



## Prototyping and Control of a 2-DOF Serial Flexible-joint Robot by using Fuzzy Control System

Kittipong Yaovaja\*, Yutthasak Promtaeng, Boonthum Wongchai and Putthipong Khunsong

Robotics and Advanced Autonomous Systems Research Group,  
Faculty of Engineering at Sriracha, Kasetsart University Sriracha campus, Chonburi, Thailand

### **Abstract**

Challenging in control of a flexible-joint robot is residual vibration due to non-linearity and flexibility of a joint. Furthermore, in a 2-DOF serial flexible-joint robot, there is interaction of Link-1 control and Link-2 control. In this research, the prototype flexible-joint robot was designed and tested. The flexible-joints have springs and flexible couplings. Conventional PID controller, which is widely used in industry, can be used in the robot with limited performance. Two PID controllers separately control the Link-1 and Link-2 link position. From the experiment tests, there is high interaction between each link. Control action of the Link-2 link affects higher residual vibration of the Link-1. Fuzzy controller was designed as a parallel compensator to reduce the oscillation. The movements of the Link-2 link are used as the fuzzy inputs. The controller generates the control input of the Link-1 that cancels the residual vibration of the Link-1. The proposed controller showed superior performance of position tracking and less vibration compared to the PID controller.

**Keywords:** *Fuzzy Control, Flexible- joint Robot, Residual Vibration*

บทความนี้ได้รับการคัดลอกเพื่อใช้ในการสอน