

**Adaptation of a six degree of freedom industrial robot for use as a  
human spine simulator**

by

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## **ABSTRACT**

The application of robotics have long been established in numerous fields ranging from automotive to manufacturing sectors, and now with the advent of robust control and more flexibility they have also become an integral part of biomedical engineering. In this study, the FANUC S-700 industrial robot was employed to simulate 3D human spinal motion. The motivation behind using an industrial robot lies in the complex kinematics of human spinal motion which require substantial torques and a large workspace volume to be generated from the robot to simulate the motion. This study focuses on establishing the suitability of employing an industrial robot for this particular biomedical engineering application. For this purpose, the robot system was enhanced to enable serial communication with a PC. A simulator has also been built in Matlab to verify the expected motion of the robot without physically operating the robot. To ascertain the suitability of using the robot for the intended application, several experiments were conducted to define critical parameters which affect the application of the robotic arm to act as a simulator. These parameters include the repeatability error of the robot for different speeds of the robot with and without a given load attached to it. The results of these experiments indicate that the robot has a very stable repeatability error. Overall the study conforms to the choice of using an industrial robot for simulating the complex human spinal motion.