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Executive Summary

Fuzzy Logic Controller for an Inverted Double Pendulum on a Cart is Designed

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During the 1960s, modern control theory emerged primarily because of the advancement of aeronautical dynamics and the beginning of space exploration. Automated control systems (ACS) are used in a variety of fields today, including biology, economics, medicine, and power and electrical systems. In the 1980s, Japan produced the first fuzzy logic controller and used it into electrical and electronic devices like cameras and washing machines. The results were quite positive, which furthered the theory's acceptability. In this study, a double-inverted pendulum (DIP) on a cart is controlled using a fuzzy logic controller (FLC).

A DIP is a naturally unstable system known as a double pendulum (DP) vertical inversion. It is a bit more sophisticated than a DP, and when mounted on an oscillating cart, it might be challenging to maintain a stable upright position in the event of a disruption. The simplicity of fuzzy logic controllers (FLCs) is one of their main advantages. Layers for intake, process, and output make up their three stages. To offer fuzzy input, the sensor signal is tweaked at the input layer and matched to the membership function. The simulation results demonstrated the FLC's effectiveness in comparison to other widely used techniques, such LQR.

In the current study, a thorough model based on a fuzzy logic controller (FLC) was suggested to operate a double-inverted pendulum (DIP) on a cart to verify its behaviour and achieve good system stability. Although the system was stabilized typically using fuzzy logic and the LQR controller, peak levels were also significantly decreased by the FLC. There have been considerable efforts in the worldwide library to address the issue of a triple-inverted pendulum, which might also be addressed by an enlargement of this controller. Future studies might expand the author’s approach by a type 2 fuzzy membership function.

Source: Information

KEYWORDS

Double-inverted pendulum; linear quadratic regulators; fuzzy logic controllers; automatic control