

Design and Fabrication of a Programmable Stiffness-Sensitive Gripper for Object Handling

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Abstract : Stiffness sensing is an important issue in medical diagnostic, robotics surgery, safe handling, and safe grasping of objects in production lines. Detecting and obtaining the characteristics in dwelling lumps embedded in a soft tissue and safe removing and handling of detected lumps is needed in surgery. Also in industry, grasping and handling an object without damaging in a place where it is not possible to access a human operator is very important. In this paper, a method for object handling is presented. It is based on the use of an intelligent gripper to detect the object stiffness and then setting a programmable force for grasping the object to move it. The main components of this system includes sensors (sensors for measuring force and displacement), electrical (electrical and electronic circuits, tactile data processing and force control system), mechanical (gripper mechanism and driving system for the gripper) and the display unit. The system uses a rotary potentiometer for measuring gripper displacement. A microcontroller using the feedback received by the load cell, mounted on the finger of the gripper, calculates the amount of stiffness, and then commands the gripper motor to apply a certain force on the object. Results of Experiments on some samples with different stiffness show that the gripper works successfully. The gripper can be used in haptic interfaces or robotic systems used for object handling.

Keywords : gripper, haptic, stiffness, robotic

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