

A Multi Finger Haptic Hand with Force Feedback

Yehia Hossam El Din ,Mina Ramzy, Emam F. Mohamed & H.E.A. Ibrahim,

Abstract

This paper presents a proposal for a twelve degrees of freedom robotic hand system controlled via haptic technology with force control and force feedback. This robotic hand can be used in hazardous environment, deserted places, or aerospace. To achieve this goal, an experimental set up in addition to a computer simulation of this robotic hand system have been carefully designed and built. The experimental set up consists of three main modules which are: the control Glove, the robotic hand, and a microcontroller. An integral controller algorithm is applied to make the robotic hand track and follow the position and movement of the haptic glove with force feedback. Three modes for force limitation are considered according to the application, which are suitable for grasping of: brittle, elastic, and hard components. For computer simulation of the system, a mathematical model has been derived considering a 3 DOF for each finger. To be compatible with robot hand used in the experimental work, only four fingers are considered i.e. total 12 DOF. The experimental work shows good gripping abilities following the glove movement and acceptable force feedback to the user hand, while the simulation results give a qualitative agreement with the experimental ones.

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