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Pneumatic Arm Control Using Microcontroller

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Abstract: ***Adjustable gripper for robotic system that is capable in identifying shape and size of an object is needed in many applications especially for picking and placing operation. This is due to some of the grippers' design are limited only to one specific shape or size that make picking and placing operation difficult. To hold different size or shape, the user needs to replace gripper which are more time consuming and more expensive. To address this problem, an adjustable gripper for robotic system has been proposed for picking and placing operation. The main objective is to design a robust gripper that can perform easier and faster picking and placing operation for multiple shapes and sizes objects. This adjustable gripper for robotic system can to improve the picking and placing operation in manufacturing field in producing more outputs without the needs to.***

Keywords: PCB, XML

I. INTRODUCTION

Due to high precision in performing different tasks and can perform multitasking work in same time, robot has been widely used in industry, medical and military operations. The robot construction technology has grown exponential every year and some competition is held in selecting the best robot design to perform specific task within period of time. Pick and place is one of the most famous applications which have been used widely. This pick and place operation is done everywhere and every time because a lot of human movement involves picking and placing objects Pick and place robot can be defined as a simple robot, often with only two or three degree of freedom and little or no trajectory control, which the main function is to transfer items from one place to another. A pick and place robot has been strategically programmed to pick literally any object and to place it wherever required. The pick and place operation is very common in pharmaceutical industry, electronic industry,food industry and consumer goods industry For industrial profitability, manipulators that able to perform such motions in the shortest possible cycle time are required. For this purpose, the gripper should able to perform the task at high speed and high acceleration. In order to fulfill the criteria of an adjustable gripper that able to perform pick and place operation with difference size and shape of object, the robot must have feedback input that can control robot's movement and actuator. The smart device is one of the important electronic equipment need to be considered because the gripper robot involved with adjustable mechanism. This smart device which is conceptually referred as sensor-actuator sub system with rich sensing and also function as the feedback input to the system for identifying various object with different shape and size.

II. SYSTEM DESCRIPTION

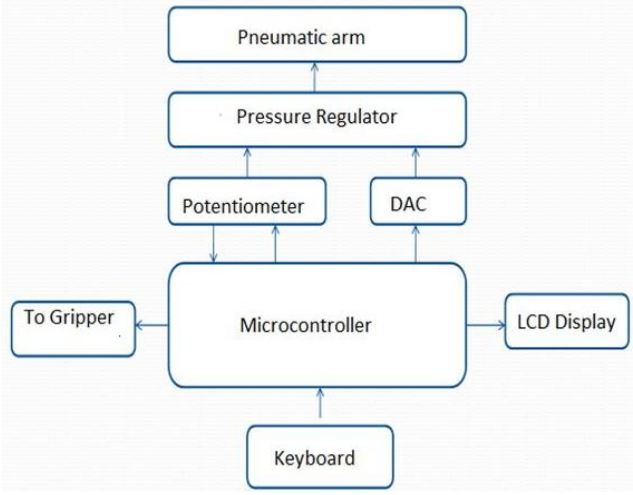

Fig 1. Block Diagram

Description
There will be two modes FEED and RUN modes

A. Feed mode

In this mode different values will be fed to respective objects.

B. Run mode

For the required object the respective switch will be pressed microcontroller will control the pressure regulator and required pressure will be created for holding the respective object. Then the object can move very easily as all the weight of the object is balanced by the pneumatic arm.

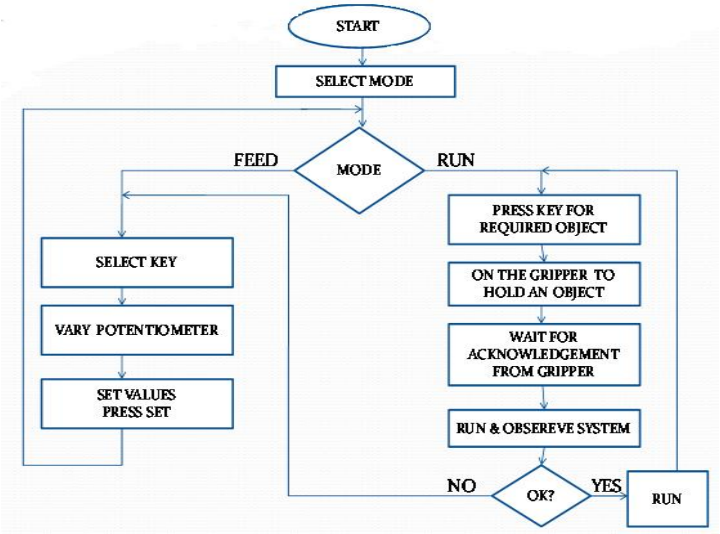

Fig. 2

III. HARDWARE DESCRIPTION

Robot has being used widely in industrial as it can perform precisely accurate in difference task, operation, heavy work and dangerous work. This helps industrial company to achieve their target by replacing some of human task in their production line

1. ATmega328

- High Performance, Low Power AVR® 8-Bit Microcontroller.
- Advanced RISC Architecture.
- 131 Powerful Instructions – Most Single Clock Cycle Execution
- Six PWM Channels.
- 6-channel 10-bit ADC in PDIP Package.
- Programmable Serial USART
- Master/Slave SPI Serial Interface

2. LCD

Display the pressure and weight. This is 16*2 LCD and compatible with the ARDUINO and ATmega328

3. Gripper

The arm robot is the crucial part in the pick and place robot. The first stage in the design process is to design the gripper and select the actuator to control it. After that, the arm of robot will be designed to support the gripper without disturbing its operation. The size, length and weight of the gripper will be determined according to the requirement

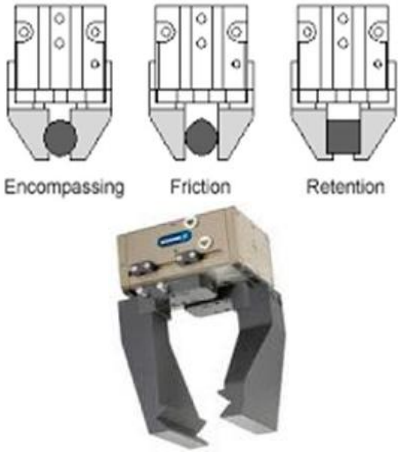

Fig. 3

IV. SOFTWARE DESCRIPTION

ARDUINO

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. The Arduino programming language is an implementation of Wiring, a similar physical computing platform, which is based on the Processing multimedia programming environment.

EAGLE

EAGLE, the Easy Applicable Graphical Layout Editor is a powerful PCB design software tailored to meet the needs of professional engineers, makers. EAGLE has been the PCB design tool of choice for hundreds of thousands of electronic design engineers and developers worldwide. With a large and active engineering and support community and an extensive ecosystem, EAGLE offers much more than pure circuit design. The simplicity of the software provides a fast learning curve, even for those new to PCB design. The openness of EAGLE design resources, such as its extensive and fully-open component libraries, ease the design process for all. The software's flexibility also means EAGLE is ever growing in its capabilities and workflow compatibility, demonstrated by the hundreds of extensions (ULPs) openly available to all users and its structured XML file format.

V. CONCLUSION

Overall, an autonomous robot with adjustable gripper that perform pick and place operation has been successfully built. The robot has been able to pick the object and place it effectively. The robot is also able to perform lifting upward and downward smoothly. By using PIC microcontroller, the robot have performed it task perfectly according program that being made. Beside than that, the adjustable gripper with sensors is able to open its grip according to the size of the object. Due to this advantage, the robot can pick object that within the gripper limitation.

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