Arduino Based Pick and Place Robotic Arm

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Abstract: **By the yesteryears experiences and seeing the future scopes, there are many domains and areas where robotic manipulators are finding their scopes for deployment, thus achieving required precision. Frequent picking and placing action is a repetitive action where picking and placing robotic vehicles can be used, in manufacturing and many other industries. Along with lot of industrial application robotic vehicles also find their applications in many other domains like safety and surveillance in difficult terrain surfaces where human personal intervention is difficult, but process has to be operated in controlled manner. Our project primarily focuses on implementation of pick and place robot on four wheeled drive vehicle for making it compatible for both Industrial and Non Industrial tasks. The robotic arm implemented has with Flex Sensor. As a modular design, changes can be made in robotic arm and end gripper as per required applications.**

Index Terms – **Six wheeled drive chassis, Picking and placing Robotic vehicle, Modular design.**

1. INTRODUCTION

In last few years repetitive human operation are tried to automate for increasing efficiency and precision of those processes, as robots can be used for monotonous tasks, there is lot of scope for deployment of robots in many industries. The term robotics is industrially understood as subject involving designing and use of robotic manipulators for their industrial tasks. Along with industrial monotonous work, robots can also be used in different situations for specific purposes like in operations in hazardous situations and also for surveillance purposes. Some of the application of robots is spray painting, different types of welding, packaging and material handling. End effectors can be changed according to the applications thus making robots widely approved option. Mostly pick and place robots are stationary in industries, our basic idea is to mount a robotic arm having 6 degree of freedom on 6 wheel drive chassis for increasing its application. In this highly competitive and developing society, time and man power are critical factors for completion of tasks in large scales. Robots are playing important role to save efforts and time of humans in monotonous tasks, and also improving quality of the end result because of high precision and accuracy in their actions. The robotic pick and place manipulator moves as it is mounted on vehicle chassis, to the initial location where it has to pick the desired object and then reaches to the final position where object needs to be placed , this complete task is carried out through human controlled based system. Due to presence of storage tank, multiple objects can be picked and placed at a time, thus again saving some valuable time by doing the action in bulk.

2. LITARATURE REVIEW

John Iovine's book PIC ROBOTICS [1] this book consists of many different aspects for designing a robot. It consists of various types of arm design, controlling techniques, vehicle design. Through this book we got our basic idea how to do design components for our pick and place robotic manipulator and also how to assemble them .Arduino cookbook, in this book various methods and their details regarding interfacing different hardware components in the project, like different types of motors like DC and Servos and transmitter and Receiver is been discussed [3]. Also studying through research papers from "International journal of advanced research in computer science" titling "All terrain robotic vehicle with robotic arm for dangerous object disposal" [2] we understood many other applications of robotic arm.

The other references listed in references sections discusses similar concepts in their respective fields such as robots used for surveillance purposes, pick and place robot controlled through using android etc. For designing the six wheel drive chassis we got help from various websites in various aspects like material selection etc.

3. METHODOLOGY

A. *Existing System*

    1. *Human being safety in dangerous situation:*

- There are many dangerous situations where human life is at danger while doing those tasks like bomb diffusing, Military surveillance, dangerous object disposal.etc

- There are also many tasks of lifting heavy objects in industry which might causes heavy injuries to the workers.

2. *Navigation:*

The complexity of navigation in some autonomous and line following robots is increased because of some uncertainties as follows.

- Presence of some obstacles in defined path.
- Lack of complete knowledge about alternate ways to be taken to complete the task, during presence of obstacle in defined path.

B. Proposed System

In our proposed scheme we are using Arduino as a main controller. The main aim of the project is to implementation of pick and place robot on Four wheeled drive vehicle for making it compatible for both Industrial and Non Industrial tasks. The robotic arm implemented has with Flex Sensor. As a modular design, changes can be made in robotic arm and end gripper as per required applications. To control navigation and exploration of robotic pick and place robot using Arduino..

4. IMPLEMENTATION
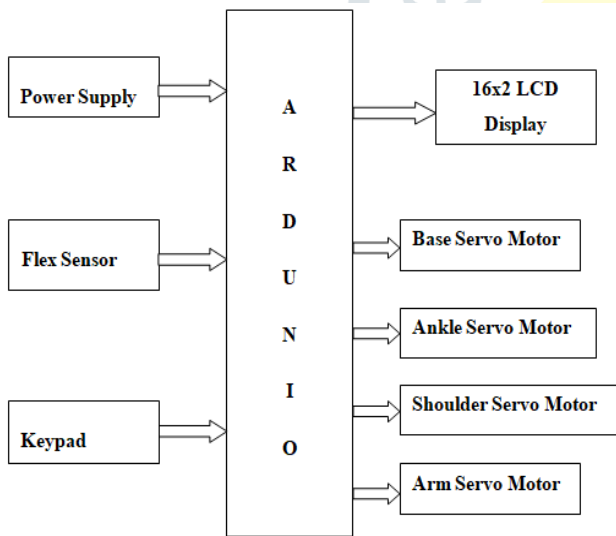
Fig.1 Proposed Block diagram

A. Arduino Nano

The Arduino UNO is a small, complete, and breadboard-friendly board based on the ATmega328 (Arduino Nano 3.0) or ATmega168 (Arduino UNO 2.x). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech.

Fig.2 Arduino UNO

B. FLEX SENSOR

The Flex Sensor patented technology is based on resistive carbon elements. As a variable printed resistor, the Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius the smaller the radius, the higher the resistance value.

Gesture identification is the first step in gesture recognition after raw data captured from sensors. Gesture identification means the detection of gestural information and segmentation of the corresponding gestural information from the raw data. Popular technologies to solve gesture identification problem are based on visual features, learning algorithms, and skeleton models

To recognize gestures in the HRC (human-robot collaboration) manufacturing context, it is beneficial to investigate into a generic and simplified human information processing model. Generalized human information processing into a four-stage model. Based on this generic model, we propose a specific model

Fig. 3: Flex Sensor

C. SERVO MOTOR

Servomotor is a revolving actuator or direct actuator that takes into account exact control of precise or straight position, speed and acceleration. [1] It comprises of an appropriate engine coupled to a sensor for position criticism. It additionally requires a moderately advanced controller, frequently a committed module structured particularly for use with servomotors. Servomotors are not a particular class of engine in spite of the fact that the term servomotor is frequently used to allude to an engine reasonable for use in a shut circle control framework. Servomotors are utilized in applications, for example, mechanical autonomy, CNC hardware or mechanized assembling

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Fig.4 Servo Motor
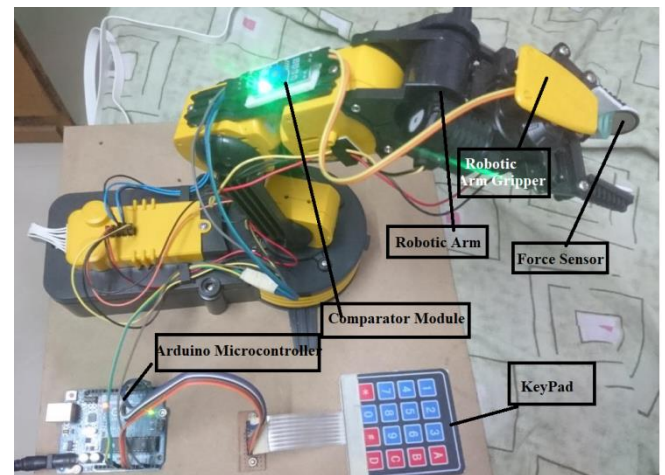
5. EXPERIMENTAL RESULTS

Fig. 5: Experimental Setup

6. CONCLUSION

Above shown designed concept is been implemented using Arduino. Thus we found that our project has the ability to reach at the location from where object needs to be picked or placed, by the virtue of six wheel drive chassis and six DC motors. Thereafter according to the motion of servos the robotic manipulator lifts and locates the required object. Thus it is an appropriate integration of locomotion and automation.

FUTURE SCOPE

1) Furthermore advancements can be done by adding a feedback system and making it work independently without any human interventions.

2) Different types of sensors can be added like obstacle sensors, metal detector etc.

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