Safety system for non-interventional flexible robotic arm of Orthopaedic Robot (OTOROB) using fuzzy logic

Abstract

One of the main and recent problem in developing countries like Malaysia is lack of surgeon or specialists, especially in rural areas. Insufficient specialized surgeons in such regions particularly in the niche of orthopedic, causes more fatalities and loss of limbs due to time and distance constrain in attending the patients. A mobile robotic system known as OTOROB (Orthopedic Robot) is designed and developed to aid surgeons to virtually present at such areas for attending patients in order to make life saving decisions. The developed mobile robotic platform is integrated with a flexible robotic arm vision system to be controlled remotely by the remote surgeon to obtain visual inspection on the patients. Fuzzy logic control is implemented in the control system as Artificial intelligence (AI) to provide safety features for the robotic arm articulation. The safety system of the robotic arm consists of Danger Monitoring System (DMS) and Obstacle Avoidance System (OAS). The experiments conducted on DMS shows that the DMS capable of conveying danger level surrounding the robotic arm to the user through GUI with warning indication and obstacle position. While, OAS developed, responded to the mobile and static obstacle around the robotic arm. The robotic arm is capable of avoiding approaching obstacle autonomously via fuzzy control. The smooth control of robotic arm coupled with safety routines improved the overall articulation of the robotic arm. The safety oriented flexible robotic arm system of OTOROB able to deliver reliable and convenient for both remote doctor and patient in real time emergency circumstances.