UAEU جامعة الإمارات العربية المتحدة United Arab Emirates University

The College of Graduate Studies and the College of Engineering Cordially Invite You to a

Master Thesis Defense

Entitled

MODELLING AND CONTROL OF A TWO-LINK RIGID FLEXIBLE MANIPULATOR

by

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Date & Venue

8:00 pm

Sunday, 18 April 2021

Online, MS Teams

https://teams.microsoft.com/l/meetup-join/19%3ameeting_YmZiZThjYTctZTEwOS00NDc1LWFmNjQtMzllYjRlZGY2N2Mw%40thread.v2/0?context=%7b%22Tid%22%3a%2297a92b04-4c87-4341-9b08-d8051ef8dce2%22%2c%22Oid%22%3a%2282e2e22e-2849-4e24-aeda-5dc08eb0948b%22%7d

Abstract

Literature lacks data on the reliability of 3D models created by Autodesk inventor software and imported to MATLAB Simulink software in comparison to mathematically generated models. In this contribution, we demonstrate a two-link rigid-flexible manipulator modelled in two different methods, one of which is using Lagrange equations and Finite element method to generate a mathematical model of the manipulator, and the other is creating a 3D model with the aid of Autodesk inventor then import to MATLAB Simulink, both models were subsequently controlled by three types of controllers, conventional PID controller, LQR controller, and LQG controller. The research demonstrated the performance of the two models with response to the three types of controllers. Achieved results has proven that the Autodesk inventor is considered as reliable tool for modelling mechanical systems. Results have also confirmed that modern controllers, i.e., LQR and LQG controllers perform much better than conventional PID controller with regards to the manipulator movement. The implementation of Autodesk inventor along with MATLAB Simulink indicates that, the Autodesk inventor can be considered as an instrumental tool for designers and engineers. The results enable future developments in the frontier area of robotics and mechanical systems, where sophisticated models could be generated by Autodesk inventor instead of being modelled mathematically which will benefit engineers and designers by saving time and effort consumed in modelling using mathematical equations, and by reducing the potential errors associated with such modelling techniques.

Keywords: Dynamic model, Flexible manipulators, Finite Element method, Simulink, Autodesk inventor, LQR controller, LQG controller, PID controller