

# **Motion control of triple links inverted pendulum on two-wheeled system using interval type-2 fuzzy logic control base on particle swarm optimization**

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## **ABSTRACT**

This paper presents a motion control of a triple link inverted pendulum on two-wheeled system, through Interval Type-2 Fuzzy logic Control based Particle Swarm Optimization. Despite this model's heightened non-linearity and complexity for being a triple link system, it has enabled additional degree of freedom for having a two-wheeled mechanism. The model was developed in SimWise 4D to maintain its complex features, while allowing observations to the system's movements. The developed system was then integrated with Interval Type-2 Fuzzy Logic Control, as designed in Matlab/Simulink. Specifically, Particle Swarm Optimization was applied to obtain the optimal values for input/output gain and parameters of the Interval Type-2 Fuzzy Logic Control, towards enhancing the system's performance. Results have shown that the proposed controller was able to perform forward and backward motions control to the system in an upright position. The system is able to perform motion task with recorded system velocity of 0.04m/s and 0.02m/s for forward and backward motions, respectively. The controller was then evaluated based on its velocity and angular position or in stable manner. This system is envisaged to be very vital in the development of mobile robots with extended functionality.

## **KEYWORDS**

Triple links inverted pendulum, Interval Type-2 Fuzzy Logic Control, Particle Swarm Optimization.

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