside of the BDI model is not being able to respond to changes in dynamic situations. A purpose will not be executed when an unexpected situation exists, and there is no applicable law for that situation. For this reason, the EBDI structures combine agents with cognitively meaningful internal actors for computer-efficient autonomous actors. The goal of integration is to establish an entity that has mental attitudes, also it is the response in dynamic situations.

In 2014 H. Jiang, and et al. [7]: provided a generic structure for an emotional agent, EBDI, it can combine multiple emotion methods with an agent's thinking operation. It applies rational logic methods. Independently from the specific emotion mechanism. The differentiation helps one to plug in an emotional system as necessary, or independently update the agent's reasoning engine by selecting and integrating unique emotion theories into the architecture as necessary, EBDI can be implemented to create high EQ agents. In tile world, they show a prototype EBDI agent, and the test results revealed that this EBDI structure is able and that the emotional agent has the best performance than logical agents. Most of the literature on multi-agent- systems has been focused on the enhancement of logical utility-maximizing agents. The study, moreover, indicates that feelings have a profound impact on the individuals' bodily states, beliefs, desires, and motives. Emotions have begun to obtain further attention in artificial intelligence studies, further prominently in human-robot/computer interaction with an emphasis on detecting or sensing emotions.

In, 2014 Lejmi-Riahi and et al. [8]: In this study, the main anticipated result was to create an improved agent model that can be applied to simulate naturalistic people's decision-making operations as possible in the real-world environment.

According to that, they improved a new EBDI agent model in which the effect of both immediate and anticipated emotions on the agent decision-making process is integrated. However, more work continues to be implemented in that, their work introduces a conceptual structure that needs to be demonstrated through a detailed scenario example that serves to clarify the agent in addition many information about the model computational formalization must be explained For e.g. they describe the approach according to which they can integrate the BDI emotional with quantitative approaches for of the decision theory to model predicted emotions. At last, they need to validate their suggested architecture within a working agent-based simulation platform to demonstrate the experimental results and to validate the methodology.

In 2008, Borowczyk , and et al.[9]: This note explores how the deployment of software agents based on BDI implementation can automate some issues and in addition enhance the patient's service. Processing framework skeleton which uses Jadex BDI agents is addressed. After that its benefits have been observed in the field of information technology.

Unfortunately, most of the programs manufactured using the BDI methods have been produced using their homemade agents. Notice that it is normal to use BDI software agents as a benefit. Actors in a framework like the one mentioned above are usually aligned with certain instruments (for example a sensor) and therefore have limited resources (for example. belief base).They required both solutions for cooperation’s methods and scope of independent an agent taking a role of a sensor there is also required for processing competitive targets Within individual agent. Because patient life is important it is necessary to describe specifically dependencies between certain objectives.

The BDI paradigm normally offers intuitive abstraction here, along with a collection of structured tools such as target deliberation strategies. the purpose of their work in the healthcare context was to use a new and thoroughly developed BDI agent framework (Jadex).They have been showing how the BDI solution naturally works with the patient status management in a restricted scenario. They have also suggested how normally it will be scalable the current framework to make it greater realistic. Moreover they explore the Jadex is a very effective promising platform for BDI agents to build and continue to improve the suggested framework to make it greater realistic and thus complex. This allowed them to determine some aspects of Jadex's.

In 2006, Obied and Randles [10]: This research has made more progress in solving the theoretical model-based control process to facilitate planning for deliberative computer organizations positioned in unpredictable complex environments. It has applied hazard methodology with deliberative and anticipatory assistance for reacting to environmental stimuli. In this way, deliberation is a reaction to hazard signals with limited intentions and verified based on the advantages (utility) that may result from enforcing these intentions. Consequently, actions may be required .deliberation cycle is a term that means Predictability and security by a robust risk evaluation that is conducted at each agent autonomously. That is the agent chooses its intentions to depend on the good available data to enhance the system's process. Furthermore, the agent can be checking its process in terms The enhance of its series of observational-deliberate-actin an effective and productive theoretical and experimental work rethinking of theoretical and experimental operation, intentions in autonomous Extended Belief-Desire-Intention (EBDI) agents were introduced. The framework combines an abstract EBDI agent structure with decision-theoretic theory (POMDP).

In 2005, Nair and Tambe [11]: The main contribution of this study is a hybrid BDI-POMDP method, where BDI team plans are used to enhance POMDP tractability, and POMDP analysis enhances the efficiency of the BDI team plan. In the specific emphasis on task distribution the main issue in BDI teams: which agents to assign for the various tasks in the team. The study introduces three key contributions. First key contribution, they explain a task allocation strategy that takes in it is a Future consideration uncertainty in the space previous work in multi-agent role distribution has failed to determine these uncertainties.to result that the new distribution POMDP model for task allocation analysis, RMTDP (Role-based Markov Team Decision Problem), will be implemented them strategy obtain intractability through substantially curtailing RMTDP policy quest special BDI team plans have unfinished RMTDP policies, and the RMTDP policy study covers the holes in those unfinished strategies through looking for the best role distribution. The second key contribution is new decomposition mechanisms to increasing enhance RMTDP policy search performance. Although limited to looking for role allocations, there is still multiple role distribution combinatorial, and it is incredibly difficult to determine each one in RMTDP to find the best layout of the BDI team plans to dramatically prune the search space for function assignments is exploited through them decomposition methodology. The third key contribution is a considerably faster policy appraisal algorithm suited for the BDI-POMDP hybrid methods. For this reason, this search leverages the advantages of both the BDI and POMDP methods to analyze and enhance critical collaboration decisions within BDI-based team plans applying POMDP-based techniques.

In 2002, Lieberman and Tambe [12]: This research shows how software agents that combine learning, proactivity, personalization, context-sensitivity teamwork can lead to a recent generation of medical apps. That will streamline user interfaces and enable the most advanced communication and problem-solving. The modern model of intelligent agent software holds considerable promise in helping medical professionals and patients cope with the challenges of "information overload" that outcome from both the explosion of accessible medical information and the complexity of traditional computer software. Through helping to combine personal information with general information use information situated in a user’s context, and conducting collective problem solving, software agents may be only what the doctor required to the next generation of medical software. For this reason, a significant improvement in health technologies is the growing use of intelligent agent apps for medical applications. As the difficulty of situations encountered by both patients and health care introduce increases traditional interfaces that are based on users to manually move data and manually execute each issue-solving phase, won't be able to keep up.

1.10. Thesis Layout

The thesis layout is structured in the following manner where This thesis presents five chapters:

•**Chapter one(Introduction):** presents an overview of healthcare, an overview of the situated agent, a Problem Statement for this research, Motivation, Aim of the thesis, Literature Survey, and layout of the thesis.

•**Chapter Two (Theoretical Background):** presents a background of the Intelligent software agent and its characteristics, Applications an agent in the Healthcare Domain, Decision theory, some of the deliberative agent models Dynamic environment, Electronic health, and EBDI model, the definition of clustering and explained reward function.

•**Chapter Three (Proposed System Design):** introduces the problem formulation and the details of the proposed implementation method. It shows the designing steps for the considered algorithms used in the implementation of "System Design and Implementation"

•Chapter Four (Empirical Validation & Results Analysis):

Contains “implementing the system and results discussion" shows the practical system results and their discussion .

•**Chapter Five (Conclusions and Suggestions for Future Works):** It draws the conclusions from the proposed system implementation followed by suggested future work.

Chapter 2 – Theoretical Background

Chapter Two

Theoretical Background

2.1 Introduction

This chapter introduces some basic knowledge about the intelligent software agent and its characteristics, and produce a brief describes several of Agent's Application in the Healthcare Domain, some of the deliberative agent models that are used in the implemented system and comparing between them to describe some types advantage and disadvantage of them, and describes a brief introduction to the main concepts of the Meta-Level Reasoning, Decision theory, reconsideration strategy, and Electronic health definitions on which the system is based, and introduce view about some basic knowledge about the biomedical sensors that are used in the implemented system and described the reward function and addition to explain to K-mean algorithm and definition about the clustering

2.2. Intelligent Software agent

Definition of an agent many researchers have been interested in the definition of an agent. for decades in a variety of fields. There is no agreed definition to the term agent. the concept 'an agent' or the term software agent has made its approach into many from technologies and has become widely used, For instance, in artificial intelligence, databases, processing systems, and computer networks. In the literature, there are various definitions of agents. They all have the same appearance; however, they differ depending on the program with which the agent was created. This idea is still utilized in a range of new applications [13-15].

While there is no single definition of an agent, all meanings accept that an agent is mainly a particular software component that independently that introduces a device interface that is interoperable or/and acts such as the human agent, operating with several clients and following its special objectives.

The main dictionary definition of agent concept acts. An agent, then, can be a person, a machine, or a part of the software. If an agent model can depend on the single-agent operating inside an environment and if needed engaging with its users, they are typically made up of several agents. These agents perhaps communicate with each other both directly and indirectly (through operating on in an environment). These multi-agent models are capable model difficult systems and produce the ability of agents having opposing or common interests. [2, 3].

There is a consensus that an independent, the capability to operate without the intervention of humans or another model is the main characteristic for the agent. In addition, that various properties reconsider various significance depending on the space of an agent.

In the domain of possible difficulty, the agent is not capable of each control of its environment. As a consequence, the same action achieved twice in the same situations seemingly perhaps give for having integrated various results, Failure also is a probability, which means the response achieve through the agent perhaps not result in the desired effect at whole [2].

We can see in Figure(2.1) depicts a high-level show of the agent inside its environment. An agent receives input from its environment and of repertoire from actions possible for it, respond for it to modify it.

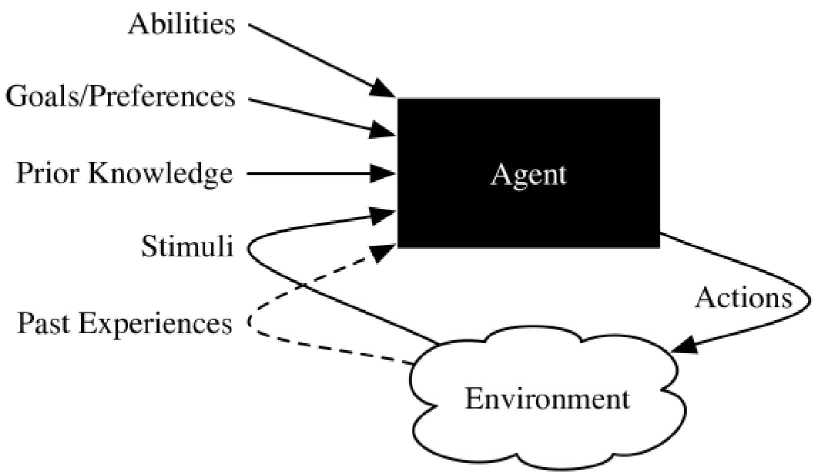

Figure 2.1 an intelligent agent interact with an environment[3]

An intelligent agent is a piece of software that has the following properties as showed in (Table (2.1)):

Table (2.1): shows some of the agent's characteristic

Property	**Meaning**
Situated	It means that it does exist in an environment
Autonomous	It means that it is independent, controlled externally
Reactive	It means that it can respond to the potential changes in its environment
Proactive	It persistently pursues the tasks and goals
Flexible	It has multiple techniques and ways of achieving the goals.
Robust	It means that whenever it faces a problem or in case of any failure it can recover from a failure.
Social	Agents are capable of working and interacting with other agents.

2.3. Autonomic Computing

Over the last few decades, computers have revolutionized and automated many of our work processes, allowing humans to address ever more challenging tasks and leaving routine tasks to machines. However an unavoidable *by-product* of such an evolution via automation is the increasing dependence on the complexity of computer systems. Hence, in IBM identified the complexity of current computing systems as a major obstacle to the growth of IT technologies [13]:

"... incredible progress in almost every aspect of computing— microprocessor power up by a factor of 10,000, storage capacity by a factor of 45,000, communication speeds by a factor of 1,000,000— however at a price. Along with that growth has come increasingly sophisticated architectures governed by software whose complexity now routinely demands tens of millions of lines of code. Even if we could somehow come up with enough skilled people, the complexity is growing beyond human ability to manage it. As computing evolves, the overlapping connections, dependencies, and interacting applications call for administrative decision making and responses faster than any human can deliver. Pinpointing root causes of failures becomes more difficult, while finding ways of increasing system efficiency generates problems with more variables than any human can hope to solve" [13].

The answer to this problem lies in more intelligent systems and computing infrastructures called *Autonomic Computing* (AC) that facilitate and automate many system management tasks currently done by humans.

A possible solution could be to enable modern, networked computing systems to manage themselves without direct human intervention. The Autonomic Computing Initiative (ACI) aims to provide the foundation for autonomic systems can manage themselves and adapt dynamically to unpredictable changes in accordance with system's policies and objectives. Self-managing systems can perform management activities based on situations they observe or sense in the environment [13, 14].

Also autonomic computing will lead to automated management of computing systems. However that capability will provide the basis for much more, including; seamless e-sourcing and grid computing to dynamic e-business and the ability to translate business decisions that managers make and policies that make those decisions a reality.

A standard set of functions and interactions govern the management of the computing system and its resources, including client, server, database manager or Web application server. This is represented by a control loop Figure 2.2 that acts as a manager of the resource through monitoring, analysis and taking action based on a set of policies and rules [14].

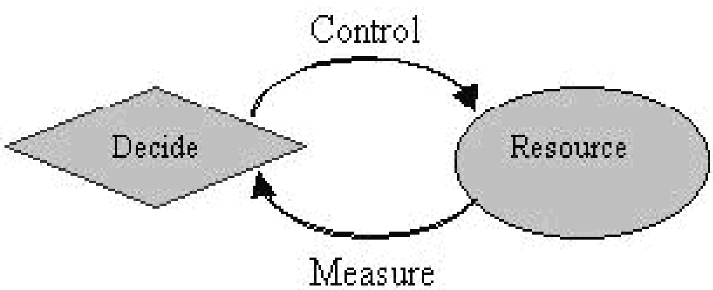

Figure 2.2: The control loop architecture [14].

These control loops or managers can communicate with each other in a peer-to-peer context and with higher-level managers. For example, a database system needs to work with the server, storage subsystem, storage management software, the Web server and other system elements to achieve a self-managing IT environment [14].

2.4. Self-Regulating System

According to a given control model, Self-regulating systems can be envisaged to have autonomous regulatory (control) capability of their own functions. This can be achieved by a given system observing and/or interacting with its environment. There are two models of self-regulating systems, which we group as:

Self-organising systems: where the self-regulation is observed as an emerging behaviour engendered via stimuli. Examples can be found in Artificial Immune System (AIS), ant colony, etc.

Model-based: where the self-regulation is achieved via the instantiation of norms, policies, etc. This is often found in cognitive systems and used in Beliefs Desires Intentions (BDI), Extensible Beliefs Desires Intentions (EBDI) Model, etc.

In addition, there are three fundamental methods to achieve such regulation [15] namely:

Buffering: is the passive absorption or damping of perturbations. For example, the wall of the thermostatically controlled room is a buffer: the thicker or the better insulated it is, the fewer effect fluctuations in outside temperature will have on the inside temperature. Other examples are the shock-absorbers in a car, and a reservoir, which provides a regular water supply in spite of variations in rain fall. The mechanism of buffering is similar to that of a stable equilibrium: dissipating perturbations without active intervention. The disadvantage is that it can only dampen the effects of uncoordinated fluctuations; it cannot systematically drive the system to a non-equilibrium state, or keep it there. For example, however well insulated a wall is alone, it cannot maintain the room at a temperature higher than the average outside temperature. *Feedback and feedforward*: both require action on the part of the system, to suppress or compensate the effect of the fluctuation. For example, the thermostat will counteract a drop in temperature by switching on the heating. *Feedforward* control will suppress the disturbance before it has had the chance to affect the system's essential variables. This requires the capacity to anticipate the effect of perturbations on the system's goal. Otherwise the system would not know which external fluctuations to consider as perturbations, or how to effectively compensate their influence before it affects the system. This requires that the control system be able to gather early information about these fluctuations [16].

For example, *feedforward* control might be applied to the thermostatically controlled room by installing a temperature sensor outside of the room, which would warn the thermostat about a drop in the outside temperature, so that it could start heating before this affect the inside temperature. In many cases, such advance warning is difficult to implement, or simply unreliable. For example, the thermostat might start heating the room, anticipating the effect of outside cooling, without being aware that at the same time ,someone in the room switched on the oven, producing more than enough heat to offset the drop in outside temperature. No sensor or anticipation can ever provide complete information about the future effects of an infinite variety of possible perturbations, and therefore *feedforward* control is bound to make mistakes. With a good control system, the resulting errors may be few, however the problem is that they will accumulate in the long run, eventually destroying the system [17].

The only way to avoid this accumulation is to use *feedback*, that is, compensate an error or deviation from the goal after it has happened. Thus *feedback* control is also called error controlled regulation, since the error is used to determine the control action, as with the thermostat which samples the temperature inside the room, switching on the heating whenever that temperature reading drops lower than a certain reference point from the goal temperature.

The disadvantage of *feedback* control is that it first must allow a deviation or error to appear before it can take action since otherwise, it would not know which action to take. Therefore, *feedback* control is by definition imperfect, whereas *feedforward* could in principle, however not in practice, be made error-free.

The reason *feedback* control can still be very effective is continuity: deviations from the goal usually do not appear at once, they tend to increase slowly, giving the controller the chance to intervene at an early stage when the deviation is still small. For example, a sensitive thermostat may start heating as soon as the temperature has dropped one tenth of a degree below the goal temperature. As soon as the temperature has again reached the goal, the thermostat switches off the heating, thus keeping the temperature within a minimal range [19].

This very precise adaptation explains why thermostats generally do not need outside sensors, and can work purely in *feedback* mode. *Feedforward* is still necessary when perturbations are either discontinuous or develop so quickly that any *feedback* reaction would come too late. For example, if you see someone pointing a gun in your direction, you would better move out of the line of fire immediately, instead of waiting until you feel the bullet making contact with your skin [18-20].

2.4.1. Components of Regulatory System

The overall scheme is a *feedback* cycle with two inputs: the goal, which stands for the preferred values of the system's essential variables, and the disturbances, which stand for all the processes in the environment that the system does not have under control however that can affect these variables. The system starts by observing or sensing the variables that it wishes to control because they affect its preferred state. This step of perception creates an internal representation of the outside situation. The information in this representation then must be processed in order to determine: the way it may affect the goal and the best reaction to safeguard that goal [21, 22].

Based on this interpretation, the system then decides on appropriate action. This action affects some part of the environment, which in turn affects other parts of the environment through the normal causal processes or dynamics of that environment. These dynamics are influenced by the set of unknown variables, which we have called disturbances. This dynamical interaction effects among others the variables that the system keeps under observation. The system again perceived The change in these variables, which triggers interpretation, decision and action, thus closing the control loop [23].

This general scheme of control may include *buffering*, *feedforward* and *feedback* regulation. *Buffering* is implicit in the dynamics, which determines to what degree the disturbances affect the observed variables. The observed variables must include the essential variables that the system wants to keep under control (*feedback* or error-controlled regulation) in order to avoid error accumulation. However, they will in general also include various non-essential variables, to function as early warning signals for anticipated disturbances, this implements *feedforward* regulation.

A amplification of the signal travelling through the control system: weak perceptual signals, carrying information however almost no energy, lead to powerful actions, carrying plenty of energy [21].

2.4.2. Control Hierarchies

In complex control systems, such as organisms or organizations, goals are typically arranged in a hierarchy, where the higher-level goals control the settings for the subsidiary goals. A control loop will reduce the variety of perturbations, however it will in general, not be able to eliminate all variation. Adding a control loop on top of the original loop may eliminate the residual variety, however if that is not sufficient, another hierarchical level may be needed. The required number of levels therefore depends on the regulatory ability of the individual control loops: the weaker that ability, the more hierarchy is needed. This is Aulin's law of requisite hierarchy [24].

On the other hand, increasing the number of levels has a negative effect on the overall regulatory ability since the more levels the perception and action signals have to pass through; the more they are likely to suffer from noise, corruption, or delays. Therefore, if possible, it is best to maximize the regulatory ability of a single layer, and thus minimize the number of requisite layers This principle has important applications for social organizations, which tend to multiply the number of bureaucratic levels.

The present trend towards the flattening of hierarchies can be explained by the increasing regulatory abilities of individuals and organizations, due to better education, management and technological support [25].

2.4.3. Requisite Knowledge

Control is not only dependent on a requisite variety of actions in the regulator: the regulator must also know which action to select in response to a given perturbation. In the simplest case, such knowledge can be represented as a one-to-one mapping from the set D of perceived disturbances to the set R of regulatory actions: $f: D \rightarrow R$, which maps each disturbance to the appropriate action that will suppress it.

Such knowledge can also be expressed as a set of production rules of the form "if condition (perceived disturbance), then action". This "knowledge" is embodied in different systems in different ways, for example, through the specific ways designers have connected the components in artificial systems, or organisms through evolved structures such as genes or learned connections between neurons as in the brain.

In the absence of such knowledge, the system would have to try out actions blindly until one would by chance eliminate the perturbation. Increasing the variety of actions must be accompanied by increasing the constraint or selectivity in choosing the appropriate action, which is, increasing knowledge. This requirement may be called the law of requisite knowledge. Since all living organisms are also control systems, life therefore implies knowledge, as in Maturana's often quoted statement that "to live is to cognize" [24].

In practice, for complex control systems, control actions will be neither blind nor completely determined, however more like "educated guesses" that have a reasonable probability of being correct, however without a guarantee of success. Feedback may help the system to correct the errors it thus makes before it is destroyed. Thus, goal-seeking activity becomes equivalent to heuristic problem-solving.

2.5. Agent's Applications in Healthcare Domain

A component of software that operates independently in a given environment obtains environmental perception. Converts to a representative model depending on its knowledge base, and executes actions to perform its design objectives. It is called a software agent (the agent is a software structure that uses Artificial Intelligent).

Although Health care issues are very difficult, it is not easy to find traditional software engineering solutions for them. In recent several years that has been change in health treatment practice to health care improve, joint patient-provider decision-making and managed care has been taking place generating a growing need for information and online services joint activities and decisions for they concerned need to be organized to ensure that treatment is effective and reliable. And to promote that decision-making mission and to the smooth execution of contact and coordination procedures, software systems are required to minimize diagnosis and treatment errors and deliver them. [9]

Develop medical education and preparation, and make health sector knowledge more available to patients, their families caregivers alike. The Automated systems required to be previously in anticipating the knowledge and information required for patients also deliver it in a timely way, enabling synchronous and synchronous contact, [16]. Also, for easily mutual decision-making between the implementation process of the health care sector program and the different individuals participating in the management. There is a big amount of medical information online on the Website.

the latest drugs, strategies, and treatments must be known to them in the case. Showing in their field of specialization; however, more professionals the time for s does not have for search about all this data and filter which one they required exactly [9].

Persons request a more active part in their treatment administration of care and aim to find relevant important information as soon as possible (however they usually do not have the skills search for the most adequate information relevant to their particular personal needs). In both situations, it is necessary to proactively obtain appropriate knowledge of useful and trustworthy sources without devoting to devote time and effort to search for them. It must be analyzed, screened, evaluated, and needs to filter [12].

Intelligent agents have played a crucial role in providing correct information for diagnostic, monitored the patients and treatment, etc. They work on behalf of human agents asking charge of routine activities, thereby the speed and efficiency of the information exchanges. There are some of the Applications of an agent in the healthcare sector such as:

• **Autonomous agent to monitor Alzheimer patients (AGALZ):** that an automated intelligent agent was created for monitoring to track Alzheimer patients' health treatment the current time. Inside geriatric homes is an independent deliberative case-dependent on a manager agent that is programmed to schedule the nurses' operating time dynamically, keep the standard operating reports the activities of the nurses, and for ensuring that patients are dedicated to the nurses they are given the appropriate treatment.

An agent works in wireless component and is combined with integrally agents into a multi-agent structure, called ALZ-MAS “Alzheimer Multi-Agent System” which is able of responding to the environment. After testing ALZ-MAS has shown it assists the nurses to obtain the time that able to be used for the care from specific patients, to learn or for present new tasks. The time used for monitoring and management of the jobs it is decreased substantially, also the time used for responding to incorrect alarms, while the time that used to direct patient treatment will be increased.

The jobs implemented through nurses are split into two types. action is taken direct and action is taken indirect. Action taken directly jobs is those which need the nurse working directly on the patient through the whole job (feeding, posture change toileting, medication, etc.). In the action taken indirectly jobs are not the nurses require operating directly with the patient's whole the time (visits, monitoring, reports).

AGALZ agents can take care of several of these indirect tasks; also, nurses can devote more time to personal patient's treatment [17].

• **Identity-Based Access Control (IBAC) security:** architecture aims to prevent these using intelligent agent-based technologies. This paradigm is new because it employs intelligent agents for the entire process of providing access management and exchange.

The model contains agents; every one of them is the response for different tasks. This approach is an easy and efficient access management mechanism depending on the agent's functionalities. new Intelligent-depend Access management Security Model (IBAC) dependent on multi-agents is suggested to keep and support the security [18].

•**A Canonical Agent Model to Healthcare canonical** The domino agent model was the starting point where Advanced Computation Laboratory enhanced this model to healthcare uses.The domino model is similar to analogous to the traditional beliefs desires intentions paradigm, however it moves beyond BDI through defining a complete collection of processes for transforming between mental states, including a fluid decision-making framework dependent on logical argumentation.

The domino paradigm reflects recent trends in software A Canonical Agent paradigm for Healthcare agent Architecture, however it has wider justification in its embodiment of characteristics common for many fields and theories of cognitive systems, containing neuroscience and cognitive psychology, for instance, a variety of main cognitive functions are commonly held to be needed by any intelligent agent. In general concepts, these functions and representations are produced through many theoretical methods to cognitive agents. preform has been widely used to establish healthcare applications such as decision support and clinical workflow control. Within the Argumentation Services Platform with Integrated Components project. The domino paradigm has been greatly extended. Funded from the European Commission, ASPIC include a broad combination of partners interested in the uses of argumentation in agent systems, involving integrant dialogue, decision making, learning and, no monotonic reasoning, the canonical paradigm captures the extended paradigm in commonly, an implementation-autonomies approach which provides a practical basis to special system execution and agent-execution tools to achieve the requirements for canonical abstraction [19].

•**Decision support system (DSS):** Ideally, this system involves an agent-depend on the paradigm of different Motivations by stakeholders and micro-decision-doing like a Sim-City to health which permit users to visualize and simulate whole from the effective components and that way aspect costs, results enhancements,

In addition, utilities from alternative health-enhancing projects . Using methodical designing that contains the more salient domains of social parameters from systems and health science, a DSS assists a manager's standardize helping also decisions concerning expenditures programs and after that administer scarce resources many effectiveness and perform desired results and effects. After each modeling is costly also simulation is used a long time (though not designing capable be far more expensive) [20].

2.6.Some Deliberative Agent Models

2.6.1. BDI model

The BDI paradigm was first proposed via Bratman (also called BDI or Belief-Desire-Intention). It is one of the most general agent decision-making paradigms in agent culture, where the design for deliberative software agents Belief, Desire, and Intention are the three BDI states. [21]

The BDI model is the most widely used of many approaches that suggest various forms of mental attitudes. There are many explanations for its success. However perhaps the most important is that the BDI model combines a respectable philosophical model of human practical reasoning, (initially developed by Michael E. Bratman [22]

BDI is defined as a philosophical method for practical reasoning in which human reasoning is interpreted using the following principles: beliefs, desires, and intentions. The BDI model supposes that actions are the conclusion of an operation which is known as practical reasoning. This process includes two steps: in the first step, a group of desires is choices to be realized based on the current situation of the agent's beliefs; and the second determines how to fulfill the basic goals defined in the previous. The following are the three mental principles that make up the BDI paradigm [21]:

•**Beliefs:** refer to service data gathered or/and arrived off a number from sources, like environment, domain, or other service beliefs (these are the internalized knowledge which an agent has around the world.) i.e. they reflect world information by storing all sensor data and combining it with the agent's vision of the world.

As a result, it can be considered as the informative component of the system. Through the communication or perception or contemplation can be obtained on Beliefs. They must reflect reality and obtained from evidence and valid arguments .because the world is constantly changing (is dynamic) the beliefs cannot be decided in a single sensing action. Therefore the information must be updated appropriately after each action is perceived.

•**Desires:** These are also known as objectives. They keep information about the objectives that need to be met and as well as about the expectations for each of them. As a result, they can be looks as the representation of the system's motivational state. Desires are every potential and future state of affairs an agent's ability likes to achieve. They reflect an agent's motivational condition.

The notion of desires is not mean that an agent will respond on whole these desires, however sort of that they provide alternatives that could affect the actions of an agent. (Desires reflect the state of affairs in a perfect universe, constantly optimizing the aims of the service) By measuring the values of a system set against its expectations (observed model states), the system detects the mismatch also induces the series of intentions [21]

• **Intention:** Intentions: They represent the current action plan that has been chosen. They can be considered as the deliberative aspect of the system. As a result, the agent selects an intended action that will fulfill its desires given the current beliefs. An intention is a commitment to a specific plan from action to achieve a certain purpose [23].

Agents are usually can be to think dynamically around their plans in the BDI framework. They are also able to learn about their inner states which mean. To be inverted on their own beliefs, intentions, and interests and , if possible, to change them. (balk and Gilbert) and for implementing intelligent agents the BDI is one of the most popular due to it is robustness and simplicity.

Figure 2.3 describe the relationship between the mental principle for the BDI paradigm

Figure (2.3): Relations between beliefs, goals and intentions

2.6.2. Beliefs-Desires-Obligations-Intentions

Also called BOID that is an expansion from the BDI concept to consider principles and criterion obligations terms and within private obligations [25, 26] . It is based on the principles defined by Also according to the mental situations for BDI, (social) rules and obligations (as one part from norms) are needed to take into consideration the social behavior of agents.

The authors of BOID argue that a multi-agent structure needs to allow an agent to deliberate around whether or not to obey social norms and share to mutual switch to grant agents 'social capacity. Usually, these deliberations did through means of discussion among obligations, the actions an agent should achieve (to the social good), with an agents' desires[24].

It is also not surprising that much of the literature at (Beliefs-Desires-Obligations-Intentions) is during the agent argumentation society. The decision-making of BOID is very much that the BDI and differentiates itself only in terms of the purpose (or objective) generation of the agents [27, 28].

also, the internalized social obligations are taken into account by the agent when generating goals, The consequence of this deliberation is based on an agent's situation towards its objectives and social responsibilities (i.e. which one it perceives to be the highest priority).BOID has the same characteristic as BDI, however unlike BDI, it makes it possible to model societal norms In (The Beliefs-Desires-Obligations-Intentions) this requirement is represented only in concepts of obligations. The bulk of the work of BOID cantered on formalizing the theory (and in particular the deliberation process) [29].

2.6.3. Extensible Beliefs Desires and Intentions

The suggested (Extensible Beliefs Desires and Intentions (EBDI)) introduce the very appropriate structure to the creation from embedded intentional software which constantly observes or/and monitors its environment and behaves in compliance with its situated BDI, which is grounded in normative settings [2,6,10].

EBDI provides Methods for enhancing an agent’s decision operations so that the action has the highest reward. Beliefs according to duties information obtained or/ and retrieved of a number from exporters, such as the environment, domain, or the other services.

- Beliefs; represent the state of affairs in an optimal world that this frequently increasing the services has aimed. Through contrast, a system’s beliefs group (monitored system states) in opposition to it is desired, that the system discovers is not similar and triggers a collection of intentions [4,7, 21]. In addition, there are three layers of intentions in EBDI:

•**Situated intentions:** appear an action set to a system represents an action to be followed by the system to meet its specified desires in a given situation, and /or to resolve the mismatch among the model’s goals (desires) and model’s environment (beliefs).

•**Normative intentions:** represent are a series of actions to guarantee that the given collection of criteria, including obligations (deontic), are followed and rule representations are observed before a specific set of standards is observed. The intent is granted is implemented to maintaining the legitimacy of new rules, too.

•**Utility intentions:** a series of actions to optimize target-oriented intentions Complementing these three items is a library with plans. In specific situations, the strategies identify the procedural understanding of low-grade actions which are supposed to share to achieving an objective in particular circumstances, i.e. they specify strategic steps that define how to achieve it. (Balk and Gilbert) Goals are stated in what an agent intentionally intends deliberately wishes to do [24].

The primacy of logical action principles desires, intentions, and beliefs are recognized via The BDI agent paradigm. Intentions directed and limited restrict the strategy processes of an agent and are a powerful abstraction for directing the agent's reasoning. To build single-agent templates, this deliberate viewpoint has been successfully used to create single-agent models [10].

Embedded intentions act as the job group to the system for taking in a specific situation to perform its selected desires, or /and to process the mismatch among the system’s objectives (desires) and system’s environment (beliefs). Normative intentions act as the group from actions for being taken to guarantee a particular group from rules including obligations (deontic), in addition, the rule's acting is monitored before a specified intention is enacted. Also, preserve the integrity of emerging rules. Utility intentions act as a group of actions to enhance goal-oriented intentions [2].

This means that at any point an agent perhaps finds itself with several competing intentions. In the first instance, this perhaps is a dispute about whether for an act or for deliberate. The more intentional dispute will occur as the agent seeks order to comply with its norm group (ontology), the general norm group (shared ontology), and its obligations to itself and another agent. Several of these competing intentions perhaps even be conflicting. Methods for enhancing an agent's decision operations, so that the action which has the highest reward for the system is performed, have been studied sometimes. However, defining and applying functions that introduce a notion of action benefit is very problematic. The complete specification maybe including a very large (even infinite) many of perception-action pairs, which may vary from one job to another [7] Also, both concepts 'agent' and 'environment' are inextricably related, so they cannot be described by anyone without the other. In reality, the difference between an agent and its environment is not usually observing, and drawing a line between them can be difficult at times [10].

Formalizing EBDI as observer architecture not just to diagnose the change however also to diagnose the change as risk or benefit [4,6,10]. It is possible to use the EBDI in a form that provides non-self (foreign entity) diagnosis (diagnose risk and benefit). It is supposed that the agent has an awareness of its current state environment (context) as a situated agent (i.e. it knows where it is). So, if there is a mismatch between system beliefs and system desires, it will recognise this as non-self in the environment, as part of its beliefs. Another belief will represent current system properties including norms, rules and any acceptance range for these properties. Also, the system, as an observer desires to observe (diagnose). As non-self may be beneficial or harmful, there is a need to compare the resulting pairs of environmental states. This is achieved by investigating utility intentions using ;

$$R(s,a) = \begin{Bmatrix} W(\boldsymbol{s}_{\text{int}}) & if a = act \\ W(s) & if a = del \end{Bmatrix} \quad (2.1)$$

Using the analysis described above the system can update its beliefs:

Either: There is a risk observed, so discard or eradicate non-self, make a system recovery, and end observer session. This will occur whenever there is no change or a negative difference (e.g., the current state is worse, the agent recognise that if there is a change out of acceptable range in system properties, in a certain range, between the current state and previous state, so in this case that every non-self-thing is considered malignant and must be expunged from the system.

Or: There is a change in system properties within an acceptable range, so the system needs to deliberate to determine which message it can send (e.g., which action can do).

Using reward function in Equation (2.1),

$a = act$ Means; end the observer (diagnosing) session and discard or eradicate non-self, if there is an unacceptable change in properties or if there is no change in properties, (e.g., if change > range acceptance or change = 0).

$a = del$ Means deliberate (there is a change under the range, if change < max range).

Also, for deliberating the observer makes its decision (What to do) dependent on utilities. At this stage there are two actions:

u_1 The non-self represents a risk.

u_2 The non-self represents a benefit.

If u_1 is chosen the message will be sent “Risk present, discard or eradicate non-self and end the session”, otherwise the message “There is benefit, end the session” will be sent.

2.7. Comparison with some Deliberation Agents

The various decision-making models of the agent were introduced and their objectives and suitability for the modeling agents were discussed in the mathematical simulations. After comparing the various architectures for these models. It is becoming clear that the extent to which these different dimensions of decision-making are covered varies greatly. By comparing as shown in (table 2.2) we show that the drawback of the BDI model is its failure to respond to changes in a changing environment.

Table (2.2): compare between some Deliberation agents:

Parameters	Agents		
	BDI	BOID	EBDI
Focus on	(Belief, Desire, Intention)	adding some norms to BDI	adding Social Obligation to BDI
Environment	Static	Dynamic	Dynamic
Reconsideration	the main problem in the architecture of BDI agents was that on intention reconsideration. There is mean none in the original model	Some norms and rules for intention reconsideration[26]	community norms take into account in form of obligations deriving of them it makes Reconsider when it is necessary [10]
Adaptive with the environment	one drawback of the BDI model is The failure to respond to changes in a dynamic environment. [3]	/	Adaptive with the environment[10]
Deliberate	If the goal is not carried out, it will be ignored. This means that agents should pause from time to time to consider their plans and rethink them.	intention reconsideration methods - which keeps an agent committed for its intentions just as long as it would be rational to perform that[26]	Improving an appropriate decision cycle with deliberation process possibility [10]

2.8. Meta-Level Reasoning

Important meta-level reasoning is a commitment strategy, which is an important aspect of agents is achieving a rational balance between deciding what to do (deliberation) and deciding how to do it (means-ends reasoning).

This is simply because real agents are resource-bounded and the task-environment of real agents is always real-time. This means that instead of deliberating indefinitely and making optimal choices, the agent can only deliberate for a limited period and must settle with satisfying decisions. In the literature, this rational balance is also known as deliberation control; inference control; or deliberation and action trade-off [9].

In the BDI literature, the rational balance has been treated as intention commitment; or intention reconsideration; or deliberative regulation. In open environments, sophisticated agents must make choices that effectively allocate their finite resources between complex deliberative activities and domain actions. [10]

For agents working in resource-constrained multi-agent settings, this is the meta-level control challenge. Control tasks include deciding what to invoke and how much time to amount to an effort to put into scheduling and coordination of domain activities. In diverse open multi-agent systems, overhead helps complex agents to solve problems more effectively than existing methods as show in figure (2.4).

there have been significant efforts to develop computational approaches to bounded rationality . These models enable intelligent agents to compute satisficing actions—decisions considered "reasonable enough"—in complex scenarios with limited time for deliberation by taking into account the computational costs of decision making [5-7].

Meta reasoning has proven to be a highly promising solution to bounded rationality. Meta reasoning enables intelligent agents the ability to deliberate about and hence refine their decision-making operation to taking appropriate action in a suitable time.

according to the uncertainty about the range of possible situations and exceptions that they perhaps encounter as well as the variability and limitations of the reasoning capabilities they need for meta reasoning has become increasingly more important with the autonomy and complexity of intelligent agents continues to grow [2,4].

The time it takes for a program to solve a particular problem depends strongly on the choice of problem solution approach, heuristics, the data representation, and other factors. The selected choices can have a significant effect on performance. Our objective is to design a problem-solving approach that dynamically adapts its search configuration to faster finding a solution [2].

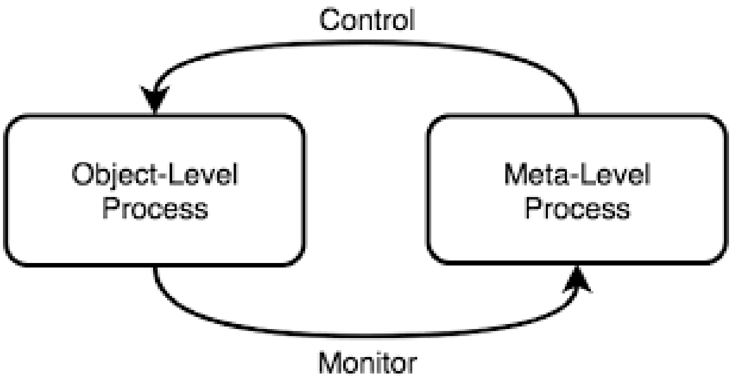

Figure (2.4) : The meta reasoning architecture of an intelligent agent[9]

2.9. Reconsideration strategy

Is finding of a suitable policy for intention reconsideration is represented as one of the most complex problems in the design of BDI (belief-desire-intention)agents? Simply put, the idea is that at any given time, an agent will have a variety of intentions, which are related to states of affairs that the agent has committed to achieving.[21]

An agent selects strategies that are suitable for achieving these intentions; when a specific strategy for a given intention fails, typically, the agent may re plane to find another course of action for this intention. On the other hand, the intentions of a logical agent would not remain constant. Logically such this agent to reconsider its intentions from time to time [22]

The belief-desire-intention (BDI) paradigm is the agent architecture they have selected for this study [21, 31]. Deliberation (deciding what intentions to accomplish) and means-ends logic (deciding how to achieve certain intentions) are the two major activities that BDI agents' decision-making consists them [21]

Deliberation is a computationally expensive operation, so a BDI agent should only deliberate when necessary this requires suitable intention reconsideration strategy [21, 32]. They investigate the performance of intention reconsideration policies in environments where the following parameters are varied:

• Accessibility (the extent to which an agent has access to the state of the environment);

• Determinism (the degree of predictability of the system behavior for identical system inputs) and

• Dynamism (the rate of change of the environment, independent of the activities of the agent),

These methods centered on algorithms for automated plan generation, which would take as input a description of the current world state, environment, a goal to achieve, and the action options available to an agent, and would provide as output a plan to achieve those goals states.

Hybrid approaches to agent design have interested a lot of interest as they seek to combine reasoning with behavioral decision-making .The belief-desire-intention (BDI) model is a common approach to the design of autonomous agents that originated in the late 1980s. The theory is that an agent is unable to deliberate indefinitely over which states of affairs to achieve; eventually, it will have to choose a subset of its desires and commit to fulfilling them. [31, 33]

As a general rule, an agent should only reconsider his intentions if it would result in a change in his or her intentions; otherwise, the time spent reconsidering will be wasted. Found EBDI architecture has better reconsideration strategies in dynamic environments . EBDI allows agents to dynamically select their intention reconsideration strategy to respond optimally following the dynamic changes in the environment. The EBDI model has been proposed for non-deterministic, dynamic scenarios [10].

The BDI model's key challenges to seeking an optimal solution are a lack of learning competencies and problems coping with vague or imprecise data sets in the field. Provides the foundation for the commitment policy in the current BDI agent framework. When an intention is decided from the deliberation operation, the commitment policy affects the decision about the intention reconsideration strategy of the agent model. As a consequence, it's crucial to focus on the commitment strategies of the agents and fundamental control structures that offer framework support to exhibit autonomous behavior in dynamic environments (environments that are constantly changing) One of the main issues that should be processed in the design of BDI agents is the suitable choice of intention reconsideration strategy or the commitment policy adopted in dynamic environments [33-35] also an essential factor for improved intention reconsideration process is that agents should adopt the Explicit behavior in learning and adaptability in dynamic environments .

To put it another way, how long does it take for an intention to become a reality? What are the circumstances in which an intention may be abandoned? The mechanism an agent uses to decides when and how to abandon the committed intention is referred to as the commitment strategy. It should be noted, though, that the existing BDI architecture lacks clarity on how to implement a commitment strategy in a dynamic environment [36].

So, in this thesis we have formalized EBDI model that outperforms all deliberative situated agent in dynamic environment in E-Health. EBDI defines the degree of commitment and the intention reconsideration of the agent that guarantees the best policy in a dynamic environment [37].

2.10. Electronic health

E-health (also known as electronic health) is a form of healthcare .The ICT (information and communication technology) information and communication systems are used to sustain it.

The exact definition of the word E-Health varies depending on the context. Despite the lack of an agreed-upon clear or precise definition the term “E-Health” has become a widely recognized neologism is significantly used, by many academic institutions, funding organizations, professional bodies, and individuals [38, 39].

An emerging field of medical informatics is ‘E-health, referring to the organization and dissemination of health information and services using the Internet and related technologies. The word refers to a modern way of functioning, an approach, and a commitment to networked, global thought in a wider context.

To improve health care regionally, locally, and worldwide through using ICT. Aside from the growing usage of information technology in healthcare today, several research studies have been conducted to study ways how to increase the efficiency of E-Health dissemination and management. [40]

The recent development of the technology offers Electronic medical equipment with their memory or a network card capable of providing patient records are now available thanks to recent technological advancements. Data can be collected in real-time using both wired and wireless networking architectures [41].

Furthermore, health primarily addresses smartphones scenarios in which devices are used to collect, transfer and process critical patients' data,

In-home care. In general, these systems are designed to provide access to medical information in a mobile and pervasive setting.

This access could be either the medical information retrieval of relevant for use of healthcare practitioners ,Acquisition of patient-generated medical information, Regardless of the user's current physical location or physical condition, effective mobile devices must be used to provide access to relevant health-related information

To collect physiological data from the patient without interfering with his or her everyday activities unobtrusive sensor technology is needed. [2]

E-health became to play a pivotal role in alleviating the pressure on health care services. in other words is the use of ICT in the health sector for clinical, education and administrative purpose, E-health enable the uses of computer, network and information technology to improve healthcare quality, patient safety and secure confidential access to health information to enable individual and communities to make the best possible health decision reducing the cost incurred on healthcare [42-45].

2.11. JADE (Java Agent Development framework)

It is a software environment that allows you to create multi-agent systems using a pre-defined, programmable, and extendable agent paradigm it is one of the most widely used frameworks for creating agents. It's written entirely in Java and uses Java libraries .It is currently one of the most widely used agent-oriented middleware solutions. Building multi-agent systems with Jade, which provides domain-independent infrastructure, jade allows developers to concentrate on the business logic of their systems rather than the definition of agent communications and interoperability [43].

The technology of Jade distribution middleware is a flexible and readily dispersed framework. Through the use of agents and a set of graphical tools, the Jade framework simplifies the creation of agent-oriented systems. Jade is a Java-based system with similar features and programming for book collections. As a result, designers may create multi-agent systems. The Jade technology may be integrated into a Java library.

The following are some of Jade's characteristics:

- Interoperability
- Multi-part application
- Having open-source software;
- A variety of things.
- Mobile software that is simple to use.

The agent's paradigm and JADE is a software platform that provides fundamental middleware- layer functionality that is agnostic of the individual application and simplifies the implementation of distribution applications that use software agents. JADE's main advantage is that it implements this abstraction over Java, a well-known object-oriented language with a straightforward and user-friendly API [44].

2.12. Clustering

Clustering is an initial and fundamental step in data analysis and denotes the grouping of data into groups of similar items that are known as (clusters) [46]. In other words, based on some similarity measure (e.g. Euclidean distance) it puts data instances that are similar to (near) each other in one cluster and data instances that are extremely different (far) from each other into different clusters. Furthermore, data clustering is a central process in Artificial Intelligence (AI) [46, 47].

Clustering is an unsupervised learning technique of patterns (observations, data objects, or feature vectors). Data clustering (or simply clustering), also known as:

- cluster analysis
- segmentation analysis
- taxonomy analysis
- or unsupervised classification

If a method of grouping items into clusters in which objects in one cluster are highly similar and objects in different clusters are considerably dissimilar. Clustering is crucial In data mining applications such as (research, text mining, information retrieval, and data exploration).where clustering comes in handy in the exploratory grouping patterns-analysis, including (Data mining, document retrieval, picture segmentation, decision-making, and machine learning situations and pattern classification [48].

Clustering is, in fact, one of the most widely used data mining techniques. It has a long history and is an important technique is utilized in a wide range of fields, including medicine, psychology, botany, sociology, biology, archeology, marketing, insurance, and libraries. – Text clustering has grown more significant in recent years as a result of the increasing growth of online documents. As a result, academics from several fields are actively working on the clustering problem [46, 47]

2.12.1. Type of clustering

There are two types of clustering: hard and soft as in figure (2.5).

Figure (2.5) Types of clustering[46]

Table (2.3): compare between Hard clustering VS Soft Clustering

Hard clustering	**Soft clustering**
Exclusive Clustering	Overlapping(fuzzy) Clustering
Each data point belongs to just one cluster.	A data point might be a member of more than one cluster or partial membership.
more usual and simple to carry out	For an application like constructing browsable hierarchies, it makes more sense.
if a element belongs to a certain cluster, it cannot be included in another cluster	Data is clustered using fuzzy sets
group data in an exclusive fashion, belong only either to 0 or 1	more natural than rigid clustering.

2.12.2. Type of clustering Algorithms

Generally, Clustering techniques may be classified into four categories as shown in figure (2.6):

- Partitioned: Partitioning algorithms are K-means and K-medoids .
- Hierarchical: Hierarchical is Agglomerative and Divisive
- Density-based: density base is DBScan, Optics, and Denclue.
- Distribution-based clustering: [48]

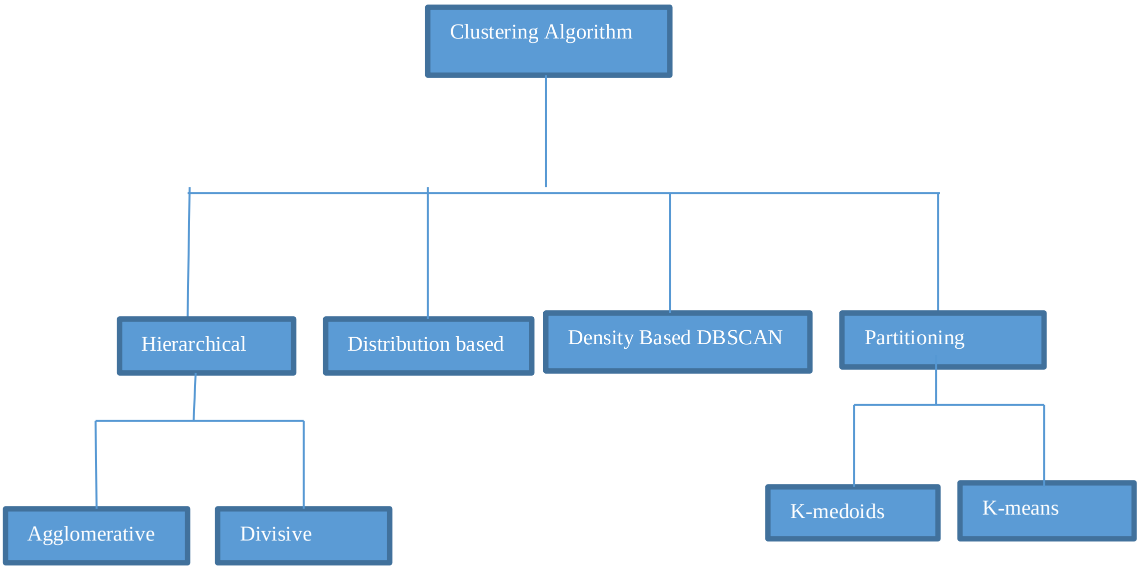

Figure (2.6) Types of clustering Algorithms

2.12.3. K-mean Algorithm

The most prevalent clustered partitioning method is K-mean .It was offered for the first time In 1967 by James MacQueen the one who coined the term "k-means". Stuart Lloyd, on the other hand, initially developed the standard method in 1957 as a pulse-code modulation approach. The partition-based cluster analysis technique K-Means clustering algorithm. Is unsupervised, non-deterministic, numerical, and iterative [49, 50].

The K-means clustering algorithm is an unsupervised computational approach for grouping comparable items into smaller partitions called clusters to group them and is a partition-based technique a continuous iterative process, this algorithm clusters data the algorithm converges with an end condition, then the iteration operation is terminated. After that, output the clustering results. This method is effective for dealing with large amounts of data [49].

The mean value of its items represents Each cluster in k-mean . Divide a set of n objects into k clusters with low inter-cluster similarity and high intracluster similarity.

The mean value of items in a cluster is used to determine similarity. The algorithm is divided into two phases [50].

The first phase selects k - centroid at random, with the value k predetermined. In second phase the closest centroid is assigned to each object in the data collection. The distance between each data object and the cluster centroid is measured using Euclidean distance for example.[49]

On the another hand, this method tries to increase intracluster variance while minimizing within-cluster variation. The initialization of the cluster centroids process involves identifying the number of clusters first and then randomly allocating cluster centroids to each cluster from the whole datasets. A distance metric is then used to determine the distance between each point in the entire dataset and each cluster centroid (e.g. Euclidean distance) [50].

The minimal distance between each data point is then calculated, and that point is allocated to the cluster with the shortest distance. Cluster assignment is the next phase, and it is repeated until all of the data points have been allocated to one of the clusters.

Finally, the mean for each cluster is computed using the total number of points in that cluster and the collected values of those points [50, 51].

Those means are then assigned as new cluster centroids, and the process of finding distances between each point and the new centroids is repeated, where points are re-assigned to the new closest clusters [51].

The process iterates a fixed number of times until points in each cluster stop moving across to different clusters. This is called convergence. The steps of the K-means can be summarized in Figure (2.7).

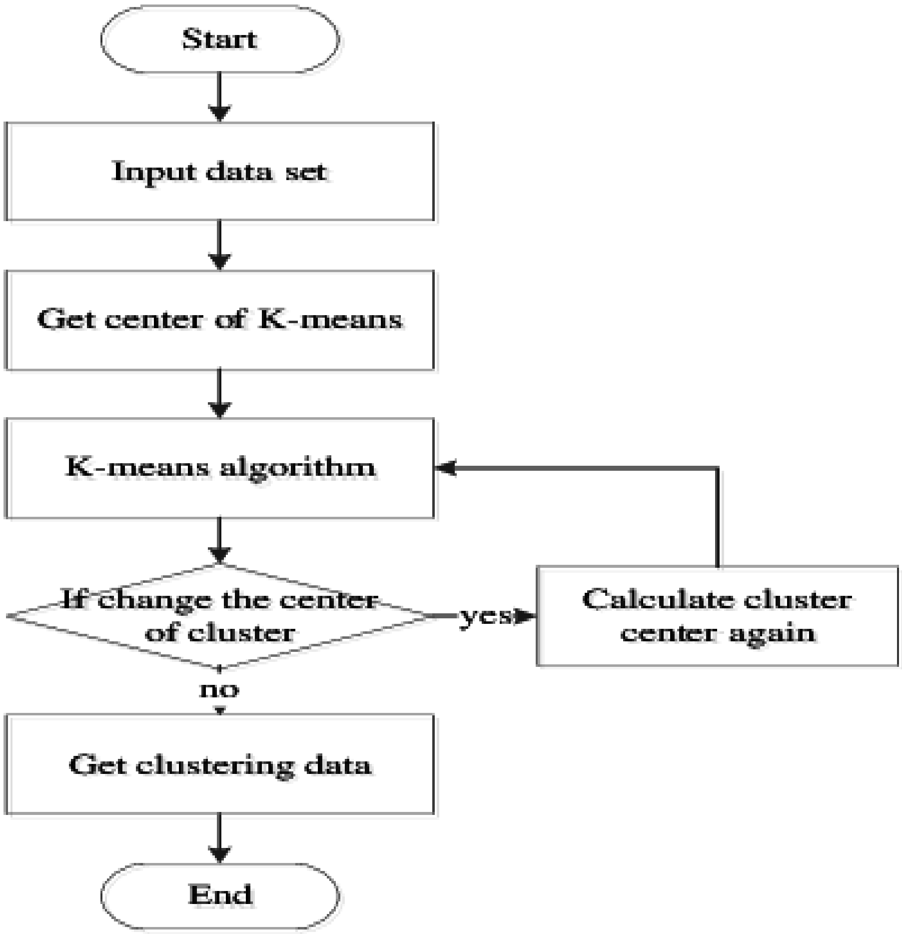

Figure (2.7) K-mean clustering Algorithm [51]

2.13. Reward Function

The reward functions are an important part of many agent learning approaches, establishing them is a difficult task in many real-world applications. [52]

The reward functions explained how the agent "ought" to behave. To put it another way, they have "normative" information that specifies what you want the agent to do. The reward function decides the agent's incentives which are not represented absolute limits, however if your reward function is “behaved better," the agent will learn better.

In practice, this means accelerating convergence and avoiding local minima. However, the type of reinforcement learning you choose will have a big impact on the rest of the requirements. Such as the action/state space discrete or continuous? Are the choices of actions or the world, random? Is the prize collected regularly or only at the end?

$R(s, a), R(s, a, s')$, And even a reward function that just depends on the current state are all examples of reward functions forms. Defining the Reward Functions: An agent's notability to sense reward from the environment is limited. Therefore, The reward function must be written by the programmer (regardless of whether the environment behavior is manifest from a simulator or the real world) [53].

The reward function, in one perspective, defines the difficulty of the issue. Such as traditionally, we may define a single state to be rewarded:

In this situation, the issue to be addressed in this instance is rather difficult. For difficult situations, might aid some algorithms by offering additional clues, although it may need more research. To make the problem well-specified, you may need to incorporate expenses as negative terms in R (e.g., energetic costs).

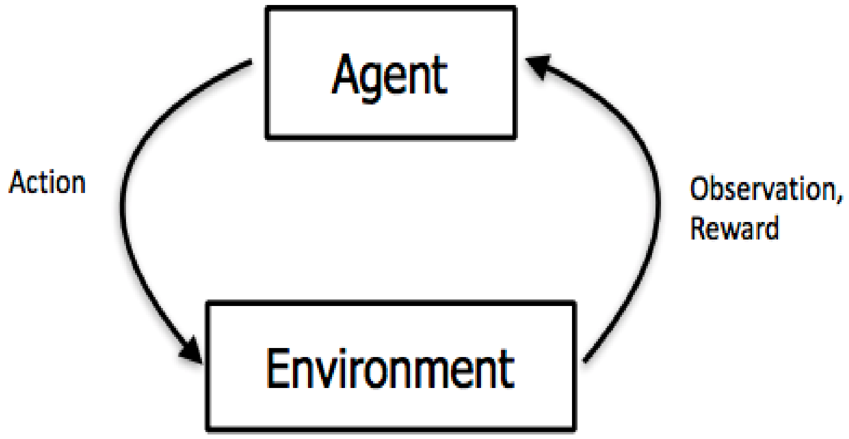

Figure (2.8) describe the Reward function with the agent[54]

Chapter 3 - Proposed System

Chapter Three

Proposed System

3.1. Introduction

This chapter introduces the overall view of the designed system of monitoring patient's state. It uses a multi-Agents (an agent proposed to be used in this system is the EBDI model) for suggesting the appropriate plan of treatment for the patients based on the information that comes from monitoring the patient state by input data (oxygen, blood glucose, and temperature, blood pressure and the pulse Rate, etc. Based on E-health) after filtering these readings, the system will suggest which treatment plan is suited for the patient's current state.

Also, this chapter includes a quick overview of the jade framework. In the following section we give a brief introduction and key properties of the jade framework in general, followed by the primary components for the proposed system, in the following sections. There have been two stages to the system's operation. The data inputs are read first, then filtered, and given an alert if there is a problem.

The second step employed the K-mean algorithm (This approach was used to cluster the data.) and membership function to help the agent in order to suggest which treatment plan is suitable to the current state for the patient based on the information gathered in the previous stage.

3.2. Formalizing EBDI Agent as Observer in E-Health

At this point we can formalize EBDI agent as observer architecture in E-health in two ways:

For monitoring agent: To formalize EBDI agent to observing patient the system made use of seven crucial sensors' reading (oxygen, temperature, blood pressure (Bb), blood glucose, Respiratory Rate (RR), and Pulse Rate (PR)). So, to evaluate the Boolean functions, starting from receiving a reading, if the reading is in acceptance range, so keep observing the patient. If the reading is not in the acceptance range, send an alert to administrative agent (server). The reward function of EBDI agent for solving Acquisitiveness Boolean function is:

$$R(s,a)=\begin{cases} W(s_{int}) & if a = keepObserv \\ W(s) & if a = sendAlert \end{cases} \quad (3.1)$$

Where $s_{int} \in S$ refers to the state the agent intends to be in while currently being in state s. Thus $a=\{KeepOserv \quad , sendAlert \quad \}$ denotes whether the agent keep observing the patient as no danger in his life or sending an alert message for administrative agent (server) if there is any uncertainty about the patient's health, and abnormality in the acquired data, which means the patient's condition, is abnormal.

Also, for deliberating the observer makes its decision (What to do) dependent on utilities. At this stage there are two actions:

u_1 The sensing reading represent a risk so, send alarm message.

u_2 The sensing reading represents no risk so, keep observing.

The decision depends on the overall system parameters can be viewed as the monitoring agent receiving sensor's readings (parameter's measures such as oxygen, temperature, blood pressure (Bb), blood glucose, Respiratory Rate (RR), and Pulse Rate (PR)).

For Administrative agent (server) in this stage the agent will receive a message from the monitoring agent which is the abnormal case for a patient, and the agent will compute membership about the patient case. Computing membership either will lead to; alternative plan, or keep the same plan, or need a second opinion. So, in this case we need to evaluate the Boolean functions, for the effects of the computing membership process. If there is an alternative plan available, suggest it. If there is no alternative plan send a message to ask for a second opinion (such as ask Consultant). The reward function of EBDI agent for solving Acquisitiveness Boolean function is:

$$R(s,a)=\begin{cases} W(S_{\text{int}}) & if a = sendPlan \\ W(s) & if a = AskFHelp. \end{cases} \qquad (3.2)$$

Where $S_{\text{int}} \in S$ refers to the state the agent intends to be in while currently being in state s. Thus $a=\{SendPlan, AskFHelp\}$ denotes whether the agent sending an alternative plan, if it found after using K-means algorithm to compute memberships, or sending a help message to get second opinion from consultant, as follow;

u_1 There is no alternative plan, so, send message for second opinion (ask consultant for help).

u_2 There is alternative plan, so, send alternative plan.

3.3. Overall System Description

This section demonstrates how the proposed framework's reasoning process works in general in this stage. The reasoning is characterized by a set of beliefs, desired, and intentions. The suggested multi-agent system will be utilized in this scenario; we first create a framework of smart healthcare systems. The adoption of round-the-clock-care sensors allows for continuous monitoring of his vital signs. All of these sensors continuously provide data to agents, communicate information with other agents as needed, and produce alarms as necessary. The system's primary aim is to keep track of the patient's vital signs whether are normal or not? The vital indicators such as oxygen, temperature, blood pressure (Bb), blood glucose, Respiratory Rate (RR), and Pulse Rate (PR). These patient's vital signs are necessary for obtaining a decision.

Through heart rate monitoring, body temperature, and the other vital indicators these collected data are given to agents, which use them to make decisions. For our solution, these agents' hardware and software are responsible for sharing the alarm message in the event of an emergency. The agents after receiving the data and performing reasoning on it conclude the current condition of the patient. We in this system present an EBDI model reasoning-based method.

So, from equation (3.1), the system may send an alert message if there is any uncertainty about the patient's health, and abnormality in the acquired data, which means the patient's condition is abnormal. The agent strategy deals with the event following its intentions and notifies the server of the medical emergency. It can also send a notice about the patient's oxygen rate and other parameters if they are not normal to the physicians' computers. Thus, this system save all input files as a patient's history and send them to physicians' computers via the jade framework, allowing the doctor to monitor the patient's condition remotely using Internet technology.

For reasoning purpose, the suggested system is based on sensing data, which collects from sensors, which is sends to EBDI (monitoring agents) in run-time The whole suggested system shown in Figure (3.1).

The suggested system's structure is gathered between the agent's architecture and the filtering E-health system, Figure (3.1) depicts this integrated system.

The overall system process can be viewed as the monitoring agent receiving sensor's inputs (parameter's measures such as oxygen, blood glucose, and temperature, blood pressure and the pulse Rate) as input and saving these readings in the database (MySQL), then filtering these parameter's measures and sending an alarm (when any of these sensor's readings is abnormal) as output from this monitoring agent.

This output will be input to in administrative agent, which also saves these alarms at DB (MySQL language) .In addition, the administrative agent will compute the membership degree for each vector reading (sensors reading which be abnormal) and then decides if There is alternative plan, so, send new plan or There is no alternative plan, so send message to consultant to ask for help (i.e. second opinion it is necessary).

The clustering method is built first so that the administrative agent may use it to categorize these input files that received from the monitoring agent. The clustering process produces five clusters, which are then used by administrative agent to classify the parameter measurements.

Figure (3.2) shows flowchart represented the overall system work; it shows both monitoring and administrative processes in these agents.

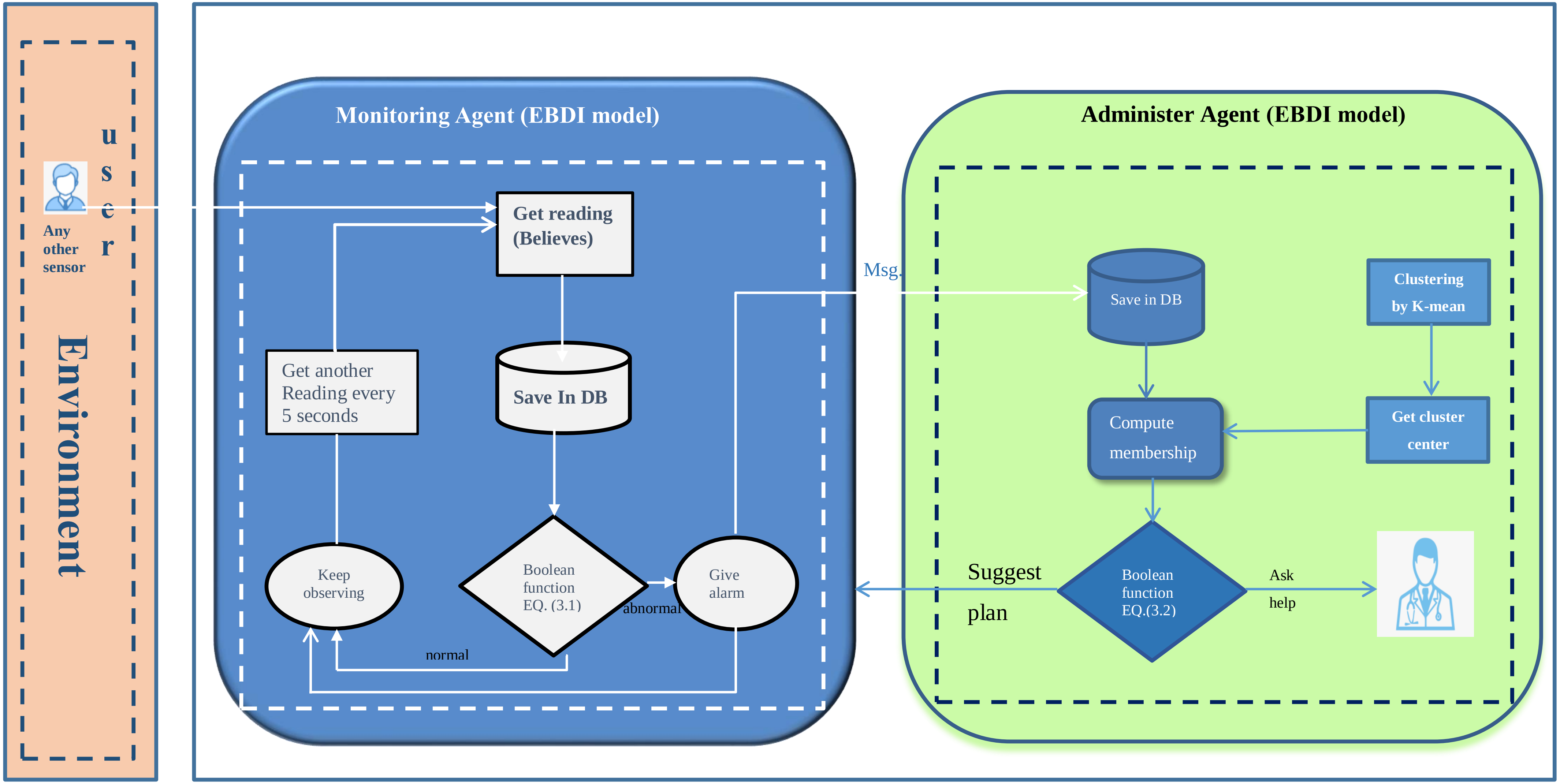

Figure (3.1) describe the proposed system work

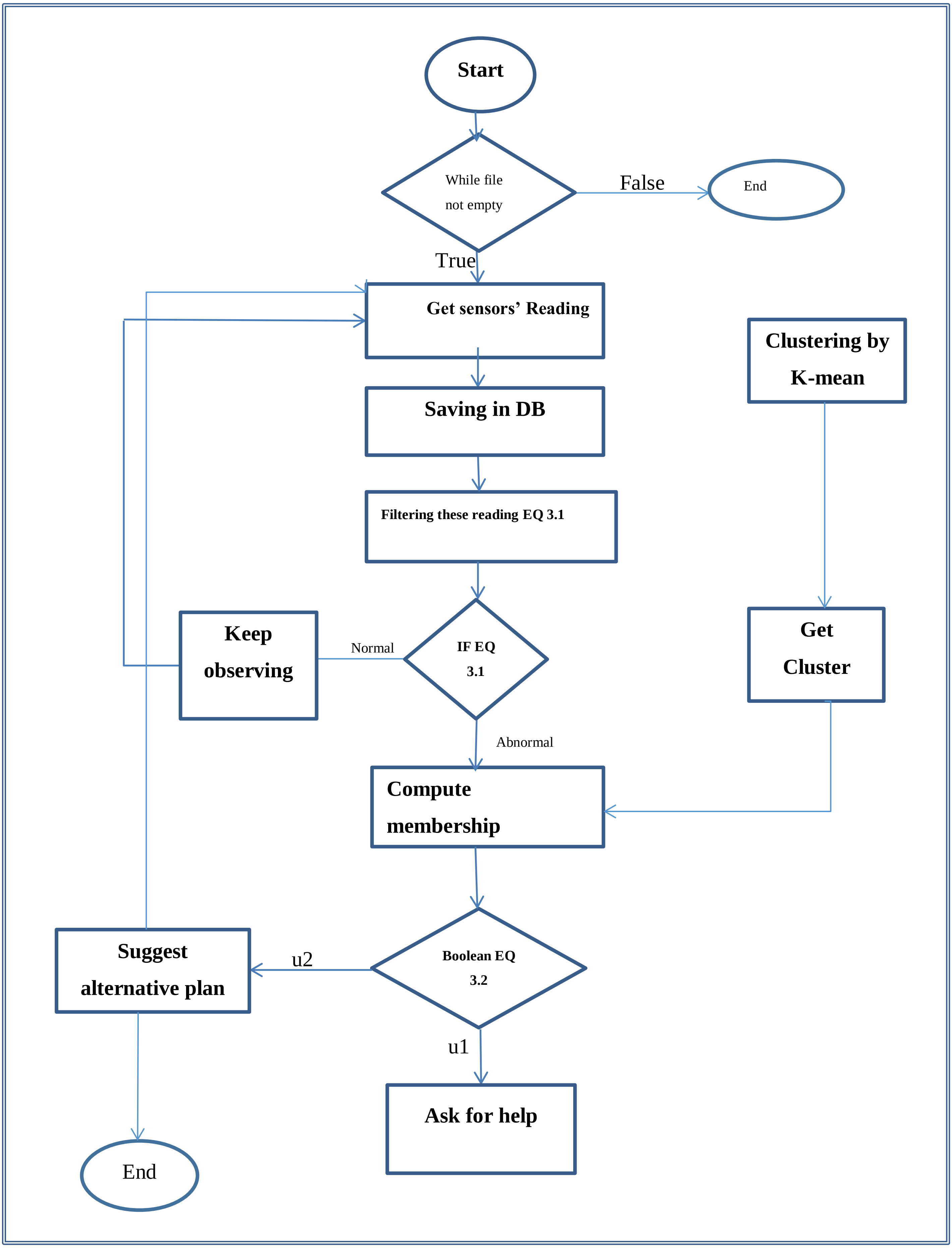

Figure (3.2) flow chart represented the overall system work

3.4 Reading Data

Sensors can be wearable sensors, WBAN (wireless body area network), or other physical sensors (heat sensors, camera, etc.) that can gather data from the surroundings and send it more for processing. The monitoring agent in our proposed system receives this information from a text file (line by line) as input and uses the get reading function to read these data input, capturing each array every 5 milliseconds, while the administrator agent takes the database records as input and always makes perception to the database to read the alarm sent by the monitoring agent or saved by the agent itself in DB the Figure (3.3) shows the part of the text file which saved the sensors' reading.

```
64,40,94,80,87,16,64
65,39,94,80,87,22,64
65,40,96,80,86,28,66
73,39,97,80,81,15,67
74,41,98,80,81,15,67
70,37,98,61,90,29,77
69,40,98,70,85,21,72
71,39,98,70,80,28,72
68,38,92,87,87,12,70
```

Figure (3.3) File (sensors' reading)

3.5. Functions of Agents

Agents deal with surroundings by detecting an input, applying a function, and taking action, as shown in Figure (3.1). In this section all agents' inputs, beliefs, desirer and intentions are detailed, where the role of each agent is explained: the monitoring agent's function is explained in the first part of the next subsections, and after that, the administrative agent's function is explained in the second part.

3.5.1 The function of Patient agent also known as The Monitoring Agent

Each patient in a clinical follow-up has their patient agent in the MAS during the patient's involvement in the follow-up process this agent is in charge of monitors all events flagging any emergency instances and, if appropriate, suggesting a solution to the patient's problems. And if it is necessary it then alerts the doctor agent by sending a message and activates their emergency procedures. Where this agent is getting data from a text file (this file is represented a sensors' reading), filtering it, and issuing an alarm; it also records input files in a database (MySQL) table named "patients." This stage is carried out automatically. The monitoring agent function is shown in (Algorithm 3.1) .The process of collecting the Data input happens every 5 milliseconds, which means that every reading is monitored and checked, and the system's database is constantly updated without the users' participation.

Algorithm (3.1): Monitoring Agent

Input: text file /* beliefs file content */

Output: DB to patients, patient table, chart for each Reading, alarm (message)

Begin:

Step1: Add Behaviour (Cyclic Behaviour) /* behavior for the agent */

Step2: Connect to MySQL database

Step3:Getting the clusters center

Step4: Get-reading (file)

Step5:Check-up ()

Step6:Save-dB ()

Step7: Send-message ()

Step8: Time .sleep (5)

End cyclic behavior

End algorithm

The next subsections will go through each stage of the aforementioned algorithm in detail:

3.5.1.1. Database Connection

Databases are used for storing information, and to handle patient and doctor tables in our suggested system, we utilize MYSQL database management. It accepts queries written in SQL code from all agents; each agent uses these tables to record input files and the alert. The data is delivered and saved in application databases illustrates how to use the Data Retrieve method to get information from a database table.

3.5.1.2. get- reading function

There is a procedure named (get reading) in the monitoring agent algorithm that is used to read sensor data that already are saved in text files. The get-reading function is depicted in (Algorithm 3.2).

Algorithm (3.2): get-reading ()

Input: data from file (line by line)

Output: Value for each parameter

Begin

Step1: Br /*Buffered Reader (file)*/;

Step2: St: Br. Read Line () /* Reading the lines from file */

Step3: For: i:0 to i < St. Length /* consider each line as array */

Step4: Oxygen: st [0],Temperature: st [1], High -Pressure: st [2],Low –

Pressure: st [3],Glucose: st [4],RR: st [5], st [6] /* Get input file from file */

Step5: I++

End for

End Begin

End algorithm

3.5.1.3. The save function

We've also seen A procedure named save exists in the monitoring agent algorithm To deliver and save the data input in a database in a table called (patient).algorithm (3.3) displays the save function.

Algorithm (3.3): save ( )

Input: data from file

Output: table of parameter value

Begin

Step1: insert into table values (oxygen, temperature, high -pressure, low - pressure, Glucose, time, current date)

Step2: Execute Update (insert)

Step3: Display-into-table ()

Step4: Draw sensors chart ()

End algorithm

End Algorithm

3.5.1.4. check-up function

There is also a method in the monitoring agent algorithm called check-up (flittering the data which are collected from sensors and already are saved at the file text in our proposed system then monitoring agent decided which are normal or abnormal) which mean evaluate the input file information to see if it is in the normal range or out of range look at the table (3.1) shows the Standard Value for the vital parameters for the patient. The check-up function is shown in algorithm (3.4)

Table (3.1) shows the Standard Value for the vital parameter for patient

Parameter	minimum value	maximum value
Oxygen	95	100
Temperature	36	37
H-pressure	100	130
L-pressure	60	90
Glucose	80	120
PR / HR	60	100
RR	12	24

Algorithm (3.4: check -up Algorithm /*by using EQ. 3.1 */
Input: input file (file contents (S)) /*Beliefs*/
Output: Boolean result (true or false)
Begin:
Step1: R_{min} /* the minimum of range */
Step2: R_{max} /* the maximum of range */
Step3: If (S >= R_{min}) && (S >= R_{max})
Boolean function: true
Else
Boolean function: false
End if
Step4:If (Boolean function= true)
Send-message: true;
Step5: If ((check = false) && (send-message = true))
Begin
Check: true;
Send-message: false;
End if
Step6: Return check;
End begin
End Algorithm

3.5.1.5. send-message function

When there is an abnormal condition, the check-up algorithm has a process called (send a message) that is used to transmit an alert as a message from the monitoring agent (patient agent) to an administrative agent (Doctor Agent). The send message procedure is depicted in (algorithm 3.5)

Algorithm (3.5): send message ( )

Input: information

Output: message has information about the patients' state

Begin

Step1: ACL Message (INFORM)

Step2: Set Content: (name, data reading (oxygen, temperature …etc.), time, date, the abnormal reading)

Step3: Receiver (server-Agent)

Step4: Send (message)

End begin

End Algorithm

3.5.2. Administrator Agent function

In the medical care center the Doctor agent is also known as the administrative at our suggestion System there is one administrative agent that connected with the patients' agents (one Doctor agent and many patients agents(MAS))this an agent is in charge of reading alarm from the monitoring agent based on the data received and dispatching assistance as needed. This allows patients to remain outside of hospitals while doctors monitor their daily activities and vital signs in real-time. The data collected by the sensors is transmitted to a server (Doctor agent), where doctors may treat patients as required., where is receives this alarm and saved it in the database it also records alarms (received as a message from monitoring an agent) in a database

(MySQL) table named "db1.", and then computes the membership for each alarm to each cluster center. Algorithm (3.6) shows the administrative agent function.

Algorithm (3.6): Administrative Agent

Input: alarm vector (message from monitor agent)

Output: action /*reconsideration */

Begin:

Step1**:** Connect to MySQL database

Step2: Add Behaviour (Cyclic Behaviour ())

Begin

Step3: ACL Message msg1: receive ()

Step4:message get Content ()

Step5: Split: message .split ("\\s") /* split message to words*/

Step6: While (i < Split .length)

Step7: st1: Split [0],st2: Split [1],st3: Split [2], st4: Split [3],st5: Split [4]

st6: Split [5], st7: Split [6],st8: Split [7]

Step8: save into dbp1 values /*save in data base*/

Step16: Execute query

Step17: Display-into-table ()

Step18: Draw sensors chart ()

Step19: I++

End while

End cyclic behavior

End begin

End algorithm

3.5.2.1. K-means Algorithm

The clustering step of data is an important step in the proposed system (implementing intelligent software agent for E-health system) for data input Filtering Systems. For that, the monitoring Agent can filter these readings and the administrative Agent suggests the appropriate treatment plan and makes reconsideration when it is necessary. Therefore needed to build the clustering algorithm and obtain the center of each cluster from it, these clusters centers are used later by the administrative Agent in the reconsideration process. Our clustering module using the K-means algorithm to classify the Data input, in this section we explained the building of the K-mean algorithm module to get clusters center from it.

Finding clusters center helps us to classify the data input into five groups (clusters) depending on the similarity between them. To find five clusters center, each one of these clusters is represented as one of the suggested treatment plans. Later, these clusters centers are used by the administrative Agent to compute the membership and perform reconsideration process steps.
used the seven numerical values (features) as data input (oxygen, temperature , etc.) in the classification process of the K-means algorithm module, firstly, we use 900 data input, normal and abnormal readings (which have contained almost all possible cases), Then we applied the k-mean algorithm to find the center of the cluster. Algorithm (3.7) shows the k-mean algorithm. Because the data input parameters are (7) Therefore the length of the vector (the sensors' reading for each once time) is (7), also the cluster center we compute is represented as a vector with length (7).

Algorithm (3.7): K-means

Input: 900 sensors ‘reading

Output: 5 clusters center, K value;

Begin

Step1: Initialize-cluster-centers () //Cluster Center Generation

Cont.

Step2: Initialize –data -points () // Get Data points we want to cluster

Step3: Boolean change: true //check if there is change the process continues else break

Step4: Total in cluster: 0 // Total for elements in each cluster

Step5: Minimum: max-d //suppose the smallest distance as biggest integer step6: number to find the smallest distance

Step7: Distance:

Step8: While (change)

Step9: While (loop<900)

Total in cluster: 0

Loop ++

Step10: Compute-centers ( ) // function to calculate cluster centers

Step11: Change: false

Step12:For: i=0 to i<N-points

Step13:Minimum: max-d

Step14:For: j=0 to j< N-clusters

Step15:Distance: get-distance (dataset[i].vector1, centroids[j].center)

Step16:If distance<minimum

Step17:Minimum: distance;

Step18:Cluster: j

End if

End for

Step19:If Dataset [i].cluster < > cluster

Step20: Change: true

Step21:Dataset [i].cluster: cluster

Step22:I++

End for

End for

End while

Step23:Save clusters center

End Algorithm

3.5.2.2. Cluster Center Computing

After reading the beliefs from the file (an Environment) performed, the algorithm starts with computing the value of the cluster center, the cluster center computed here is a vector with real values. Algorithm (3.8) shows the compute cluster center algorithm.

Algorithm (3.8): Cluster Center Computing

Input: membership array mu, current reading x

Output: cluster center array

Begin

Step1:distance : 0.0,cluster : 0, minimum : max-d, total in cluster

Step2:For i: 0 to i< N-points

Step3:Dataset [i]: new data-set ()

Step4:Minimum : max-d

Step5:For t: 0 to t < vector-size

Step6:Dataset[i].vector1 [t] : dd [i][t] // dd represented the dataset

Step7: For j: 0 to j<N-clusters

Step8:Distance: get-distance (dataset[i].vector1, centroids[j].center)

Step9:If distance < minimum

Step10: minimum : distance;

Step11: cluster : j;

Step12: Dataset [i].cluster :cluster

End begin

End algorithm

3. 5.2.3. Compute Membership Function

In this step, when implementing the membership to the cluster center, five membership values are calculated for each alarm vector. This approach uses a function named (get-distance) to determine the Euclidean distance between two vectors. The get-distance algorithm is depicted in algorithm (3.9). The membership algorithm is depicted in algorithm (3.10).

Algorithm(3.9): get-distance

Input: two vectors x_1, x_2

Output: distance as real

Begin

Step1: For i: 0 to x1 .length-1 do

Step2: Sum: sum+(x_1[i]-x_2[i]) ^2

Step3: sqrt (sum)

step4:Return sum

End begin

End algorithm

Algorithm(3.10): Compute membership values

Input: cluster center array, membership array

Output: member ship array

Begin

Step1: Declare $center_1$ [7], $center_2$ [7], $center_3$ [7], $center_4$ [7] , $center_5$ [7] , x [7] , Column: 7, Rows: 900

Step2: For i: 0 to rows-1do

Step3: For t: 0 to col-1 do

Cont.

Step4: X [t] //represented current reading

Step5: For j: 0 to c-1 do //c it is the number of clusters

Step6: For t: 0 to col-1 do

Step6:$center_1$ [t]: cluster center[j] [t];

Step7:d1: get distance (x, $center_1$);

Step8: For k: 0 to c-1 do

Step9: For t: 0 to col-1 do

Step10:$center_2$ [t]: cluster center[k] [t];

Step11: d2:get distance(x, $center_2$);

Step12: Sum: sum+ ((d_1/d_2) ^m1

Step13: Sum: 0

End begin

End Algorithm

when we designed and implemented our suggestion system and after describing the Agents' GUI (patients agent GUI and doctor agent GUI) we can show the chart for each sensors' reading are made by using the draw chart function shown below in algorithm (3.11).

Algorithm(3.11): Draw chart function

Input : query by sql

Output: chart for each input reading

Begin

Step1: Connection with DB

Step2: Query: "SELECT time, parameter name FROM data base"

Step3:Execute Query

Cont.

step4:New JDBC Category Dataset (jdbc : mysql://localhost:no./name of table in the

data base","url dB"," username", "password")

step5: Execute Query

step6: JFree Chart chart : Chart Factory .create Line Chart ("chart name” ,"Colum 1

Name (X- axis)","Colum 2 name (y-axis), dataset, Plot Orientation .VERTICAL,

false, true, true)

step7:Chart Panel chart name: new Chart Panel (chart);

step8: chart name .set Mouse Wheel Enabled (true);

step9: Insert chart to panel to displayed

step10: jPanel . Validate

End begin

End algorithm

After finishing the designing and implementation processes, the system is now ready to be tested . Validation and experimental results are shown in the next chapter.

Chapter 4 –Empirical Validation & Results Analysis

Chapter Four

Empirical Validation & Results Analysis

4.1. Introduction

This chapter is intended to display the design specs and experimental results for constructing a situated agent (EBDI model)for an electronic health system, test the prposed system and describe the results obtained by implementing the system using different parameters(sensors reading) in E-health.

Proposed system used two ways to evaluated, the first way is by using a case study with real data and the comparing agent's behavior with real data. In the second way formalized Reward function somehow to calculate Reward values that represent like scores for agent's behavior. In both previous ways the proposed system proved excellent behavior working correctly 100%.

Furthermore, in this chapter begins with an explanation of how to utilize the GUI windows and then moves on to the outcomes of the implemented system through GUI windows for all of the instances that are being considered. Finally, the explanation of the acquired results is introduced. The suggested system has been implemented in the provided prototype system utilizing the JADE agent platform, which is a distribution system implemented on a computer.

The suggested model aims to filter the information that an agent perceives from the environment and then decide on a treatment plan based on the results of these filtering steps (which might include an alert if there is an aberrant state). So, this suggested system also has Machine-learning algorithms, such as the K-mean algorithm discussed in section (3.6.2.1), which are used to cluster this data and membership function also used by this system.

4.2. System's main parts

A variety of software languages and packages are used to create the suggested system for it to operate appropriately. Such as:

- A Java Language development environment (Java Development Kit (JDK) Version 15.0.1.0)

- Apache Net Beans IDE 12.2
- JADE Platform (JADE-bin-4.5.0 software package)
- MySQL Workbench 8.0 CE (language were used for implementing the system).
- jfreechart-1.0.19-demo.jar Open JDK Platform binary
- Sensors reading (text file)

4.3. Case Study

Discussed the system in this part, which runs on the data in the size of the 900 samples each sample has seven vital parameters (which are oxygen, temperature, high pressure, low

Pressure, glucose, heart rate, and Respiratory rate) shown in table (4.1). The data used in this proposed system are collected from the hospital by tracking the vitals' parameters (explained previously) for 15 patients. Each patient was examined 4 times a day , and this tracking is continuous for 15 days also this study contains more than cases normal (which mean the data reading in the natural range look to the table(4.2)and figure(4.1)) and also this study contains abnormal states (out of range). So, the system we suggested filters these values and this proposed system can decide which are normal and which abnormal data.

Table (4.1) shows some of the data which are collected for some of patients

Oxygen	Temperature	H-pressure	L-pressure	Glucose	Respiratory Rate	Pulse Rate
66	39	90	90	81	15	67
65	41	90	90	81	15	72
74	36	96	90	80	12	70
60	38	98	80	85	20	77
61	38	92	60	85	14	70
63	39	96	70	80	25	76
64	40	94	80	87	16	64
65	39	94	80	87	22	64
65	40	96	80	86	28	66
73	39	97	80	81	15	67
74	41	98	80	81	15	67
70	37	98	61	90	29	77
69	40	98	70	85	21	72
71	39	98	70	80	28	72
68	38	92	87	87	12	70

Table (4.2) shows the natural range of parameters values

Parameter	minimum value	maximum value
Oxygen	95	100
Temperature	36	37
H-pressure	100	130
L-pressure	60	90
Glucose	80	120
PR / HR	60	100
RR	12	24

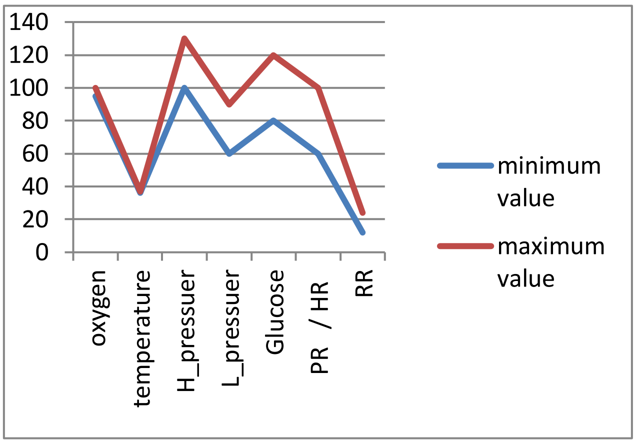

Figure (4.1) chart for the natural range of parameters values

Furthermore, the suggested system has been built using a Java Language (JDK) Version 15.0.1.0 (Apache Net Beans IDE 12.2) and certain libraries such as the JADE agent platform, which operates as a distribution system implemented on a computer network, as described in the previous chapters. The proposed system employs the topology depicted in figure (4.2), consisting of a client and server model (client represent a monitoring agent and server represent administrative agent). The agent is installed in each client and server to simulate configuring a multi-agent environment. In this case, the system is running on a standard PC with the following specifications (the Processor: Intel® core ™ i7 105 10U CPU @ 1.80 GHz 2.30 GHz and 8.0GB main memory under the Microsoft Windows 10 operating system).

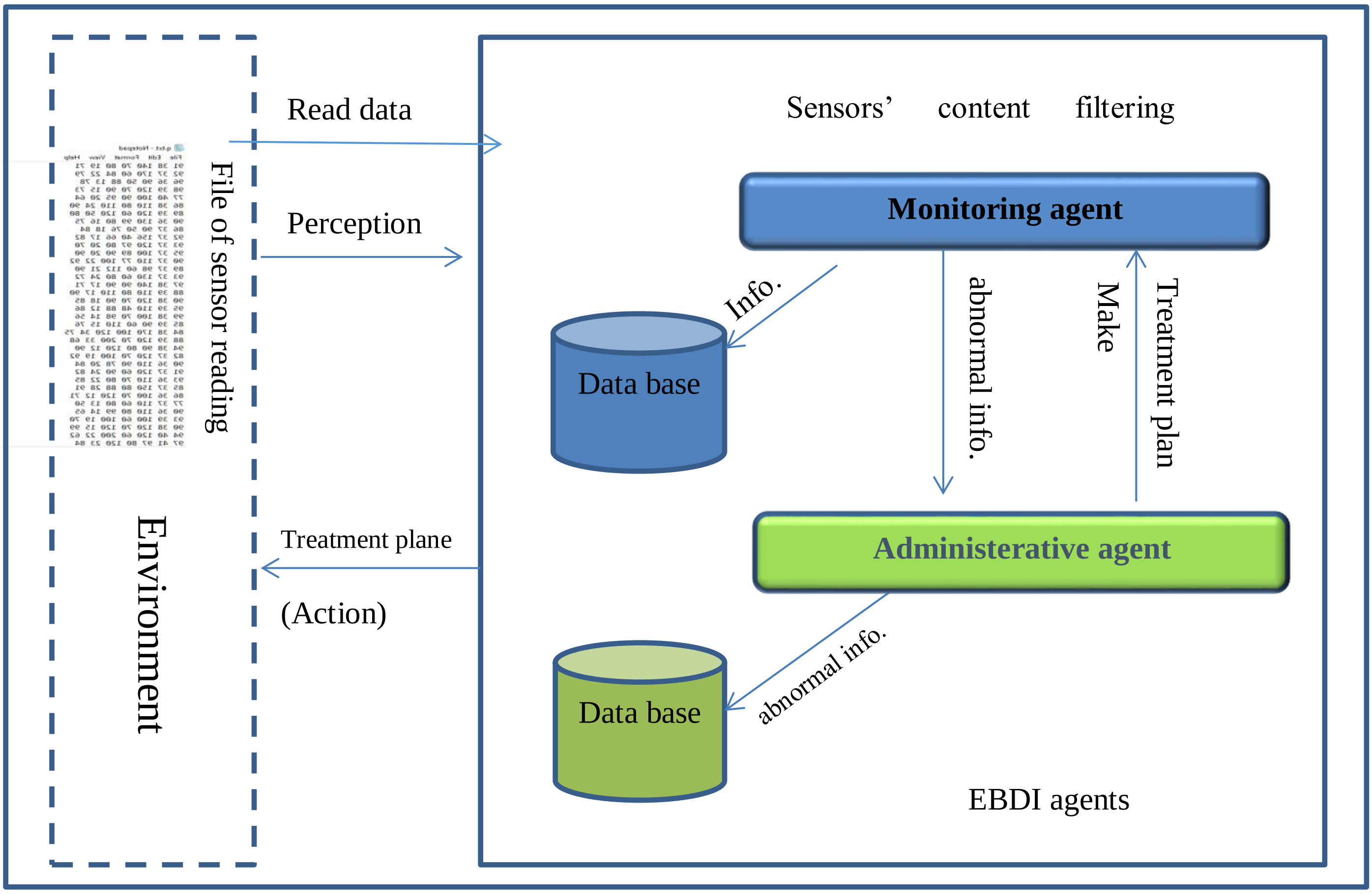

Figure (4.2) the role of system

As illustrated in Figure (4.3) , the initial step in running the program, which is described how to operate the system in a Windows environment Java programming language is utilized to run the application software using the JADE framework.

After executing this program, the JADE is now operational and ready to construct the agents that we designed

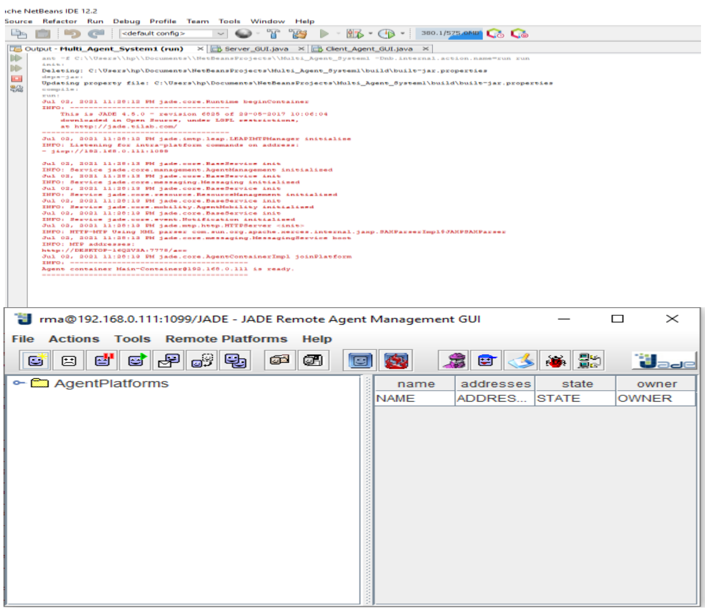

Figure (4.3) first step for the running of the program

4.4. GUI Windows Description

The implemented system has two GUI windows: the Client's Agent (monitoring agent) GUI and the server agent (administrative agent**)** GUI, as stated in chapter three. As a result, each of them will be discussed in the following sections.

The system experiments on many patients’ agents and one administrative agent**,** as shown in the Figure (4.4) describes the overall view experimented for the suggested system.

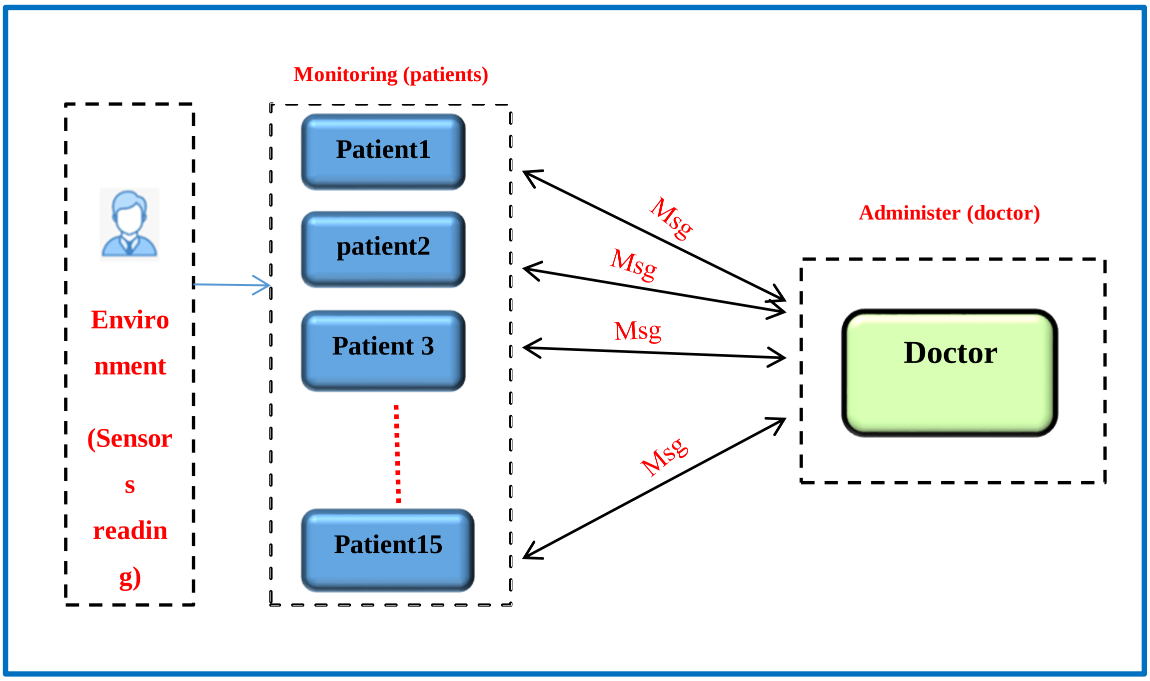

Figure (4.4) the overview for experimented proposed System

4.4.1. Client (Patient) GUI Window Description

After designing the monitoring agent as described in Chapter 3 constructed it using JADE. The following picture depicts the monitoring agent's template interface figure (4.5) after the first step when invocating the monitoring agent at the jade frame work . In addition that the Figure (4.6) describe the GUI window for the monitoring agent at executing the system .

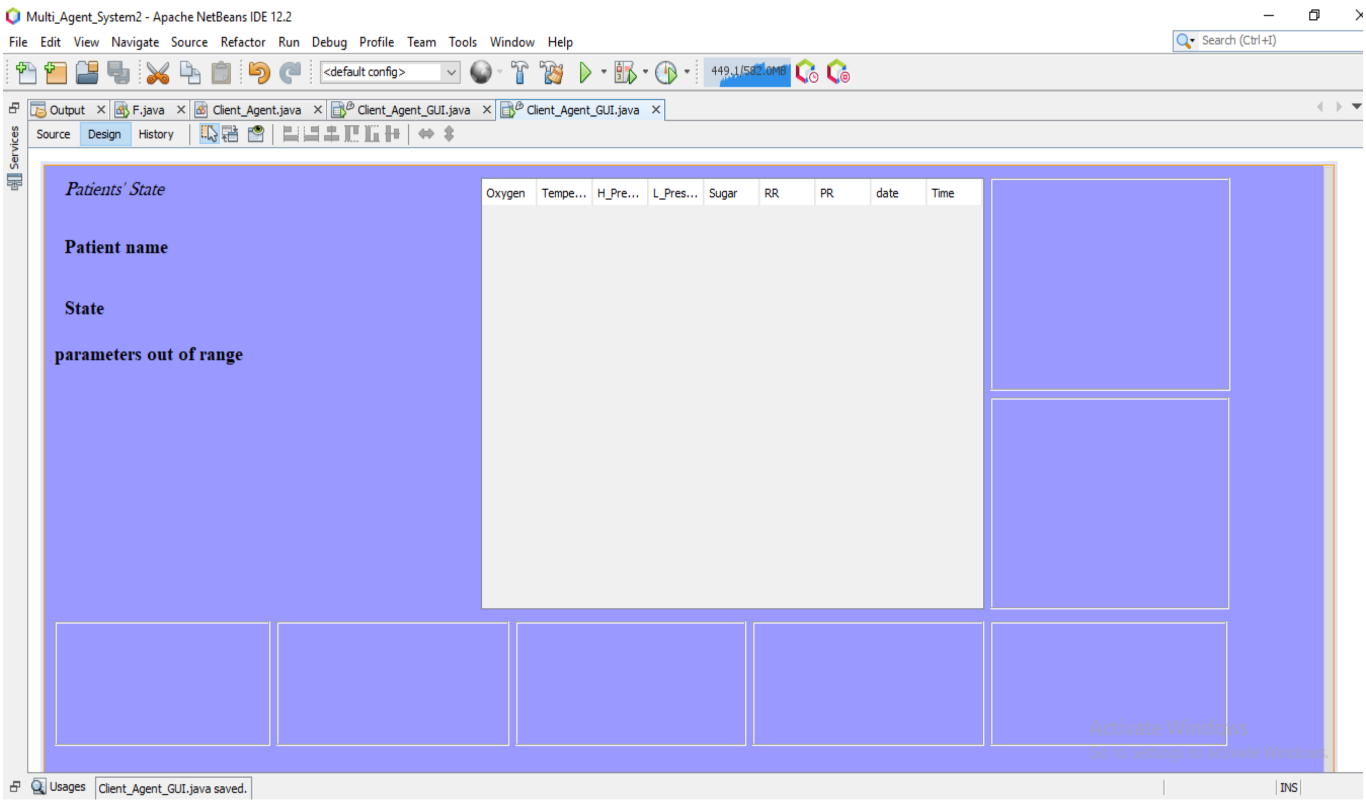

Figure (4.5) shows the Monitoring Agent Template Interface

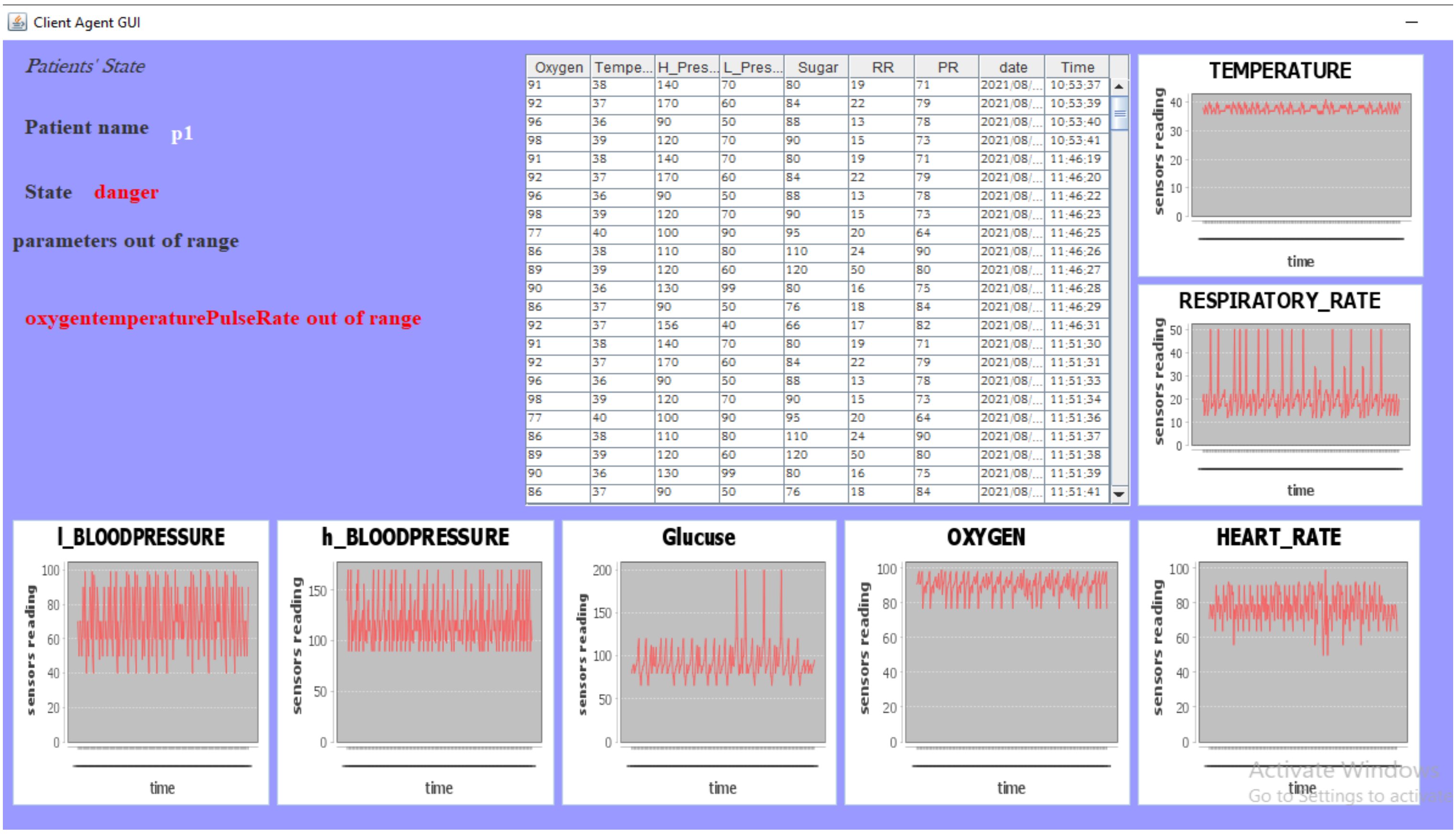

Figure (4.6) shows the Monitoring Agent Interface (Patient)

This window aims to display the information that the agent is perceived from an environment (Beliefs) , it saved them at the database (by MySQL language) named (patients) in a table is shown on this interface as figure (4.6 a) depicted it this table had columns for patient name and all sensors 'reading, the current time and date for this reading.

Oxygen	Tempe...	H_Pres...	L_Pres...	Sugar	RR	PR	date	Time
66	39	90	90	81	15	67	2021/09/...	12:34:47
65	41	90	90	81	15	72	2021/09/...	12:34:49
74	36	96	90	80	12	70	2021/09/...	12:34:50
74	36	96	90	80	12	70	2021/09/...	12:34:52
74	36	96	90	80	12	70	2021/09/...	12:34:53
74	36	96	90	80	12	70	2021/09/...	12:34:54
60	38	98	80	85	20	77	2021/09/...	12:34:56
61	38	92	60	85	14	70	2021/09/...	12:34:57
63	39	96	70	80	25	76	2021/09/...	12:34:58
64	40	94	80	87	16	64	2021/09/...	12:34:59
65	39	94	80	87	22	64	2021/09/...	12:35:01
65	40	96	80	86	28	66	2021/09/...	12:35:02
73	39	97	80	81	15	67	2021/09/...	12:35:03
74	41	98	80	81	15	67	2021/09/...	12:35:04
70	37	98	61	90	29	77	2021/09/...	12:35:05
69	40	98	70	85	21	72	2021/09/...	12:35:07
71	39	98	70	80	28	72	2021/09/...	12:35:08
68	38	92	87	87	12	70	2021/09/...	12:35:09
74	41	98	80	81	15	67	2021/09/...	12:35:10
70	37	98	61	90	29	77	2021/09/...	12:35:12
69	40	98	70	85	21	72	2021/09/...	12:35:13
71	39	98	70	80	28	72	2021/09/...	12:35:14
68	38	92	87	87	12	70	2021/09/...	12:35:15

Figure (4.6 a) screen shoot for the part display the patient table

Also the monitoring agent interface display on its interface the patient' info . (the state for the patient if it is normal will be this notation at the green color with the statement keep observing look Figure (4.6 b), and if the state for the patient is abnormal then the monitoring agent will show us on its interface the state is abnormal and which the sensors' reading was out of the natural range and these information will be at the red color as shown in the figure (4.6 c).

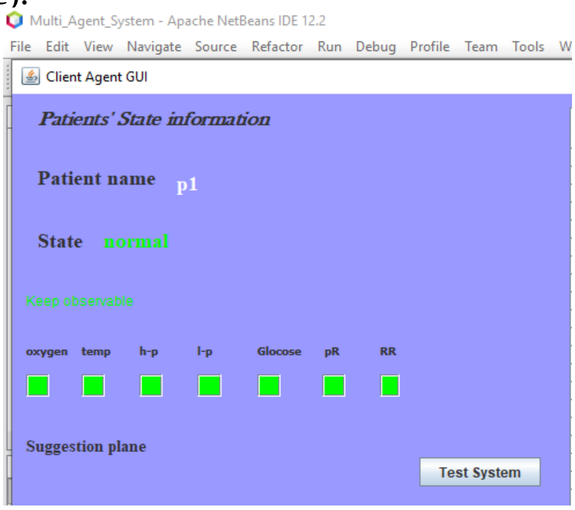

Figure (4.6b) screen shoot for the part display the patient info. When normal state

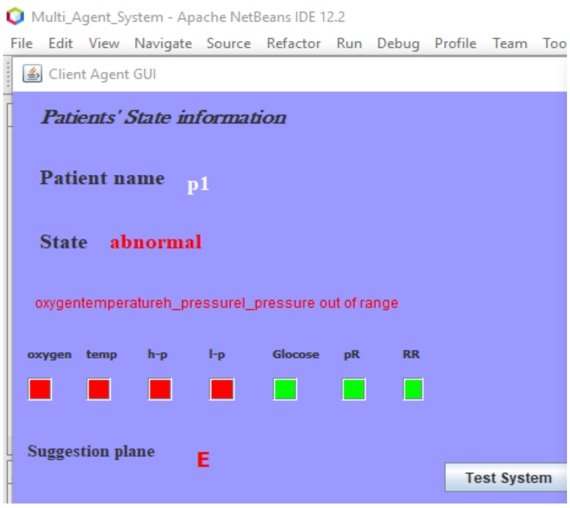

Figure (4.6 C) screen shoot for the part display the patient info. When abnormal state

Also, monitoring agent interface also display the chart for each this sensors' reading in the panels as shown in figure (4.6 d).

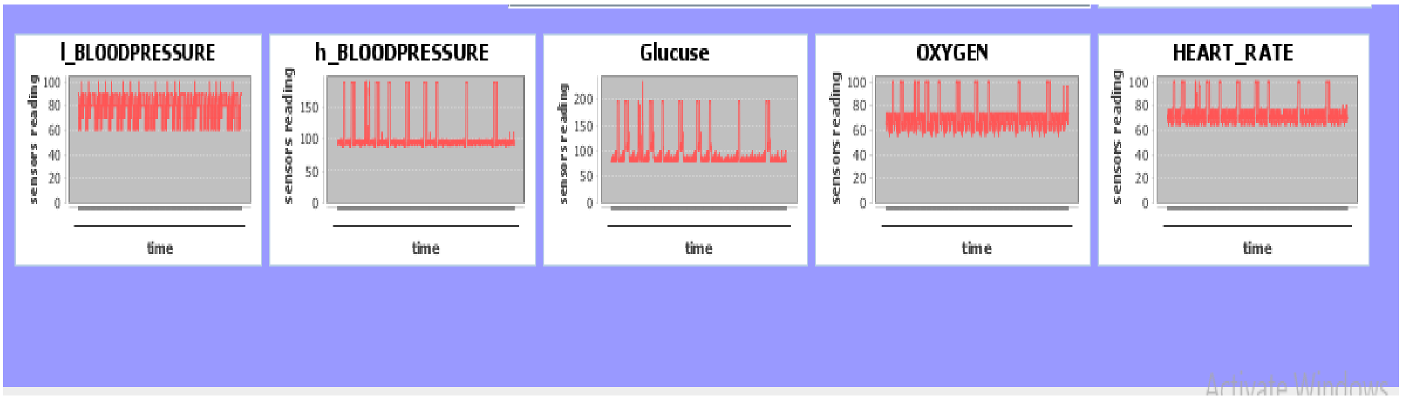

Figure (4.6 d) screen shoot for the part display the chart for the sensors' reading

4.4.2. Server (Doctor) GUI Window Description

For administrative agent, Figure (4.8) shows the administrative agent template interface. Using JADE's cyclic Behavior after invitation for this agent as shown in figure (4.7)

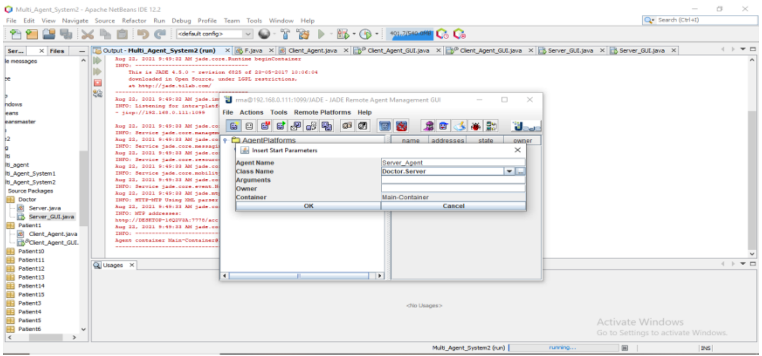

Figure (4.7) shows the invocated for an administrative agent by the jade framework

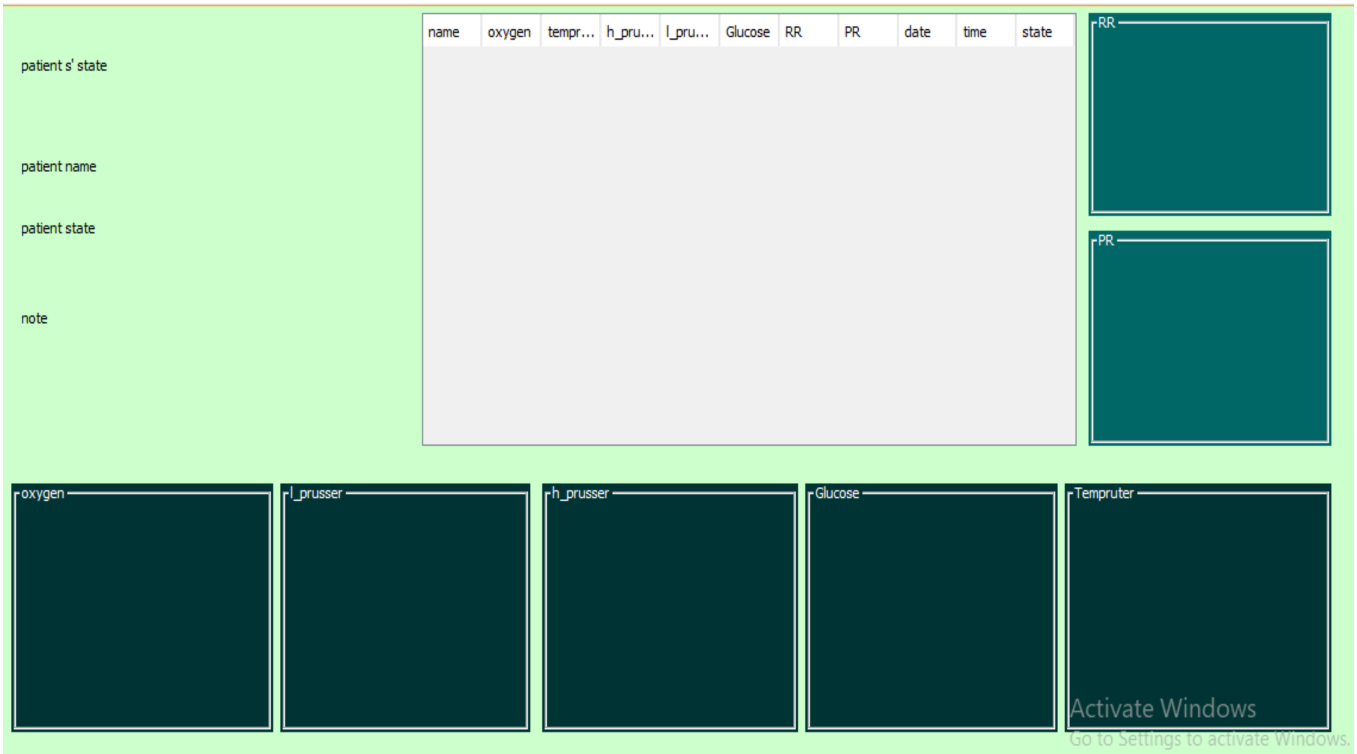

Figure (4.8) shows the Administrative Template Interface

Figure (4.9) depicts the administrative agent interface when it is in use. This agent automatically reads the alarms from the monitoring agent when it received an alert(as a message) from it. And like the monitoring agent, the administrative agent also displays the information about the patient and saves them in the database called “doctor” in the table “dbp” and draw the chart for each abnormal sensors' reading as shown at the Figure (4.12). Also, this agent suggests the appropriate treatment plan after computing the membership for this vector reading (when received an alert (message of information) at abnormal information).

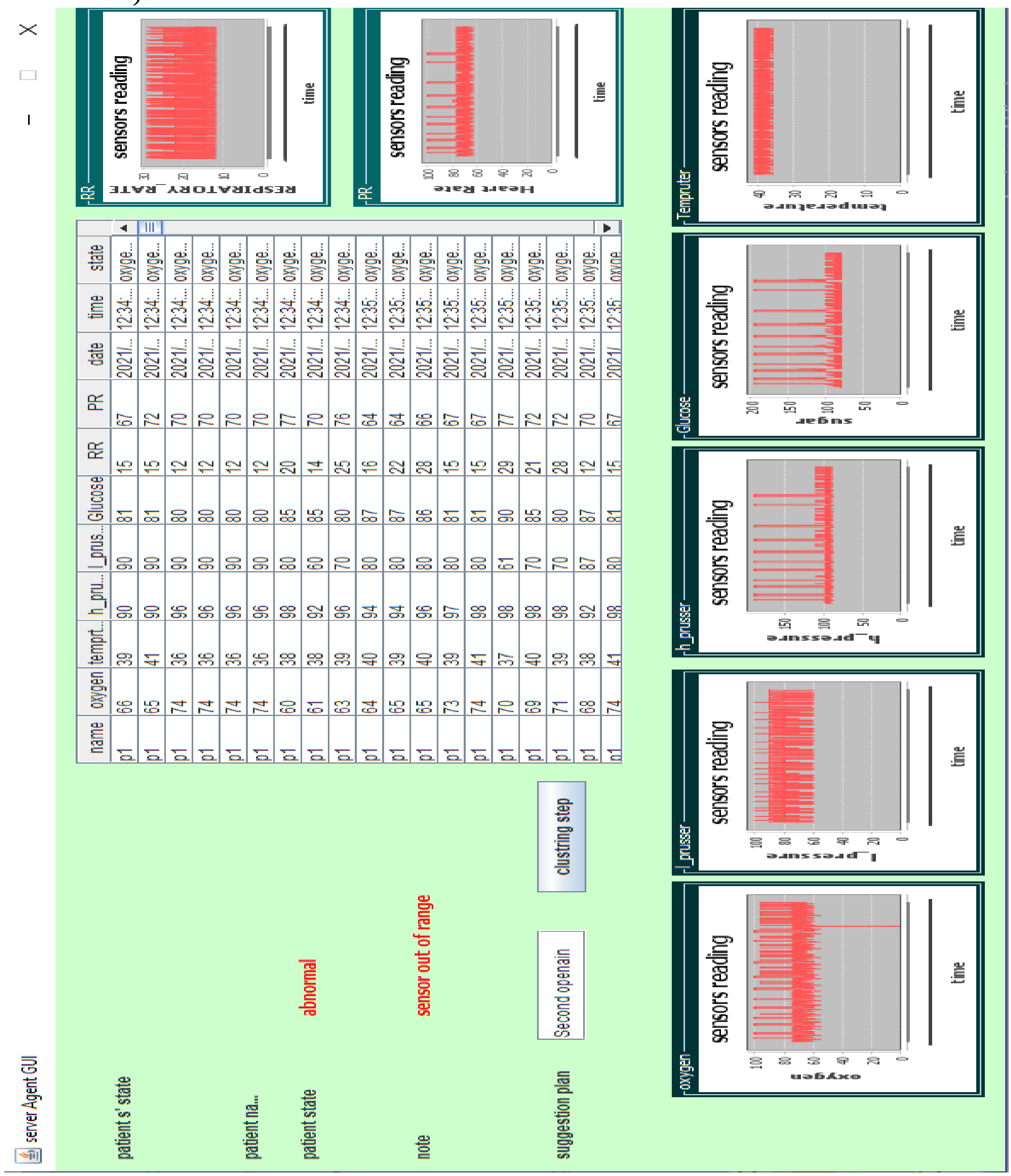

Figure (4.9) shows the Administer Agent Interface (Doctor)

Figure (4.10) describes the rustles for both agent's interfaces (monitoring and administrative) when executing our proposed system.

So, by watching the results in Figures (4.9) and (4.10) and comparing thus results with data that can see in Appendix A, we can conclude the proposed system is working correctly 100%.

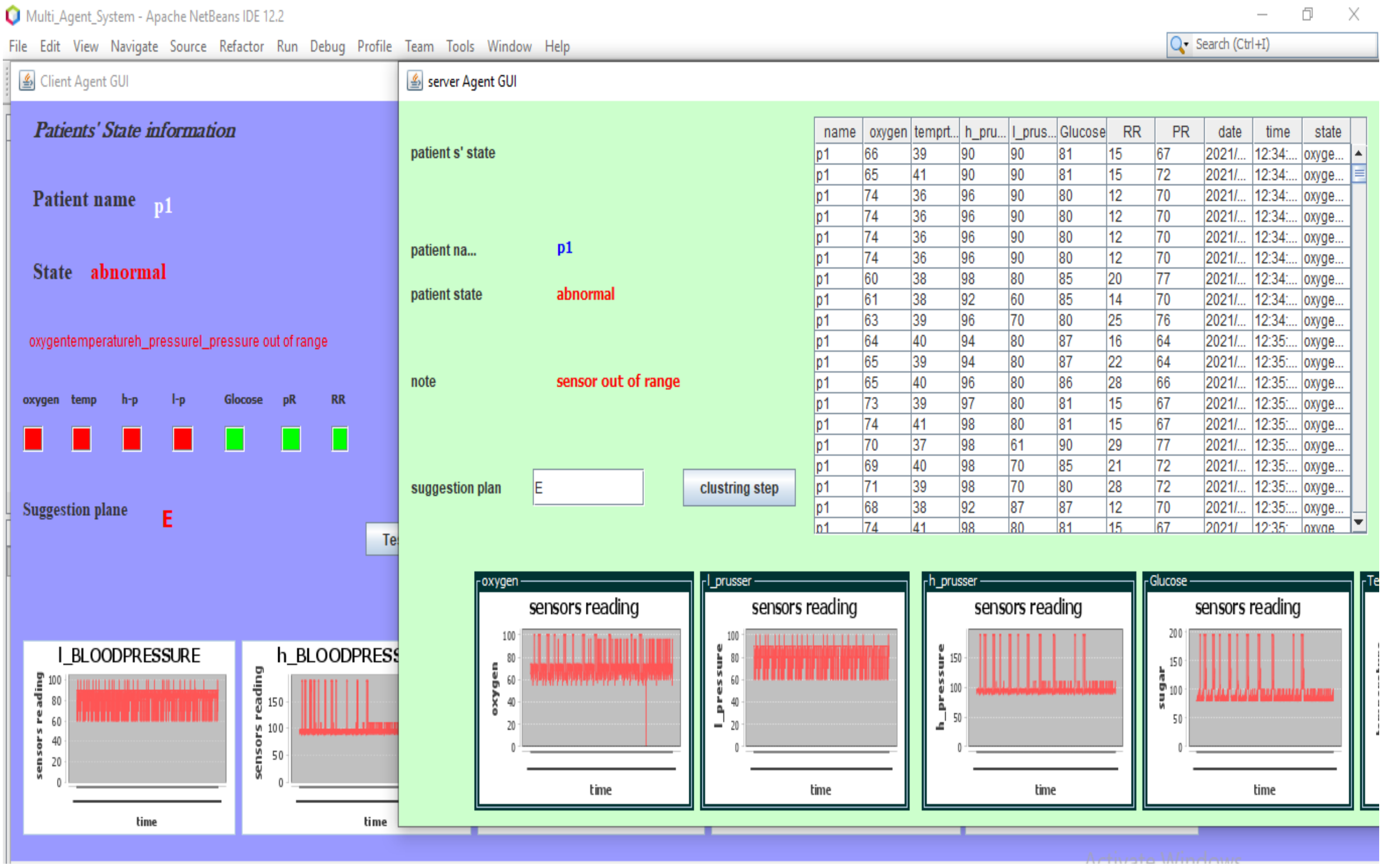

Figure (4.10) describes the monitoring and administrative agents' interfaces when executed the proposed system

4.4.3. Description Clustering Steps using K-Mean Algorithm

This stage is an important stage of the model stages. It is possible to cluster the data input depending on the degree of similarity between them into groups. The dataset that is used in this stage is collected from the hospital by tracking the patients' stats which were 900 samples each sample has 7 features , these features are represented the input data(vital parameters: oxygen, temperature, blood pressure (Bb), blood glucose, Respiratory Rate (RR), and Pulse Rate (PR)).

There are several algorithms used to cluster these data such as the K-mean algorithm that we used at this phase because it is more active with the numeric and big data the result for applying this phase are shown in figure (4.11) which is described for five groups obtained after the applied k-mean algorithm.

Data set :900 Sampls	Clusters Groups				
parameters at data set	Cluster 0 includes: 278	Cluster 1 includes: 148	Cluster 2 includes: 157	Cluster 3 includes: 134	Cluster 4 includes: 183
oxgyen,Temprtuer,h-prssure,l-pr	oxgyen,Temprtuer,h-prssure,l-prssure,Gluc	oxgyen,Temprtuer,h-prssure,l-prssure,Glu	oxgyen,Temprtuer,h-prssure,l-prssure,Glucos	oxgyen,Temprtuer,h-prssure,l-prssure,Glucos	oxgyen,Temprtuer,h-prssure,l-prssure,G
66,39,90,90,81,15,67	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(100.0,38.0,160.0,70.0,134.0,28.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(97.0,39.0,180.0,80.0,233.0,22.0,107.0)	(66.0,39.0,90.0,90.0,81.0,15.0,67.0
65,41,90,90,81,15,72	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(100.0,38.0,160.0,70.0,134.0,28.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(96.0,41.0,170.0,70.0,233.0,22.0,103.0)	(65.0,41.0,90.0,90.0,81.0,15.0,72.0
74,36,96,90,80,12,70	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(100.0,38.0,160.0,70.0,134.0,28.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(98.0,40.0,190.0,80.0,233.0,22.0,106.0)	(74.0,36.0,96.0,90.0,80.0,12.0,70.0
74,36,96,90,80,12,70	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(100.0,38.0,160.0,70.0,134.0,28.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,40.0,180.0,70.0,233.0,22.0,105.0)	(74.0,36.0,96.0,90.0,80.0,12.0,70.0
74,36,96,90,80,12,70	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(98.0,39.0,190.0,110.0,111.0,18.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,38.0,190.0,80.0,234.0,28.0,96.0)	(74.0,36.0,96.0,90.0,80.0,12.0,70.0
74,36,96,90,80,12,70	(88.0,38.0,110.0,60.0,260.0,18.0,76.0)	(99.0,40.0,180.0,90.0,120.0,18.0,96.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(96.0,40.0,190.0,90.0,234.0,28.0,96.0)	(74.0,36.0,96.0,90.0,80.0,12.0,70.0
60,38,98,80,85,20,77	(73.0,40.0,90.0,90.0,250.0,25.0,90.0)	(98.0,39.0,190.0,110.0,111.0,18.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,36.0,190.0,90.0,234.0,28.0,96.0)	(60.0,38.0,98.0,80.0,85.0,20.0,77.0
61,38,92,60,85,14,70	(79.0,39.0,90.0,90.0,200.0,25.0,89.0)	(99.0,40.0,180.0,90.0,120.0,18.0,96.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,38.0,190.0,80.0,234.0,28.0,96.0)	(61.0,38.0,92.0,60.0,85.0,14.0,70.0
63,39,96,70,80,25,76	(77.0,40.0,90.0,90.0,200.0,25.0,88.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(96.0,40.0,190.0,90.0,234.0,28.0,96.0)	(63.0,39.0,96.0,70.0,80.0,25.0,76.0
64,40,94,80,87,16,64	(79.0,39.0,90.0,80.0,200.0,25.0,87.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,36.0,190.0,90.0,234.0,28.0,96.0)	(64.0,40.0,94.0,80.0,87.0,16.0,64.0
65,39,94,80,87,22,64	(78.0,40.0,90.0,80.0,232.0,25.0,86.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,41.0,190.0,80.0,234.0,28.0,96.0)	(65.0,39.0,94.0,80.0,87.0,22.0,64.0
65,40,96,80,86,28,66	(79.0,39.0,90.0,80.0,232.0,25.0,85.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(98.0,38.0,180.0,70.0,234.0,28.0,96.0)	(65.0,40.0,96.0,80.0,86.0,28.0,66.0
73,39,97,80,81,15,67	(72.0,41.0,90.0,98.0,232.0,25.0,84.0)	(65.0,41.0,165.0,105.0,110.0,38.0,98.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(97.0,39.0,190.0,70.0,234.0,28.0,96.0)	(73.0,39.0,97.0,80.0,81.0,15.0,67.0
74,41,98,80,81,15,67	(76.0,40.0,90.0,96.0,232.0,25.0,83.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,41.0,150.0,90.0,234.0,28.0,96.0)	(74.0,41.0,98.0,80.0,81.0,15.0,67.0
70,37,98,61,90,29,77	(78.0,40.0,90.0,94.0,232.0,28.0,82.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(92.0,41.0,170.0,90.0,234.0,28.0,96.0)	(70.0,37.0,98.0,61.0,90.0,29.0,77.0
69,40,98,70,85,21,72	(75.0,41.0,90.0,92.0,232.0,30.0,81.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(97.0,39.0,180.0,80.0,233.0,22.0,107.0)	(69.0,40.0,98.0,70.0,85.0,21.0,72.0
71,39,98,70,80,28,72	(78.0,38.0,90.0,90.0,232.0,32.0,80.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(96.0,41.0,170.0,70.0,233.0,22.0,103.0)	(71.0,39.0,98.0,70.0,80.0,28.0,72.0
68,38,92,87,87,12,70	(77.0,40.0,96.0,88.0,200.0,34.0,79.0)	(65.0,41.0,165.0,105.0,110.0,38.0,98.	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(98.0,40.0,190.0,80.0,233.0,22.0,106.0)	(68.0,38.0,92.0,87.0,87.0,12.0,70.0
74,41,98,80,81,15,67	(75.0,36.0,92.0,86.0,200.0,36.0,78.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,189.0,80.0,195.0,22.0,100.0)	(99.0,40.0,180.0,70.0,233.0,22.0,105.0)	(74.0,41.0,98.0,80.0,81.0,15.0,67.0
70,37,98,61,90,29,77	(76.0,38.0,88.0,84.0,200.0,38.0,77.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,190.0,80.0,187.0,25.0,90.0)	(99.0,38.0,190.0,80.0,234.0,28.0,96.0)	(70.0,37.0,98.0,61.0,90.0,29.0,77.0
69,40,98,70,85,21,72	(73.0,41.0,84.0,82.0,200.0,40.0,76.0)	(61.0,39.0,167.0,95.0,102.0,19.0,94.0	(100.0,39.0,190.0,80.0,187.0,25.0,90.0)	(96.0,40.0,190.0,90.0,234.0,28.0,96.0)	(69.0,40.0,98.0,70.0,85.0,21.0,72.0
71,39,98,70,80,28,72	(80.0,38.0,80.0,80.0,200.0,42.0,75.0)	(64.0,40.0,166.0,100.0,106.0,40.0,96.	(100.0,39.0,190.0,80.0,187.0,25.0,90.0)	(99.0,36.0,190.0,90.0,234.0,28.0,96.0)	(71.0,39.0,98.0,70.0,80.0,28.0,72.0
68,38,92,87,87,12,70	(79.0,39.0,76.0,78.0,200.0,44.0,74.0)	(65.0,41.0,165.0,105.0,110.0,38.0,98.	(100.0,39.0,190.0,80.0,187.0,25.0,90.0)	(99.0,38.0,190.0,80.0,234.0,28.0,96.0)	(68.0,38.0,92.0,87.0,87.0,12.0,70.0

Figure (4-11): Screenshot for the clustering result by K-means Algorithm for 900 samples

We need from this stage only the cluster centers which represent the suggested treatment plane in the Table (4.3) Shown the Cluster center for each cluster group described above. And this result we want from the clustering step by using K-mean Algorithm.

Table (4.3): shows the cluster center for each cluster group

no	Cluster center name	Cluster center contents
1	Cluster center 0	(76.8129,39.1727,87.4388,83.0935,222.795,32.1439,80.2662)
2	Cluster center 1	(66.3919,38.3581,164.5135,92.5811,115.0405,29.9595,92.0946)
3	Cluster center 2	(98.0573,39.2293,178.3885,80.3185,182.5541,21.0764,91.9809)
4	Cluster center 3	(88.2761,39.0821,171.4925,77.3134,248.3358,22.1045,80.7985)
5	Cluster center 4	(66.4262,38.8907,95.7869,81.1803,94.5137,21.4918,72.8033)

4.5. Evaluation via Reward Function

The reward function Used to evaluate our agent behavior in the previous case study. So, discussed the system in this part, which runs over 900 samples that are collected by tracking the vitals' parameters for patients each patient was examined 4 times in one day. This tracking is continuous for days and the system we suggested filter these values and this proposed system can decide which normal and abnormal data. We assess the efficacy of our system based on the following Reward function after using our method to filter and make decisions regarding these statuses.

Formalized Reward function that mentioned in Section 2.13 in this thesis to evaluate the proposed agent's behavior in such cases like this case study in two ways:

4.5.1. Reward Values for each Observation:

To formalize Reward function for each **observation** with agents' action for the same patient as the following:

Let $xi = x1, x2, x3 \ldots . x\ n$ {represent **observations** (vitals' parameters) for patient j}

Let $[\ ai\ , bi]$ {the closed intervals that represented the minimum and

Maximum accepted natural values for each sensor's reading)}

Where if $xi \in [\, a\,i\,, bi]$ then the patient has a normal state (i.e. the patient in the safe health condition), so the agent behavior will be kept observing without any alert message.

And if $x\,i \notin [a\,i, bi]$ then the patient is in an abnormal state (i.e. the patient in danger), so agent behavior will be sending an alert message to the server (Administrative agent)

Also, we know the agent's behavior depending on the Boolean function (Eq .3.1) which is in simple way:

$$B = \begin{cases} \text{Act (keep observing)} \\ \text{Del (send alert message)} \end{cases}$$

Therefore in this way, we can calculate the reward function value as flowing

if $xi \in [\, a\,i\,, bi]$, and $B = keep\ observing \quad \Rightarrow R = 1$

if $xi \in [\, a\,i\,, bi]$, and $B = send\ alert\ message \ \Rightarrow R = -1$

if $x\,i \notin [a\,i\,, bi]$, and $B = keep\ observing \quad \Rightarrow R = -1$

if $x\,i \notin [a\,i\,, bi]$, and $B = send\ alert\ message \ \Rightarrow R = 1$

In above, we calculate the reward function value for each **observation** as shown in the flowing flowchart describe calculating the reward function value to evaluate our proposed system behavior in case study.

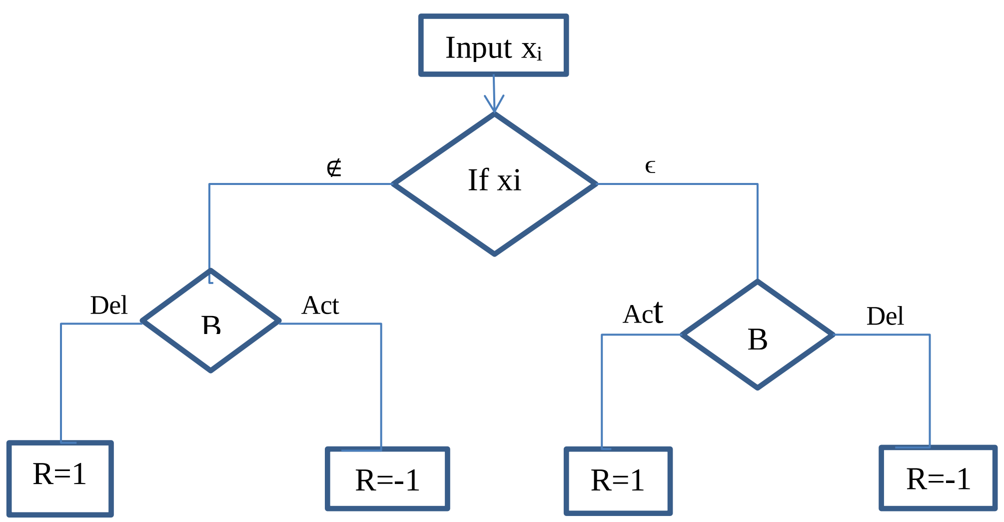

Figure (4.12) calculating the reward function value for each observation

4.5.2 Reward Values for all Observations

In this way we can formalize Reward function by generalize previous way to calculate reward values for all observation with agents' behavior as following:

if $x1 \epsilon [\, a\ i\ , bi]$, and $x2 \epsilon [\, a\ i\ , bi]$,…and $x\ n \epsilon [\, a\ i\ , bi]$, and $B = keep\ observing$ $\Rightarrow R = 1$

if $x1 \epsilon [\, a\ i\ , bi]$, and $x2 \epsilon [\, a\ i\ , bi]$,…and $x\ n \epsilon [\, a\ i\ , bi]$, and $B = send\ alert\ message$ $\Rightarrow R = -1$

if $x1 \notin [\, a\ i\ , bi]$, or $x2 \notin [\, a\ i\ , bi]$,…or $x\ n \notin [\, a\ i\ , bi]$, and $B = keep\ observing$ $\Rightarrow R = -1$

if $x1 \notin [\, a\ i\ , bi]$, or $x2 \notin [\, a\ i\ , bi]$,…or $x\ n \notin [\, a\ i\ , bi]$, and $B = send\ alert\ message$ $\Rightarrow R = 1$

4.5.3. The Results of Evolution

By using the second way that explained in Section (4.4.2) to evaluate the proposed system's behavior . We have obtained the results which showed in table (4.4) that represent the evaluation for our proposed system where the test is applied on the 100 samples. However, we can see that the reward value was 1 and this means that the agent is worked correctly 100%.

Table (4.4) outcomes after Implement the system and evaluated it

no	oxygen	Temperature	h-pressure	l-pressure	Glucose	RR	PR	check-action	reward-value
1	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
2	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
3	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
4	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
5	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1

6	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
7	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
8	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
9	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
10	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
11	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
12	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
13	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
14	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
15	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
16	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
17	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
18	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
19	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
20	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
21	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
22	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
23	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
24	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
25	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert	1

								message	
26	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
27	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
28	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
29	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
30	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
31	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
32	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
33	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
34	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
35	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
36	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
37	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
38	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
39	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
40	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
41	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
42	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
43	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
44	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1

45	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
46	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
47	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
48	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
49	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
50	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
51	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
52	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
53	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
54	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
55	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
56	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
57	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
58	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
59	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
60	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
61	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
62	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
63	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1

64	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
65	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
66	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
67	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
68	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
69	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
70	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
71	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
72	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
73	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
74	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
75	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
76	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
77	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
78	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
79	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
80	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
81	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
82	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1

83	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
84	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
85	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
86	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
87	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
88	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
89	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
90	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
91	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
92	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
93	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
94	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
95	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
96	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
97	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
98	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
99	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
100	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1

Chapter 5 – Conclusions and Future Work

Chapter Five

Conclusions and Future Works

5.1. Introduction (Where are we?)

For this thesis, problem was introducing an intelligent deliberative software system for Electronic Health (E-Health) to monitor patient cases in run-time under dynamic and non-deterministic environment conditions, and help physicians, and nurses in their job.

In other words, how could implement and evaluate intelligent software for E-Health to help physicians, nurses, and health practitioners daily to collect and track patient data to improve care decisions? How could do that in run-time under dynamic and non-deterministic environment conditions?

In addition, the objectives of this thesis; to implement a model-based system such as the Extensible Beliefs Desires and Intentions (EBDI) model as architecture for situated autonomic software agents in run-time under dynamic and non-deterministic environment's conditions.

5.2. Conclusions

The following points are shown as conclusions during designing and building the intelligent software agent implemented in the E-health system utilizing MAS:

1. The system was created by using AI (intelligent Software agent) with E-health.

2. formalized the EBDI model that outperforms all deliberative situated agents in dynamic environments in E-Health.
3. EBDI defines the degree of commitment and the intention reconsideration of the agent that guarantees the best policy in a dynamic environment.
4. The designed system is based on the EBDI model, which is active in a dynamic environment, and it is expected to be a future alternative to the existing system for improving life quality.
5. built a model(multi-Agent-System) that can implement a software intelligent agent(EBDI model) for E-health to work as monitoring for patient's state which gives an alarm where there is a problem at any input file (filtering a piece of information that an agent percept it from an environment).
6. The method allows the doctor to make the best decision possible at the appropriate time, saving the patient's life.
7. The technology is intended to keep track of patients' states in hospitals.
8. The proposed system can suggest the appropriate treatment plan for the patient depending on the alarm received from the patient side by using the clustering technique (K-mean algorithm) with the membership function.
9. Used two ways to evaluate the proposed system, first way by using a case study with real data and comparing agent's behavior with real data. In the second way we formalize Reward function to calculate Reward values that represent like scores for agent's behavior. In both previous ways the proposed system proved excellent behavior working correctly 100%.

10. Formalized Reward function to evaluate the proposed agent's behavior in such cases like this case in this thesis, which represents an easy and better way to evaluate agent behavior in the same circumstances.

5.3. Future Work

The following some recommendations for further work:

1. Adding many more input files to the system to improve it .
2. Improving the system by designing one **administrative agent** as a server and many **monitoring agents** working in parallel in run time .
3. A diagnosis system may be created, and the system can be made portable to be utilized at any time and from any location while keeping track of the patients' condition.
4. The GUI window appearance can be changed depending on the institution that will use the proposed system.
5. The system can be developed by using another function for clustering’s such as DBSCAN algorithms or FCM algorithms.

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المستخلص

في الوقت الحاضر ، أهتم الباحثون بأنظمة الرعاية الصحية (أنظمة مراقبة المريض وتشخيصه). حيث قاموا بالعديد من الأبحاث في مجالات الصحة الإلكترونية وتحسين أنظمة الرعاية الصحية وتقليل الجهد والوقت على المستخدمين الصحيين (الأطباء والممرضات) وكذلك متابعة حالة المرضى و وبالأخص كبار السن ، و نتيجة لأن معظم المستشفيات قد نفدت طاقتها ، تم استخدام برنامج الوكيل الذكي في هذا المجال.

الغرض الرئيسي من هذه الرسالة هو معرفة كيف يمكننا توظيف وتقييم البرامج الذكية في مجال الصحة الإلكترونية في ظل ظروف بيئة ديناميكية وغير متوقعة من أجل مساعدة الأطباء والممرضات والممارسين الصحيين على أساس يومي لجمع وتتبع بيانات المرضى وكذلك لتحسين أتخاذ قرارات الرعاية.

في هذه الرسالة قمنا بتنفيذ نظام قائم على النموذج مثل نموذج توسيع المعتقدات والرغبات والنوايا (EBDI)كهيكل لوكلاء البرامج المضمنة في ظل ظروف بيئة ديناميكية وغير متوقعة.

إضفنا الطابع الرسمي على نموذج EBDI في الصحة الإلكترونية ليعمل كمراقب لمتابعة حالة المريض المتصل بأجهزة الاستشعار مثل مقياس الحرارة (مقياس الحرارة) ، ومقياس الأكسجين ...) حيث يعمل هذا النوذج على يقوم تصفية البيانات (قراءات الاستشعار) ويحدد هل حالة المريض طبيعية ام لا ثم يرسل تنبيه إلى الوكيل الإداري ، والذي يمثل نوعًا آخر من وكيل.EBDI

إضافة لما سبق ، يعمل النظام المقترح بالمساهمة من خلال اقتراح خطة علاج تتناسب مع قراءات المستشعرات وفي بعض الحالات الطارئة يطلب استشارة الطبيب.

تم تصميم نظام مراقبة لمتابعة (مراقبة) الحالة الصحية للمرضى في هذه الدراسة على أنه نظام متعدد العوامل (MAS) مع استخدام تقنية التجميع (باستخدام خوارزمية-K mean).

مع ملاحظة انه تم تقييم النظام المقترح من خلال استخدام طريقتين ، الطريقة الأولى باستخدام دراسة الحالة وتتمثل باخذ ببيانات حقيقية ومقارنة سلوك الوكيل بالبيانات

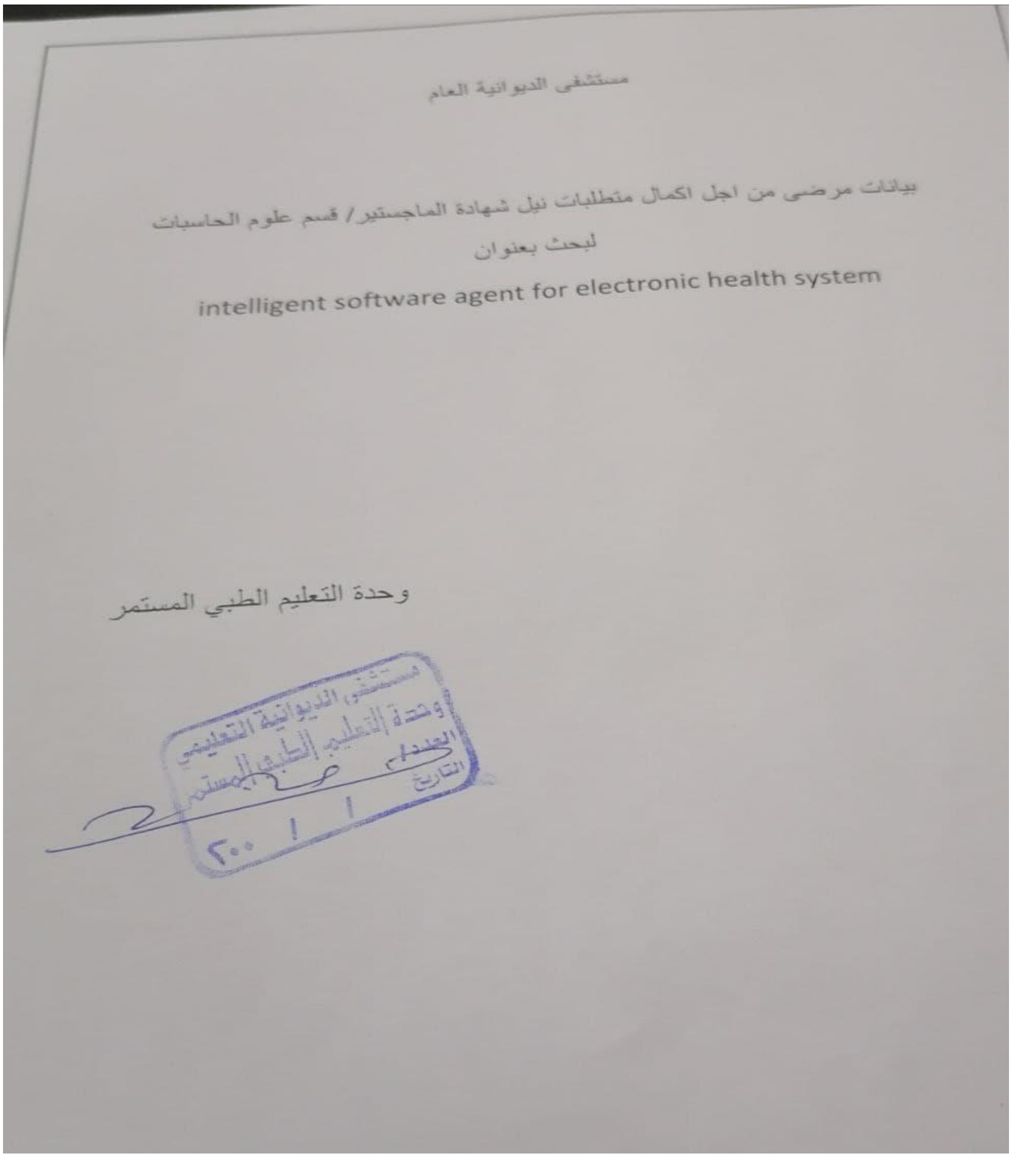
الحقيقية. أما الطريقة الثانية ،من خلال عمل صياغة لوظيفة المكافأة بطريقة ما لحساب قيم المكافأة التي تمثل مثل الدرجات لسلوك الوكيل.ومن ملاحظتنا لكلا الطريقتين السابقتين ، أثبت النظام المقترح أن سلوك العامل يعمل بشكل صحيح بنسبة 100٪.

وبالنهاية قمنا بصياغة الطابع الرسمي على وظيفة المكافأة لتقييم سلوك الوكيل المقترح في مثل هذه الحالات مثل هذه الحالة في هذه الرسالة ، والتي تمثل طريقة سهلة وأفضل لتقييم سلوك الوكيل في نفس الظروف.

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

Appendix A , B

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital


مستشفى الديوانية العام

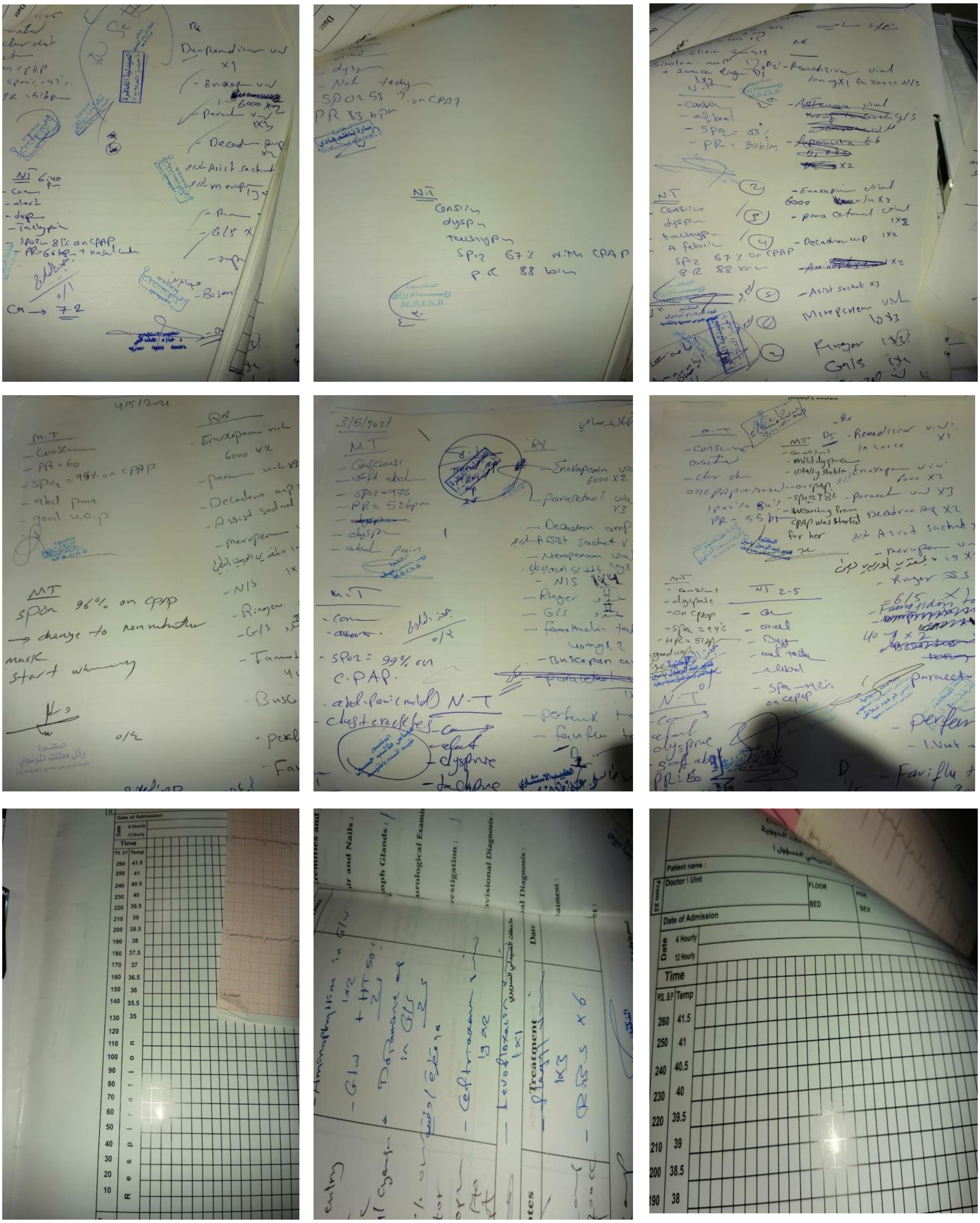
بيانات مرضى من اجل اكمال متطلبات نيل شهادة الماجستير/ قسم علوم الحاسبات

لبحث بعنوان

intelligent software agent for electronic health system

وحدة التعليم الطبي المستمر

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital



Screen shoot for some patients' records which the data are collected from it

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

no	id	oxygen	temperature	H-pressure	L-pressure	Glucose	Respiratory Rate	Pulse Rate
1	1	66	39	90	90	81	15	67
2	1	65	41	90	90	81	15	72
3	1	74	36	96	90	80	12	70
4	1	60	38	98	80	85	20	77
5	1	61	38	92	60	85	14	70
6	1	63	39	96	70	80	25	76
7	1	64	40	94	80	87	16	64
8	1	65	39	94	80	87	22	64
9	1	65	40	96	80	86	28	66
10	1	73	39	97	80	81	15	67
11	1	74	41	98	80	81	15	67
12	1	70	37	98	61	90	29	77
13	1	69	40	98	70	85	21	72
14	1	71	39	98	70	80	28	72
15	1	68	38	92	87	87	12	70
16	1	59	40	93	86	84	20	77
17	1	67	40	94	60	86	14	70
18	1	72	41	95	70	81	15	76
19	1	66	36	96	80	85	19	64
20	1	62	38	97	90	88	22	66
21	1	74	37	98	70	80	25	67
22	1	66	41	99	100	95	20	72
23	1	55	41	95	84	81	26	70
24	1	61	40	90	90	81	22	77
25	1	62	38	97	82	88	13	70
26	1	65	37	98	81	80	16	76
27	1	71	41	90	90	100	24	64
28	1	59	37	95	81	90	29	64
29	1	68	40	89	90	85	21	66
30	1	73	39	88	70	80	28	67
31	1	68	38	92	87	87	12	67
32	1	73	40	93	86	84	20	70
33	1	58	40	99	90	97	17	78
34	1	100	39	189	80	195	22	100
35	1	66	39	90	90	101	15	67
36	1	65	41	90	90	108	15	72
37	1	63	36	96	90	115	12	80
38	1	67	36	98	80	122	20	88
39	1	61	38	92	60	129	14	70
40	1	61	37	96	70	136	25	76
41	1	64	40	94	80	87	16	64

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

42	1	65	39	94	80	87	22	64
43	1	65	40	96	80	86	28	66
44	1	66	40	97	80	81	15	67
45	1	65	41	98	80	81	15	67
46	1	57	37	98	61	90	29	77
47	1	69	40	98	70	85	21	72
48	1	74	39	98	70	80	28	72
49	1	68	38	92	87	87	12	70
50	1	70	40	93	86	84	20	77
51	1	67	40	94	60	86	14	70
52	1	58	41	95	70	81	15	76
53	1	66	38	96	80	85	19	64
54	1	55	38	97	90	88	22	66
55	1	72	37	98	70	80	25	67
56	1	56	40	110	90	85	22	78
57	1	100	39	190	80	187	25	90
58	1	66	41	90	90	101	15	67
59	1	65	41	90	90	108	15	72
60	1	60	36	96	90	115	12	70
61	2	60	36	98	80	122	20	77
62	2	61	38	92	60	129	14	70
63	2	61	37	96	70	136	25	76
64	2	64	40	94	80	87	16	64
65	2	65	39	94	80	87	22	64
66	2	65	40	96	80	86	28	66
67	2	66	40	97	80	81	15	67
68	2	65	41	98	80	81	15	67
69	2	53	37	98	61	90	29	83
70	2	67	40	98	70	85	21	88
71	2	72	39	98	70	80	28	72
72	2	68	38	92	87	87	12	70
73	2	56	40	93	86	84	20	77
74	2	67	40	94	60	86	14	70
75	2	62	41	95	70	81	15	76
76	2	66	37	96	80	85	19	64
77	2	63	38	97	90	88	22	66
78	2	66	39	98	70	80	25	67
79	2	66	41	99	100	130	15	72
80	2	73	41	95	84	81	26	70
81	2	66	40	90	90	81	22	77
82	2	62	38	97	82	88	13	70
83	2	66	37	98	81	80	16	76
84	2	72	41	90	90	100	19	64

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

85	2	70	37	95	81	90	29	64
86	2	68	40	89	90	85	21	66
87	2	72	39	88	70	80	28	67
88	2	68	38	92	87	87	12	67
89	2	73	40	93	86	84	20	70
90	2	70	40	120	90	86	22	79
91	2	61	38	90	70	100	14	77
92	2	61	39	90	70	80	25	70
93	2	64	40	90	90	87	16	76
94	2	65	39	92	90	87	22	64
95	2	65	40	94	90	86	28	66
96	2	66	40	90	90	81	15	67
97	2	65	41	90	90	81	15	72
98	2	60	36	96	90	80	12	70
99	2	60	38	98	80	85	20	77
100	2	61	38	92	60	85	14	70
101	2	61	39	96	70	80	25	76
102	2	64	40	94	80	87	16	64
103	2	65	39	94	80	87	22	64
104	2	65	40	96	80	86	28	66
105	2	66	39	97	80	81	15	67
106	2	65	41	98	80	81	15	67
107	2	71	37	98	61	90	29	77
108	2	69	40	98	70	85	21	72
109	2	74	39	98	70	80	28	72
110	2	68	38	92	87	87	12	70
111	2	69	40	93	86	84	20	77
112	2	67	40	94	60	86	14	70
113	2	72	41	95	70	81	15	76
114	2	66	36	96	80	85	19	64
115	2	63	38	97	90	88	22	66
116	2	71	37	98	70	80	25	67
117	2	66	41	99	100	142	19	72
118	2	69	41	95	84	81	26	70
119	2	66	40	90	90	81	22	77
120	2	62	38	97	82	88	13	70
121	3	66	37	98	81	80	16	76
122	3	69	41	90	90	100	18	64
123	3	70	37	95	81	90	29	64
124	3	68	40	89	90	85	21	66
125	3	71	39	88	70	80	28	67
126	3	68	38	92	87	87	12	67
127	3	73	40	93	86	84	20	77

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

128	3	59	40	130	90	100	19	75
129	3	100	40	190	80	196	21	91
130	3	95	40	170	100	150	18	90
131	3	98	39	190	90	200	25	86
132	3	99	40	180	90	200	24	100
133	3	97	39	180	80	233	22	107
134	3	96	41	170	70	233	22	103
135	3	98	40	190	80	233	22	106
136	3	99	40	180	70	233	22	105
137	3	100	41	180	90	133	23	98
138	3	99	38	190	80	233	22	105
139	3	96	40	190	90	233	22	99
140	3	99	36	190	90	233	22	93
141	3	100	38	170	70	136	24	95
142	3	99	41	190	80	233	22	88
143	3	98	38	180	70	233	22	93
144	3	97	39	190	70	233	22	90
145	3	99	41	150	90	233	22	92
146	3	94	41	170	90	233	22	90
147	3	100	39	189	80	187	20	96
148	3	94	40	170	100	121	13	95
149	3	98	39	190	110	234	28	86
150	3	99	40	180	90	234	28	96
151	3	97	39	180	80	234	28	96
152	3	96	41	170	70	234	28	96
153	3	98	40	190	80	234	28	96
154	3	99	40	180	70	234	28	96
155	3	100	41	170	90	167	26	96
156	3	99	38	190	80	234	28	96
157	3	96	40	190	90	234	28	96
158	3	99	36	190	90	234	28	96
159	3	100	38	160	70	134	28	96
160	3	99	41	190	80	234	28	96
161	3	98	38	180	70	234	28	96
162	3	97	39	190	70	234	28	96
163	3	99	41	150	90	234	28	96
164	3	92	41	170	90	234	28	96
165	3	100	39	189	80	154	23	96
166	3	95	40	170	100	150	24	96
167	3	98	39	190	110	190	18	96
168	3	99	40	180	90	154	18	96
169	3	97	39	180	80	186	18	96
170	3	96	41	170	70	186	18	96

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

171	3	98	40	190	80	186	18	96
172	3	99	40	180	70	186	18	96
173	3	100	41	170	90	123	21	96
174	3	99	38	190	80	190	18	96
175	3	96	40	190	90	132	18	96
176	3	99	36	190	90	100	15	96
177	3	100	38	180	70	134	27	96
178	3	99	41	190	80	154	15	96
179	3	98	38	180	70	177	15	96
180	3	97	39	190	70	145	15	96
181	4	99	41	150	90	134	16	96
182	4	93	41	170	90	150	15	96
183	4	100	39	189	80	187	26	96
184	4	96	40	170	100	350	24	96
185	4	98	39	190	110	111	18	96
186	4	99	40	180	90	120	18	96
187	4	97	39	180	80	129	18	96
188	4	96	41	170	70	138	18	96
189	4	98	40	190	80	147	18	96
190	4	99	40	180	70	156	18	96
191	4	100	41	170	90	188	18	96
192	4	99	38	190	80	126	18	96
193	4	96	40	190	90	129	18	96
194	4	99	36	190	90	132	18	96
195	4	100	38	160	70	197	18	96
196	4	99	41	190	80	149	18	96
197	4	98	38	180	70	134	18	96
198	4	97	39	190	70	189	18	96
199	4	99	41	150	90	103	16	96
200	4	92	38	170	90	123	17	96
201	4	100	39	189	80	190	19	96
202	4	98	39	190	110	181	17	96
203	4	99	40	180	90	180	17	96
204	4	97	39	180	80	179	17	96
205	4	96	41	170	70	178	17	96
206	4	98	40	190	80	177	17	96
207	4	99	40	180	70	176	17	96
208	4	100	41	170	90	175	17	96
209	4	99	38	190	80	195	17	96
210	4	96	40	190	90	195	17	96
211	4	99	36	190	90	125	17	96
212	4	100	38	160	70	189	17	96
213	4	99	41	190	80	199	17	96

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

214	4	98	38	180	70	187	17	96
215	4	97	39	190	70	178	17	96
216	4	99	41	150	90	169	16	96
217	4	92	39	170	90	145	24	96
218	4	100	39	189	80	184	19	96
219	4	92	40	170	100	167	18	96
220	4	98	39	190	110	190	25	96
221	4	99	40	180	90	166	24	96
222	4	97	39	180	80	155	22	96
223	4	96	41	170	70	178	24	96
224	4	98	40	190	80	187	25	96
225	4	99	40	180	70	144	33	96
226	4	100	41	170	90	176	30	96
227	4	99	38	190	80	155	22	96
228	4	96	40	190	90	156	33	96
229	4	99	36	190	90	181	33	96
230	4	100	38	190	70	183	24	96
231	4	99	41	190	80	156	21	96
232	4	98	38	180	70	166	33	96
233	4	97	39	190	70	198	36	96
234	4	99	41	150	90	121	16	96
235	4	92	36	170	90	189	24	96
236	4	100	39	189	80	176	19	96
237	4	100	39	189	80	187	19	96
238	4	96	40	170	100	288	24	76
239	4	98	39	190	110	167	15	96
240	4	99	40	180	90	148	15	96
241	5	97	39	180	80	140	15	96
242	5	96	41	170	70	189	15	96
243	5	98	40	190	80	148	15	96
244	5	99	40	180	70	122	15	96
245	5	100	41	170	90	193	15	96
246	5	99	38	190	80	167	15	96
247	5	96	40	190	90	198	15	96
248	5	99	36	190	90	188	15	96
249	5	100	38	170	70	164	15	96
250	5	99	41	190	80	189	15	96
251	5	98	38	180	70	190	15	96
252	5	97	39	190	70	167	15	96
253	5	99	41	150	90	190	15	96
254	5	92	37	170	90	155	15	96
255	5	97	40	170	100	150	25	93
256	5	98	39	190	110	112	15	96

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

257	5	99	40	180	90	122	15	96
258	5	97	39	180	80	132	15	96
259	5	96	41	170	70	142	15	96
260	5	98	40	190	80	167	15	106
261	5	99	40	180	70	167	15	105
262	5	100	41	170	90	179	15	98
263	5	99	38	190	80	179	15	105
264	5	96	40	190	90	179	15	99
265	5	99	36	190	90	100	15	100
266	5	100	38	160	70	186	15	95
267	5	99	41	190	80	189	21	107
268	5	98	38	180	70	125	33	88
269	5	97	39	190	70	133	36	106
270	5	99	41	150	90	188	16	100
271	5	93	39	170	90	232	23	97
272	5	99	38	190	80	167	22	105
273	5	96	40	190	90	187	33	99
274	5	99	36	190	90	110	33	100
275	5	100	38	160	70	156	24	95
276	5	99	41	190	80	178	21	107
277	5	98	38	180	70	177	33	88
278	5	97	39	190	70	110	36	106
279	5	99	41	150	90	124	16	100
280	5	94	40	170	90	267	15	97
281	5	100	39	189	80	198	19	100
282	5	82	40	170	100	169	22	75
283	5	98	39	190	110	133	25	86
284	5	99	40	180	90	190	24	100
285	5	97	39	180	80	180	22	107
286	5	96	41	170	70	121	24	103
287	5	98	40	190	80	156	25	106
288	5	99	40	180	70	166	33	105
289	5	100	41	170	90	183	30	98
290	5	99	38	190	80	154	22	105
291	5	96	40	190	90	188	33	99
292	5	99	36	190	90	110	33	100
293	5	100	38	160	70	199	24	95
294	5	99	41	190	80	188	21	107
295	5	98	38	180	70	146	33	88
296	5	97	39	190	70	138	36	106
297	5	99	41	150	90	121	16	100
298	5	92	36	170	90	245	24	95
299	5	100	39	189	80	195	19	100

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

300	5	84	40	170	100	244	24	75
301	6	97	39	190	110	190	25	52
302	6	99	40	180	90	188	24	86
303	6	97	39	180	80	187	22	90
304	6	96	41	170	70	155	24	93
305	6	95	40	190	80	178	25	60
306	6	96	40	180	70	196	33	62
307	6	100	41	170	90	176	30	64
308	6	99	38	190	80	131	22	65
309	6	96	40	190	90	141	33	99
310	6	99	36	190	90	151	33	100
311	6	100	38	160	70	161	24	95
312	6	99	41	190	80	171	21	107
313	6	98	38	180	70	181	33	88
314	6	97	39	190	70	191	36	106
315	6	99	41	150	90	2021	16	100
316	6	92	41	170	90	211	24	100
317	6	100	39	189	80	177	19	100
318	6	85	40	170	100	350	24	80
319	6	98	39	190	90	134	25	86
320	6	99	40	180	90	156	24	100
321	6	97	39	180	80	178	22	107
322	6	96	41	170	70	189	24	103
323	6	98	40	190	80	125	25	106
324	6	99	40	180	70	198	33	105
325	6	100	41	170	90	193	30	98
326	6	99	38	190	80	122	22	105
327	6	96	40	190	90	189	33	99
328	6	99	36	190	90	187	33	100
329	6	100	38	160	70	191	24	95
330	6	99	41	190	80	123	21	107
331	6	98	38	180	70	145	33	88
332	6	97	39	190	70	156	36	106
333	6	99	41	150	90	178	16	100
334	6	92	41	170	90	289	24	99
335	6	100	39	189	80	158	19	100
336	6	100	39	189	80	189	19	100
337	6	86	40	170	90	350	24	75
338	6	98	39	190	80	156	25	86
339	6	99	40	180	90	154	24	100
340	6	97	39	180	80	145	22	107
341	6	96	41	170	70	167	24	103
342	6	98	40	190	80	187	25	106

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

343	6	99	40	180	70	188	33	105
344	6	100	41	170	90	185	30	98
345	6	99	38	190	80	177	22	105
346	6	96	40	190	90	189	33	99
347	6	99	36	190	90	150	33	100
348	6	100	38	160	70	183	24	95
349	6	99	41	190	80	123	21	107
350	6	98	38	180	70	143	33	88
351	6	97	39	190	70	176	36	106
352	6	99	41	150	90	166	16	100
353	6	92	41	170	90	234	24	99
354	6	87	40	170	100	145	24	75
355	6	98	39	190	110	145	25	86
356	6	99	40	180	90	167	24	100
357	6	97	39	180	80	187	22	107
358	6	96	41	170	70	123	24	103
359	6	98	40	190	80	133	25	106
360	6	99	40	180	70	196	33	105
361	7	100	41	170	90	156	30	98
362	7	99	38	190	80	109	22	105
363	7	96	40	190	90	100	33	99
364	7	99	36	190	90	110	33	100
365	7	100	38	160	70	188	24	95
366	7	99	41	190	80	120	21	107
367	7	98	38	180	70	124	33	88
368	7	97	39	190	70	134	36	106
369	7	99	41	150	90	145	16	100
370	7	92	41	170	90	156	24	94
371	7	100	39	189	80	181	19	100
372	7	81	40	170	100	350	24	75
373	7	98	39	190	110	178	25	86
374	7	99	40	180	90	190	24	100
375	7	97	39	180	80	176	22	107
376	7	96	41	170	70	187	24	103
377	7	98	40	190	80	133	25	106
378	7	99	40	180	70	145	33	105
379	7	100	41	170	90	184	30	98
380	7	99	38	190	80	123	22	105
381	7	96	40	190	90	154	33	99
382	7	99	36	190	90	178	33	100
383	7	100	38	160	70	167	24	95
384	7	99	41	190	80	189	21	107
385	7	98	38	180	70	176	33	88

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

386	7	97	39	190	70	121	36	106
387	7	99	41	150	90	180	16	100
388	7	92	41	170	90	156	24	90
389	7	100	39	189	80	171	19	100
390	7	80	40	180	80	250	20	72
391	7	98	39	190	110	146	25	86
392	7	99	40	180	90	176	24	100
393	7	97	39	180	80	156	22	107
394	7	96	41	170	70	188	24	103
395	7	98	40	190	80	134	25	106
396	7	99	40	180	70	189	33	105
397	7	100	41	170	90	193	30	98
398	7	99	38	190	80	199	22	105
399	7	96	40	190	90	156	33	99
400	7	99	36	190	90	187	33	100
401	7	100	38	160	70	167	24	95
402	7	99	41	190	80	193	21	107
403	7	98	38	180	70	145	33	88
404	7	97	39	190	70	167	36	106
405	7	99	41	150	90	167	16	100
406	7	92	41	170	90	180	24	90
407	7	100	39	189	80	166	19	100
408	7	88	40	170	100	350	24	95
409	7	98	39	190	110	189	25	86
410	7	99	40	180	90	124	24	100
411	7	97	39	180	80	134	22	107
412	7	96	41	170	70	178	24	103
413	7	98	40	190	80	189	25	106
414	7	99	40	180	70	199	33	105
415	7	100	41	170	90	183	30	98
416	7	99	38	190	80	134	22	105
417	7	96	40	190	90	145	33	99
418	7	99	36	190	90	156	33	100
419	7	100	38	160	70	174	24	95
420	7	99	41	190	80	184	21	107
421	8	98	38	180	70	194	33	88
422	8	97	39	190	70	204	36	106
423	8	99	41	150	90	214	16	100
424	8	98	41	170	90	224	24	90
425	8	80	40	180	80	250	20	72
426	8	80	40	160	60	205	29	88
427	8	81	41	150	70	210	28	74
428	8	82	38	160	80	215	27	75

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

429	8	93	40	170	80	220	26	51
430	8	81	40	180	80	250	20	60
431	8	85	38	180	90	230	24	78
432	8	86	39	190	90	245	23	79
433	8	87	37	170	80	240	22	89
434	8	88	37	170	90	245	21	72
435	8	89	40	180	80	250	20	72
436	8	90	39	190	70	250	20	74
437	8	88	38	110	60	260	18	76
438	8	89	40	190	70	255	19	74
439	8	87	40	130	70	270	16	73
440	8	85	41	140	60	275	15	76
441	8	86	36	150	50	280	14	79
442	8	82	38	190	70	255	19	74
443	8	86	37	170	90	290	22	72
444	8	89	41	160	80	295	13	72
445	8	89	40	180	80	250	20	72
446	8	80	40	160	60	205	29	88
447	8	81	41	150	70	210	28	74
448	8	81	38	160	80	215	27	75
449	8	84	40	170	80	220	26	80
450	8	89	40	180	80	250	20	72
451	8	85	38	180	90	230	24	78
452	8	86	39	190	90	245	23	79
453	8	85	37	170	80	240	22	89
454	8	89	37	170	90	245	21	72
455	8	86	40	180	80	250	20	72
456	8	88	39	190	70	255	19	74
457	8	88	38	110	60	260	18	76
458	8	89	40	190	70	255	19	74
459	8	87	40	130	70	270	16	73
460	8	85	41	140	60	275	15	76
461	8	86	36	150	50	280	14	79
462	8	82	38	190	70	255	19	74
463	8	86	37	170	90	290	22	72
464	8	89	41	160	80	295	13	72
465	8	100	38	160	70	100	24	95
466	8	99	41	190	80	105	21	107
467	8	98	38	180	70	110	33	88
468	8	97	39	190	70	115	36	106
469	8	84	41	150	90	120	16	55
470	8	98	41	170	90	125	24	51
471	8	94	40	180	80	250	20	51

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

472	8	92	40	160	60	205	29	60
473	8	81	41	150	70	210	28	74
474	8	82	38	160	80	215	27	75
475	8	83	40	170	80	220	26	80
476	8	84	40	180	80	250	20	72
477	8	85	38	180	90	230	24	78
478	8	86	39	190	90	245	23	79
479	8	87	37	170	80	240	22	89
480	8	88	37	170	90	245	21	72
481	9	89	40	180	80	250	20	72
482	9	90	39	190	70	155	19	74
483	9	88	38	110	60	260	18	76
484	9	89	40	190	70	255	19	74
485	9	87	40	130	70	270	16	73
486	9	85	41	140	60	275	15	76
487	9	86	36	150	50	280	14	79
488	9	82	38	190	70	255	19	74
489	9	86	37	170	90	290	22	72
490	9	89	41	160	80	295	13	72
491	9	89	40	180	80	250	20	72
492	9	80	40	160	60	205	29	88
493	9	81	41	150	70	210	28	74
494	9	81	38	160	80	215	27	75
495	9	84	40	170	80	220	26	80
496	9	89	40	180	80	250	20	72
497	9	85	38	180	90	230	24	78
498	9	86	39	190	90	245	23	79
499	9	85	37	170	80	240	22	89
500	9	89	37	170	90	245	21	72
501	9	86	40	180	80	250	20	72
502	9	88	39	190	70	255	19	74
503	9	88	38	110	60	260	18	76
504	9	89	40	190	70	255	19	74
505	9	87	40	130	70	270	16	73
506	9	85	41	140	60	275	15	76
507	9	86	36	150	50	280	14	79
508	9	82	38	190	70	255	19	74
509	9	86	37	170	90	290	22	72
510	9	89	41	160	80	295	13	72
511	9	73	40	90	90	250	25	90
512	9	79	39	90	90	200	25	89
513	9	77	40	90	90	200	25	88
514	9	79	39	90	80	200	25	87

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

515	9	78	40	90	80	232	25	86
516	9	79	39	90	80	232	25	85
517	9	72	41	90	98	232	25	84
518	9	76	40	90	96	232	25	83
519	9	78	40	90	94	232	28	82
520	9	75	41	90	92	232	30	81
521	9	78	38	90	90	232	32	80
522	9	77	40	96	88	200	34	79
523	9	75	36	92	86	200	36	78
524	9	76	38	88	84	200	38	77
525	9	73	41	84	82	200	40	76
526	9	80	38	80	80	200	42	75
527	9	79	39	76	78	200	44	74
528	9	77	41	72	76	200	46	73
529	9	76	40	90	80	200	48	72
530	9	93	39	170	80	164	18	90
531	9	75	38	90	80	225	30	86
532	9	76	40	90	80	230	34	82
533	9	72	36	90	80	235	30	78
534	9	78	41	90	80	240	30	74
535	9	79	40	90	80	245	30	75
536	9	70	39	90	80	250	30	80
537	9	71	38	90	80	255	30	80
538	9	72	40	90	90	180	30	90
539	9	79	39	90	90	200	30	89
540	9	77	40	90	90	254	30	88
541	10	79	39	90	80	250	30	87
542	10	78	40	90	80	250	30	86
543	10	79	39	90	80	300	30	85
544	10	74	41	90	98	300	30	84
545	10	76	40	90	96	300	30	83
546	10	78	40	90	94	300	30	82
547	10	75	41	90	92	198	30	81
548	10	78	38	90	90	270	32	80
549	10	77	40	96	88	270	34	79
550	10	75	36	92	86	270	36	78
551	10	76	38	88	84	270	38	77
552	10	71	41	84	82	270	40	76
553	10	80	38	80	80	132	42	75
554	10	79	39	80	78	205	44	74
555	10	77	41	80	76	210	46	73
556	10	76	40	80	80	215	48	72
557	10	100	39	190	80	156	22	90

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

558	10	75	38	90	80	225	40	86
559	10	76	40	90	80	230	38	82
560	10	74	36	90	80	235	36	78
561	10	78	41	90	80	240	34	74
562	10	79	40	90	80	245	32	75
563	10	72	39	90	80	250	30	80
564	10	71	38	90	80	255	30	80
565	10	100	39	180	80	161	23	90
566	10	75	38	80	80	225	33	86
567	10	76	40	80	80	230	36	82
568	10	74	36	80	80	235	39	78
569	10	78	41	80	80	240	42	74
570	10	79	40	80	80	245	45	75
571	10	75	39	80	80	250	33	80
572	10	71	38	80	80	255	33	80
573	10	75	40	90	90	180	33	90
574	10	79	39	110	90	170	29	89
575	10	77	40	110	90	160	27	88
576	10	79	39	110	80	150	32	87
577	10	78	40	90	80	193	33	86
578	10	79	39	100	80	167	28	85
579	10	75	41	90	98	220	24	84
580	10	76	40	90	96	203	26	83
581	10	78	40	90	94	178	35	82
582	10	75	41	90	92	121	30	81
583	10	78	38	90	90	245	32	80
584	10	77	40	96	88	180	34	79
585	10	75	36	92	86	185	36	78
586	10	76	38	88	84	190	38	77
587	10	71	41	84	82	195	40	76
588	10	80	38	80	80	200	42	75
589	10	79	39	76	78	205	44	74
590	10	77	41	72	76	210	46	73
591	10	76	40	90	80	215	48	72
592	10	100	39	170	80	181	21	90
593	10	75	38	90	80	225	25	86
594	10	76	40	90	80	230	18	82
595	10	74	36	90	80	235	25	78
596	10	78	41	90	80	240	25	74
597	10	79	40	90	80	245	23	75
598	10	77	39	90	80	250	18	80
599	10	71	38	90	80	255	25	80
600	10	70	40	90	90	180	15	90

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

601	11	79	39	90	90	170	23	89
602	11	77	40	110	90	160	22	88
603	11	79	39	110	80	150	22	87
604	11	78	40	90	80	196	30	86
605	11	79	39	100	80	200	22	85
606	11	70	41	90	98	120	30	84
607	11	76	40	90	96	110	26	83
608	11	78	40	90	94	234	33	82
609	11	75	41	90	92	234	30	81
610	11	78	38	90	90	254	32	80
611	11	77	40	96	88	280	34	79
612	11	75	36	92	86	285	36	78
613	11	76	38	88	84	190	38	77
614	11	70	41	84	82	195	40	76
615	11	80	38	80	80	200	42	75
616	11	79	39	76	78	205	44	74
617	11	77	41	72	76	210	46	73
618	11	76	40	90	80	215	48	72
619	11	100	39	160	80	194	17	90
620	11	75	38	80	80	225	25	86
621	11	76	40	80	80	230	18	82
622	11	74	36	80	80	235	25	78
623	11	78	41	80	80	240	25	74
624	11	79	40	80	80	245	34	75
625	11	73	39	80	80	250	31	80
626	11	71	38	80	80	255	25	80
627	11	100	39	160	80	191	19	90
628	11	75	38	90	80	225	25	86
629	11	76	40	90	80	230	23	82
630	11	74	36	90	80	235	25	78
631	11	78	41	90	80	240	25	74
632	11	79	40	90	80	245	34	75
633	11	74	39	90	80	250	27	80
634	11	71	38	90	80	255	25	80
635	11	74	40	90	90	180	40	90
636	11	79	39	90	90	170	40	89
637	11	77	40	90	90	160	33	88
638	11	79	39	90	80	150	34	87
639	11	78	40	90	80	243	40	86
640	11	79	39	90	80	243	37	85
641	11	72	41	90	98	243	24	84
642	11	76	40	90	96	243	26	83
643	11	78	40	90	94	243	22	82

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

644	11	75	41	90	92	154	30	81
645	11	78	38	90	90	166	32	80
646	11	77	40	96	88	180	34	79
647	11	75	36	92	86	185	36	78
648	11	76	38	88	84	190	38	77
649	11	76	41	84	82	195	40	76
650	11	80	38	80	80	200	42	75
651	11	79	39	76	78	205	44	74
652	11	77	41	72	76	210	46	73
653	11	76	40	110	80	115	48	72
654	11	100	39	180	80	194	27	90
655	11	75	38	90	80	225	25	86
656	11	76	40	90	80	230	18	82
657	11	74	36	90	80	235	25	78
658	11	78	41	90	80	240	25	74
659	11	79	40	90	80	245	28	75
660	11	80	39	90	80	250	31	80
661	12	71	38	90	80	255	25	80
662	12	80	40	80	90	180	32	90
663	12	79	39	80	90	170	31	89
664	12	77	40	80	90	160	40	88
665	12	79	39	80	80	150	32	87
666	12	78	40	90	80	140	30	86
667	12	79	39	100	80	130	40	85
668	12	78	41	90	98	207	24	84
669	12	76	40	90	96	197	36	83
670	12	78	40	90	94	197	29	82
671	12	75	41	90	92	197	30	81
672	12	78	38	90	90	197	32	80
673	12	77	40	96	88	180	34	79
674	12	75	36	92	86	185	36	78
675	12	76	38	88	84	190	38	77
676	12	76	41	84	82	195	40	76
677	12	80	38	80	80	200	42	75
678	12	79	39	76	78	205	44	74
679	12	77	41	72	76	210	46	73
680	12	76	40	80	80	215	48	72
681	12	100	39	180	80	163	18	90
682	12	75	38	90	80	225	36	86
683	12	76	40	90	80	230	32	82
684	12	74	36	90	80	235	30	78
685	12	78	41	90	80	240	31	74
686	12	79	40	90	80	245	33	75

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

687	12	77	39	90	80	250	40	80
688	12	71	38	90	80	255	25	80
689	12	100	39	190	80	183	16	90
690	12	75	38	80	80	225	25	86
691	12	76	40	80	80	230	33	82
692	12	74	36	80	80	235	25	78
693	12	78	41	80	80	240	25	74
694	12	79	40	80	80	245	26	75
695	12	73	39	80	80	250	31	80
696	12	71	38	80	80	255	25	80
697	12	72	40	90	90	180	31	90
698	12	79	39	90	90	170	35	89
699	12	77	40	80	90	160	32	88
700	12	79	39	90	80	150	34	87
701	12	78	40	80	80	189	30	86
702	12	79	39	90	80	234	29	85
703	12	71	41	80	98	222	24	84
704	12	76	40	90	96	228	26	83
705	12	78	40	90	94	267	23	82
706	12	75	41	90	92	288	30	81
707	12	78	38	90	90	184	32	80
708	12	77	40	96	88	180	34	79
709	12	75	36	92	86	185	36	78
710	12	76	38	88	84	190	38	77
711	12	80	41	84	82	195	40	76
712	12	80	38	80	80	200	42	75
713	12	79	39	76	78	205	44	74
714	12	77	41	72	76	210	46	73
715	12	76	40	90	80	215	48	72
716	12	100	39	160	80	164	15	90
717	12	75	38	90	80	225	25	86
718	12	76	40	90	80	230	34	82
719	12	74	36	90	80	235	25	78
720	12	78	41	90	80	240	25	74
721	13	79	40	90	80	245	40	75
722	13	73	39	90	80	250	36	80
723	13	71	38	90	80	255	25	80
724	13	74	40	90	90	180	37	90
725	13	79	39	90	90	276	34	89
726	13	77	40	90	90	265	30	88
727	13	79	39	90	80	251	28	87
728	13	78	40	90	80	243	27	86
729	13	79	39	80	80	243	27	85

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

730	13	75	41	90	98	243	27	84
731	13	76	40	90	96	234	26	83
732	13	78	40	90	94	2021	28	82
733	13	75	41	90	92	2021	30	81
734	13	78	38	90	90	180	32	80
735	13	77	40	96	88	180	34	79
736	13	75	36	92	86	185	36	78
737	13	76	38	88	84	190	38	77
738	13	77	41	84	82	195	40	76
739	13	80	38	80	80	200	42	75
740	13	79	39	76	78	205	44	74
741	13	77	41	72	76	210	46	73
742	13	76	40	110	80	215	48	72
743	13	100	39	170	80	173	19	90
744	13	75	38	130	80	225	33	86
745	13	76	40	110	80	230	33	82
746	13	74	36	120	80	235	33	78
747	13	78	41	90	80	240	33	74
748	13	79	40	90	80	245	33	75
749	13	78	39	90	80	250	33	80
750	13	71	38	90	80	255	33	80
751	13	100	39	160	80	158	26	90
752	13	75	38	90	80	225	30	86
753	13	76	40	80	80	230	30	82
754	13	74	36	80	80	235	30	78
755	13	78	41	80	80	240	30	74
756	13	79	40	80	80	245	30	75
757	13	72	39	90	80	250	30	80
758	13	71	38	90	80	255	30	80
759	13	61	39	167	95	102	19	94
760	13	64	40	166	100	106	40	96
761	13	65	41	165	105	110	38	98
762	13	65	38	164	110	114	36	100
763	13	66	37	163	80	118	34	102
764	13	65	36	162	90	122	32	100
765	13	69	40	161	100	126	30	96
766	13	68	38	160	88	140	24	77
767	13	69	38	159	80	134	26	77
768	13	68	38	158	88	138	24	74
769	13	55	37	110	80	90	31	90
770	13	59	36	169	85	94	33	90
771	13	57	37	110	80	90	33	91
772	13	59	36	169	85	94	33	90

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

773	13	61	38	168	90	98	26	92
774	13	61	39	167	95	102	19	94
775	13	64	40	166	100	106	40	96
776	13	65	41	165	105	110	38	98
777	13	65	38	164	110	114	36	100
778	13	66	37	163	80	118	34	102
779	13	65	36	162	90	122	32	100
780	13	69	40	161	100	126	30	96
781	14	68	38	160	88	140	24	77
782	14	69	38	159	80	134	26	77
783	14	68	38	158	88	138	24	74
784	14	61	39	167	95	102	19	94
785	14	64	40	166	100	106	40	96
786	14	65	41	165	105	110	38	98
787	14	65	38	164	110	114	36	100
788	14	66	37	163	80	118	34	102
789	14	65	36	162	90	122	32	100
790	14	69	40	161	100	126	30	96
791	14	68	38	160	88	140	24	77
792	14	69	38	159	80	134	26	77
793	14	68	38	158	88	138	24	74
794	14	58	37	110	80	90	32	90
795	14	59	36	169	85	94	33	90
796	14	57	37	110	80	90	30	91
797	14	59	36	169	85	94	33	90
798	14	61	38	168	90	98	26	92
799	14	61	39	167	95	102	19	94
800	14	64	40	166	100	106	40	96
801	14	65	41	165	105	110	38	98
802	14	65	38	164	110	114	36	100
803	14	66	37	163	80	118	34	102
804	14	65	36	162	90	122	32	100
805	14	69	40	161	100	126	30	96
806	14	68	38	160	88	140	24	77
807	14	69	38	159	80	134	26	77
808	14	68	38	158	88	138	24	74
809	14	56	37	110	80	90	34	90
810	14	59	36	169	85	94	33	90
811	14	61	38	168	90	98	26	92
812	14	61	39	167	95	102	19	94
813	14	64	40	166	100	106	40	96
814	14	59	36	169	85	94	33	90
815	14	61	38	168	90	98	26	92

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

816	14	61	39	167	95	102	19	94
817	14	64	40	166	100	106	40	96
818	14	65	41	165	105	110	38	98
819	14	65	38	164	110	114	36	100
820	14	66	37	163	80	118	34	102
821	14	65	36	162	90	122	32	100
822	14	69	40	161	100	126	30	96
823	14	68	38	160	88	140	24	77
824	14	69	38	159	80	134	26	77
825	14	68	38	158	88	138	24	74
826	14	57	37	110	80	90	32	91
827	14	59	36	169	85	94	33	90
828	14	59	37	110	80	90	30	90
829	14	59	36	169	85	94	33	90
830	14	61	38	168	90	98	26	92
831	14	61	39	167	95	102	19	94
832	14	64	40	166	100	106	40	96
833	14	65	41	165	105	110	38	98
834	14	65	38	164	110	114	36	100
835	14	66	37	163	80	118	34	102
836	14	65	36	162	90	122	32	100
837	14	69	40	161	100	126	30	96
838	14	68	38	160	88	140	24	77
839	14	69	38	159	80	134	26	77
840	14	68	38	158	88	138	24	74
841	15	58	37	110	80	90	30	94
842	15	59	36	169	85	94	33	90
843	15	61	38	168	90	98	26	92
844	15	61	39	167	95	102	19	94
845	15	64	40	166	100	106	40	96
846	15	59	36	169	85	94	33	90
847	15	61	38	168	90	98	26	92
848	15	61	39	167	95	102	19	94
849	15	64	40	166	100	106	40	96
850	15	65	41	165	105	110	38	98
851	15	65	38	164	110	114	36	100
852	15	66	37	163	80	118	34	102
853	15	65	36	162	90	122	32	100
854	15	69	40	161	100	126	30	96
855	15	68	38	160	88	140	24	77
856	15	69	38	159	80	134	26	77
857	15	68	38	158	88	138	24	74
858	15	56	37	110	80	90	32	93

Appendix A describes the data (900samples each sample had seven vital parameters are tracking) collected from hospital

859	15	59	36	169	85	94	33	90
860	15	57	37	110	80	90	32	91
861	15	59	36	169	85	94	33	90
862	15	61	38	168	90	98	26	92
863	15	61	39	167	95	102	19	94
864	15	64	40	166	100	106	40	96
865	15	65	41	165	105	110	38	98
866	15	65	38	164	110	114	36	100
867	15	66	37	163	80	118	34	102
868	15	65	36	162	90	122	32	100
869	15	69	40	161	100	126	30	96
870	15	68	38	160	88	140	24	77
871	15	69	38	159	80	134	26	77
872	15	68	38	158	88	138	24	74
873	15	57	37	110	80	90	32	91
874	15	59	36	169	85	94	33	90
875	15	61	38	168	90	98	26	92
876	15	61	39	167	95	102	19	94
877	15	64	40	166	100	106	40	96
878	15	65	41	165	105	110	38	98
879	15	65	38	164	110	114	36	100
880	15	66	37	163	80	118	34	102
881	15	65	36	162	90	122	32	100
882	15	69	40	161	100	126	30	96
883	15	68	38	160	88	140	24	77
884	15	69	38	159	80	134	26	77
885	15	68	38	158	88	138	24	74
886	15	56	37	110	80	90	30	92
887	15	59	36	169	85	94	33	90
888	15	58	37	110	80	90	32	93
889	15	59	36	169	85	94	33	90
890	15	61	38	168	90	98	26	92
891	15	61	39	167	95	102	19	94
892	15	64	40	166	100	106	40	96
893	15	65	41	165	105	110	38	98
894	15	65	38	164	110	114	36	100
895	15	66	37	163	80	118	34	102
896	15	65	36	162	90	122	32	100
897	15	69	40	161	100	126	30	96
898	15	68	38	160	88	140	24	77
899	15	69	38	159	80	134	26	77
900	15	68	38	158	88	138	24	74

no	Oxygen	Temperature	h-pressure	l-pressure	Glucose	RR	PR	check-action	reward-value
1	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
2	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
3	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
4	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
5	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
6	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
7	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
8	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
9	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
10	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
11	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
12	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
13	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
14	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
15	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
16	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
17	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
18	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
19	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
20	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
21	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
22	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	FALS	Send Alert	1

							E	message	
23	TRUE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
24	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
25	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
26	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
27	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
28	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
29	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
30	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
31	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
32	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
33	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
34	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
35	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
36	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
37	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
38	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
39	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
40	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
41	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
42	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
43	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
44	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1

45	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
46	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
47	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
48	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
49	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
50	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
51	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
52	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
53	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
54	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
55	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
56	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
57	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
58	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
59	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
60	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
61	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
62	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
63	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
64	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
65	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
66	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
67	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS	Send Alert	1

							E	message	
68	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
69	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
70	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
71	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
72	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
73	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
74	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
75	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
76	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
77	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
78	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
79	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
80	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
81	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
82	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
83	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
84	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
85	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
86	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
87	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
88	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
89	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1

90	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS E	Send Alert message	1
91	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
92	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALS E	Send Alert message	1
93	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
94	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	FALS E	Send Alert message	1
95	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
96	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
97	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
98	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
99	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
100	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
101	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALS E	Send Alert message	1
102	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALS E	Send Alert message	1
103	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
104	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
105	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
106	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
107	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALS E	Send Alert message	1
108	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALS E	Send Alert message	1
109	FALSE	TRUE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
110	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
111	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
112	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert	1

								message	
113	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
114	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
115	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
116	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
117	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
118	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
119	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
120	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
121	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
122	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
123	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
124	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
125	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
126	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
127	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
128	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	Send Alert message	1
129	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
130	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
131	FALSE	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
132	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
133	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
134	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1

135	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
136	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
137	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
138	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
139	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
140	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
141	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	TRUE	Send Alert message	1
142	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	TRUE	Send Alert message	1
143	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
144	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
145	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	TRUE	Send Alert message	1
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494	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
495	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
496	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	Send Alert message	1
497	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	Send Alert message	1
498	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
499	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
500	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
501	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
502	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	Send Alert message	1
503	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
504	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1

505	FALSE	TRUE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
506	FALSE	TRUE	FALSE	FALSE	FALSE	TRUE	TRUE	Send Alert message	1
507	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	Send Alert message	1
508	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
509	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	FALS E	Send Alert message	1
510	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
511	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
512	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
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516	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	Send Alert message	1
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518	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
519	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
520	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS E	Send Alert message	1
521	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS E	Send Alert message	1
522	TRUE	FALSE	FALSE	TRUE	TRUE	FALSE	FALS	Send Alert	1

							E	message	
523	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
524	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
525	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
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527	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
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529	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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531	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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537	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
538	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
539	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1

540	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
541	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
542	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
543	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
544	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
545	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
546	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
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548	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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553	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
554	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
555	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
556	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
557	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS	Send Alert	1

							E	message	
558	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
559	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
560	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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566	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
567	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
568	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
569	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
570	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
571	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
572	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
573	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
574	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1

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581	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
582	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
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590	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
591	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
592	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep	1

								observing	
593	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALS E	Send Alert message	1
594	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
595	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS E	Send Alert message	1
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602	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
603	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
604	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALS E	Send Alert message	1
605	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
606	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALS E	Send Alert message	1
607	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
608	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE	FALS E	Send Alert message	1
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627	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert	1

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628	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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634	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
635	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
636	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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649	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
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662	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS	Send Alert	1

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663	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
664	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
665	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
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677	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
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695	FALSE	TRUE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
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697	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALS	Send Alert	1

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699	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
700	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
701	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS E	Send Alert message	1
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711	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
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727	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
728	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
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731	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
732	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS	Send Alert	1

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739	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	Send Alert message	1
740	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
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767	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALS	Send Alert	1

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775	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
776	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
777	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
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799	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
800	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
801	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALS E	Send Alert message	1
802	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALS	Send Alert	1

							E	message	
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806	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
807	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
808	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
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814	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
815	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
816	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
817	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
818	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
819	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1

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827	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
828	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
829	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
830	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
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832	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
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835	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
836	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
837	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALS	Send Alert	1

							E	message	
838	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
839	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
840	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
841	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
842	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
843	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
844	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
845	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
846	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
847	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
848	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
849	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
850	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
851	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
852	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
853	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
854	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1

855	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
856	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
857	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
858	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
859	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
860	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
861	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
862	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
863	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
864	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
865	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
866	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
867	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
868	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
869	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
870	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
871	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
872	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep	1

								observing	
873	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
874	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
875	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
876	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
877	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
878	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
879	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
880	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
881	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
882	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
883	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
884	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
885	FALSE	TRUE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
886	TRUE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	Send Alert message	1
887	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
888	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
889	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1

890	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	Send Alert message	1
891	TRUE	FALSE	FALSE	TRUE	TRUE	TRUE	FALSE	Send Alert message	1
892	TRUE	FALSE	FALSE	TRUE	FALSE	TRUE	FALSE	Send Alert message	1
893	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	Send Alert message	1
894	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
895	FALSE	FALSE	TRUE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
896	FALSE	FALSE	FALSE	FALSE	TRUE	TRUE	FALSE	Send Alert message	1
897	FALSE	TRUE	TRUE	TRUE	TRUE	FALSE	FALSE	Send Alert message	1
898	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	TRUE	Send Alert message	1
899	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1
899	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	Keep observing	1

المستخلص

في الوقت الحاضر ، أهتم الباحثون بأنظمة الرعاية الصحية (أنظمة مراقبة المريض وتشخيصه). حيث قاموا بالعديد من الأبحاث في مجالات الصحة الإلكترونية وتحسين أنظمة الرعاية الصحية وتقليل الجهد والوقت على المستخدمين الصحيين (الأطباء والممرضات) وكذلك متابعة حالة المرضى و وبالأخص كبار السن ، و نتيجة لأن معظم المستشفيات قد نفدت طاقتها ، تم استخدام برنامج الوكيل الذكي في هذا المجال.

الغرض الرئيسي من هذه الرسالة هو معرفة كيف يمكننا توظيف وتقييم البرامج الذكية في مجال الصحة الإلكترونية في ظل ظروف بيئة ديناميكية وغير متوقعة من أجل مساعدة الأطباء والممرضات والممارسين الصحيين على أساس يومي لجمع وتتبع بيانات المرضى وكذلك لتحسين أتخاذ قرارات الرعاية.

في هذه الرسالة تم تنفيذ نظام قائم على النموذج مثل نموذج توسيع المعتقدات والرغبات والنوايا (EBDI)كهيكل لوكلاء البرامج المضمنة في ظل ظروف بيئة ديناميكية وغير متوقعة.

إضفنا الطابع الرسمي على نموذج EBDI في الصحة الإلكترونية ليعمل كمراقب لمتابعة حالة المريض المتصل بأجهزة الاستشعار مثل مقياس الحرارة (مقياس الحرارة) ، ومقياس الأكسجين ...) حيث يعمل هذا النوذج على يقوم تصفية البيانات (قراءات الاستشعار) ويحدد هل حالة المريض طبيعية ام لا ثم يرسل تنبيه إلى الوكيل الإداري ، والذي يمثل نوعًا آخر من وكيل.EBDI

إضافة لما سبق ، يعمل النظام المقترح بالمساهمة من خلال اقتراح خطة علاج تتناسب مع قراءات المستشعرات وفي بعض الحالات الطارئة يطلب استشارة الطبيب.

تم تصميم نظام مراقبة لمتابعة (مراقبة) الحالة الصحية للمرضى في هذه الدراسة على أنه نظام متعدد العوامل (MAS) مع استخدام تقنية التجميع (باستخدام خوارزمية-K mean).

مع ملاحظة انه تم تقييم النظام المقترح من خلال استخدام طريقتين ، الطريقة الأولى باستخدام دراسة الحالة وتتمثل باخذ ببيانات حقيقية ومقارنة سلوك الوكيل بالبيانات

الحقيقية. أما الطريقة الثانية ،من خلال عمل صياغة لوظيفة المكافأة بطريقة ما لحساب قيم المكافأة التي تمثل مثل الدرجات لسلوك الوكيل.ومن ملاحظتنا لكلا الطريقتين السابقتين ، أثبت النظام المقترح أن سلوك العامل يعمل بشكل صحيح بنسبة 100٪.

وبالنهاية تم صياغة الطابع الرسمي على وظيفة المكافأة لتقييم سلوك الوكيل المقترح في مثل هذه الحالات مثل هذه الحالة في هذه الأطروحة ، والتي تمثل طريقة سهلة وأفضل لتقييم سلوك الوكيل في نفس الظروف.

جمهورية العراق

وزارة التعليم العالي والبحث العلمي

جامعة القادسية

كلية علوم الحاسب وتكنولوجيا المعلومات

قسم علوم الحاسوب

وكلاء برمجيات ذكية لنظام الصحة الإلكترونية

رسالة

مقدمة إلى مجلس كلية علوم الحاسب وتكنولوجيا المعلومات - جامعة القادسية وهي جزء من متطلبات نيل درجة الماجستير في قسم علوم الحاسوب

مقدمة من قبل الطالبة

عبير حسين جابر

بأشراف:

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