No clutch fuzzy logic-controlled hybrid transmission

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This work presents a proposed design of a fuzzy logic-controlled hybrid transmission with only one electric motor/generator (MG) and without any rotating clutches. The proposed hybrid transmission serves to regulate the engine's effective gear velocity by mixing the engine and electric MG powers through a power controlling device. With a control unit, four major modes of operation excluding a regenerative braking capability are shown to be feasible in the proposed hybrid transmission; electric motor mode, engine mode, engine/charge mode, and power modes. Continuously variable transmission (CVT) capability is provided with the engine/charge mode and with the power mode. The power mode can be further subdivided into three hybrid sub-modes that correspond to the direct drive, under-drive, and over-drive of a conventional automatic transmission. The feasibility of the proposed hybrid transmission is demonstrated with a numerical example employing a simple gear train. All the driving conditions of the vehicle are studied and identified. The design is implemented using fuzzy logic and simulated in MATLAB/ Simulink.

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