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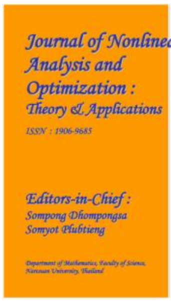


IOT BASED ANDROID CONTROLLED ROBOTIC ARM USING NODE MCU

[1]SHAIK USAMAH SUHAIL,[2]M PAVAN KARTHIK YADAV,[3]G SANDEEP TEJA,[4]S P PAVAN KUMAR,[5]K MUDDU SWAMY
[1234]Student,[5]Assistant Professor
Department Of Computer Science Engineering
Dr.K.V.Subba Reddy Institute of Technology, Kurnool,AP

ABSTRACT

Nowadays, the Internet of Things (IoT) is a rapidly growing field. The Internet of Things (IoT) refers to the use of the internet to connect and control devices. Robotics is another topic that everyone is interested in. Everyone wants to use automated machines because they can perform tasks that we can only dream of. This project involves the creation and construction of a low-cost robotic arm using the Internet of Things. The robotic arm is extremely useful in a wide range of applications, including medical disciplines and industrial automation. With the widespread availability of the internet, controlling and monitoring robots from afar has never been easier. A robotic arm is built in this project to be controlled by an authorised person at any time and from any location using an internet-based application. It's simple to operate gadgets with an Android app. The robotic arm can be controlled in different ways: up down grip and release.

INTRODUCTION

1.1GENERAL

Versatile motor skills for hitting and throwing motions can be observed in humans already in early ages. Future robots require high power-to-weight ratios as well as inherent long operational lifetimes without breakage in order to achieve similar perfection. Robustness due to passive compliance and high-speed catapult-like motions as possible with fast energy release are further beneficial characteristics. Such properties can be realized with antagonistic muscle-based designs. Additionally, control algorithms need to exploit the full potential of the robot. Learning control is a promising direction due to its the potential to capture uncertainty and control of complex systems. The aim of this paper is to build a robotic arm that is capable of generating high accelerations and sophisticated trajectories as well as enable exploration at such speeds for robot learning approaches.

Robotic arm provides similar functions like a human arm depending upon the degree of freedom it can offer. Motion control system plays a major role in the control of different types of industrial automation devices such as robotic arm manipulator [1] Arm controller is the challenging field in industrial applications. Robotic control is an exciting, complex and high challenge research work in recent year [2] The goal of gesture recognition is to create a system which can identify specific human gestures and use them to convey information or for device control[3] The system recognized these gestures with over 97% accuracy[4]. It is a robust way to recognize hand postures and gestures[5]. It can be used to recognize both simple hand postures and gestures and also complex ones as well. and using hand gestures as a control mechanism in virtual reality [6]. It can also be used for the improvement of interaction between two humans. In our work, a miniature MEMS Accelerometer. Robots are generally used to perform hazardous, highly repetitive, and unpleasant tasks. Most robots are set up for an operation by the teach-and-repeat technique. In this mode, a trained operator (programmer) typically uses a portable control device (a teach pendant) to teach a robot its task manually. The programming and controlling of movements of robotic arm through the use of robot teach pendant is still a difficult and time consuming task that requires technical expertise. Therefore, new and easier ways for robot programming are required. The main aim of this paper is to develop a methodology with a high level of abstraction that simplifies the robot programming. In this paper we proposed an accelerometer-based gesture recognition system to control an industrial robot in a natural way. A 3-axis wireless accelerometer is attached to the human arm, capturing its behaviour (gestures and postures). A trained system was used to recognize gestures and postures. During the movement controls of any mechanical equipment like robots, robotic arms, the work of miniature accelerometer based recognition system which acknowledges hand gestures or motions will be recognized. MEMS accelerometer measures the acceleration of the signal in three coordinates such as x-axis, y-axis, and z-axis. To capture the hand motions online, the general MEMS sensor which can be operated without any external reference and limitation in working conditions is used. This Arduino Robotic Arm can be controlled by accelerometer attached to it, each accelerometer is used to control each servomotor. You can move these servomotor is based upon the hand movements with holding accelerometer inside, by changing the movements towards up and down the robot works and the by rotating the pots to pick some object, with some practice you can easily pick and move the object from one place to another. We have used low torque servos here but you can use more powerful servos to pick heavy object works and the robotic arm needs several functions in order to perform the complex tasks. This doesn't give dynamicity to the motion inputs because of layout coordinating. Another framework utilizes machine interface gadget to give continuous signals to the robot. Simplex sensors are utilized on the hand glove to quantify the finger twisting and hand position.

A robotic arm is a popularly used and preferred electromechanical machine for many applications in most of the industrial areas. The robotic arm is the product of high-tech automation in the new era. Its advantage is that it can accomplish expected operation through programming and realize remote control. The robotic arm not only has intelligence but also has anti-pressure ability. A robotic arm has similar functions of a human arm, so that can be instead of workers in high-risk environments and highly repetitive work items. Although the robotic arm is not as flexible as the human hand, it can repeat work, and snatch weights, which is far greater than the human hand. It fears neither exhaustion nor danger. As a result, the robotic arm is widely used in a variety of fields. Furthermore, the Internet of Things (IoT), a development of the Internet of Things, enables networking devices to establish communication with people and various "things" via the Internet of Things. Network components, as well as services in distributed computing systems, fall under this category. The Internet and its core are essential to the Internet of Things (IoT). It uses wireless communication technologies to connect the perception layer to the application layer. The Internet of Things (IoT) connects everything to the Internet, exchanges data, and communicates in order to provide control and monitoring. The Internet of Things not only brings convenience to life but also plays a vital role in various fields. The main focus of the work is to apply the Internet of Things technology to the control of the robotic arm and to realize data transmission through MQTT communication protocol.

1.2 OBJECTIVE

We have designed a light-weight robot arm with moving masses below 300 g with powerful antagonistic compliant actuation with pneumatic artificial muscles. Rather than recreating human anatomy, our system is designed to be easy to control in order to facilitate future learning of fast trajectory tracking control. The resulting robot is precise at low speeds using a simple PID controller while reaching high velocities of up to 12 m/s in task space and 1500 deg/s in joint space. This arm will enable new applications in fast changing and uncertain task like robot table tennis while being a sophisticated and reproducible test-bed for robot skill learning methods. Construction details are available.

1.3 EXISTING SYSTEM

The system which used just controls the movement of the Robots automatically by using the keypad alone

1.4 DISADVANTAGES OF EXISTING SYSTEM

- Paralysis people are unable use these technologies
- Its take more time for processing

Complex to use

1.5 PROPOSED SYSTEM

Here IOT technology used to control the robot. This robot mainly developed for paralysis people Motion detection, Weight sensors used to control the robot

1.6 ADVANTAGES OF PROPOSED SYSTEM

- Flexible to use
- Less processing time
- It is affordable and simple
- High-level spinal cord injuries to control wheel chair.

PROJECT DESCRIPTION

Embedded systems are designed to do some specific task rather than be a general purpose computer for multiple tasks. Some also have real time performance constraints that must met, for reason such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs.

An embedded system is not always a separate block very often it is physically built in to the device it is controlling. The software written for embedded systems is often called firmware, and is stored in read only memory or flash convector chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen and little memory.

To perform any application in the embedded system we require microprocessor and microcontroller. In the microprocessor an external memory is connected which increases the size of the microprocessor and multiple operations are being performed by the microprocessor but whereas in the microprocessor the memory is inbuilt and also we can use this controller only for the specific applications where the speed is increased so most probably microcontrollers are used in the different applications in the embedded systems rather than microprocessor. Embedded Systems has witnessed tremendous growth in the last one decade. Almost all the fast developing sectors like automobile, aeronautics, space, rail, mobile communications, and electronic payment solutions have witnessed increased use of embedded technologies. Greater value to mobility is one of the prominent reasons for the rise and development of embedded technologies

2.2 BLOCK DIAGRAM

ROBOT SECTION:

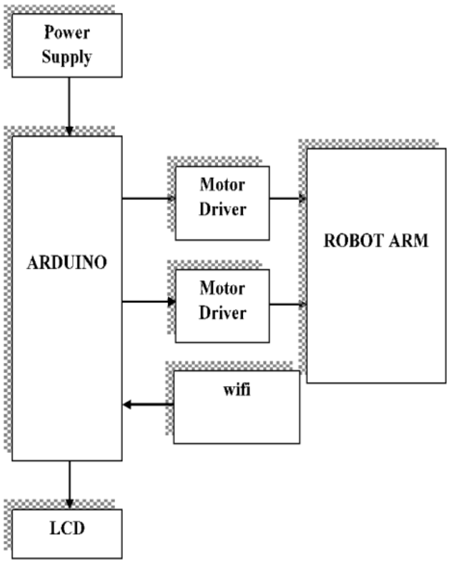


Fig 2.2.1. Block Diagram of Robot Section

2.3 MODULES

DC MOTOR

A DC motor in simple words is a device that converts direct current(electrical energy) into mechanical energy. It's of vital importance for the industry today.

A DC motor is designed to run on DC electric power. Two examples of pure DC designs are Michael Faraday's homo-polar motor (which is uncommon), and the ball bearing motor, which is (so far) a novelty.

By far the most common DC motor types are the brushed and brushless types, which use internal and external commutation respectively to create an oscillating AC current from the DC source—so they are not purely DC machines in a strict sense.

We in our project are using brushed DC Motor, which will operate in the ratings of 12v DC 0.6A.

The speed of a DC motor can be controlled by changing the voltage applied to the armature or by changing the field current. The introduction of variable resistance in the armature circuit or field circuit allowed speed control. Modern DC motors are often controlled by power electronics systems called DC drives.

Fig 2.8.1. Motor

DRIVER CIRCUIT (L293D)

L293D IC generally comes as a standard 16-pin DIP (dual-in line package). This motor driver IC can simultaneously control two small motors in either direction; forward and reverse with just 4 microcontroller pins (if you do not use enable pins).

Pin Diagram

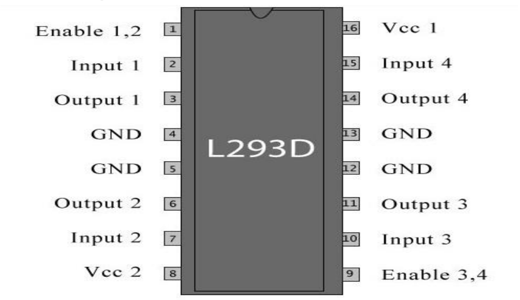


Fig 2.9.1. Showing Pin Diagram of L293D

Working of L293D

The 4 input pins for this l293d, pin 2,7 on the left and pin 15 ,10 on the right as shown on the pin diagram. Left input pins will regulate the rotation of motor connected across left side and right input for motor on the right hand side. The motors are rotated on the basis of the inputs provided across the input pins as LOGIC 0 or LOGIC 1.

In simple you need to provide Logic 0 or 1 across the input pins for rotating the motor.

IMPLEMENTATION

4.1 SCHEMATIC DIAGRAM

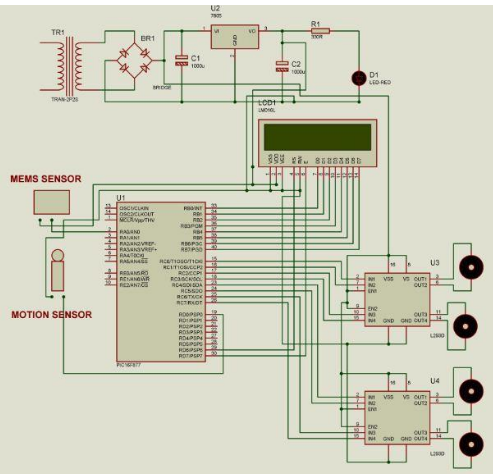


Fig 4.1.1. Implementation of Robotic Arm

4.2 WORKING PRINCIPLE

This is an automatic closed loop control system. Here instead of controlling a device by applying the variable input signal, the device is controlled by a feedback signal generated by comparing output signal and the reference input signal. When reference input signal or command signal is applied to the system, it is compared with output reference signal of the system produced by output sensor, and a third signal produced by a feedback system. A servo (servomechanism) is an electromagnetic device that converts electricity into precise controlled motion by use of negative feedback mechanisms. servos can be used to generate linear or circular motion, depending on their type. The makeup of a typical servo includes a DC motor, a gear train, a potentiometer, an integrated circuit (IC) and an output shaft. The desired servo position is input and comes in as a coded signal to the IC. The IC directs the motor to go, driving the motor's energy through gears that set the speed and desired direction of movement until the signal from the potentiometer provides feedback that the desire position is reached and the IC stops the motor. The potentiometer makes controlled motion possible by relaying the current position while allowing for correction from outside forces acting on control surfaces. Position control: Globe control valve with pneumatic actuator and "positioner". This is a servo which ensures the valve opens to the desired position regardless of friction A common type of servo provides position control. Commonly, servos are electrical, hydraulic or pneumatic. They operate on the principle of negative feedback, where the control input is compared to the actual position of the mechanical system as measured by some sort of transducer at the output. Any difference between the actual and wanted values (an "error signal") is amplified (and converted) and used to drive the system in the direction necessary to reduce or eliminate the error .this procedure is one widely used application of control theory. Speed control: speed control via a governor is another type of servomechanism The steam engine uses mechanical governors; another early application was to govern the speed of water wheels. Prior to World WarII the constant speed propeller was developed to control engine speed for maneuvering aircraft. Fuel controls for gas turbine engines employ either hydro mechanical or electronic governing

ROBOTIC ARM

We use a basic structure of robotic arm which is printed with 3d print and externally connected with tower pro servo which is 180 degree servo technology with that basic aspects to be needed like a control system has to run with at mega 328p which is an open source circuit. A robotic arm is usually programmable, with similar functions to a human arm. The links of such manipulator are connected by joints allowing either rotational motion or translational (linear) displacement. Objects can be of almost any shape or geometry and typically are produced using digital model data from a 3D model or another electronic data source such as an Additive Manufacturing File (AMF) file (usually in sequential layers). Stereo lithography (STL) is one of the most common file types that is used for 3D printing. Thus, unlike material removed from a stock in the conventional machining process, 3D printing or AM builds a three-dimensional object from computer-aided design (CAD) model or AMF file, usually by successively adding material layer by layer. The term "3D printing" originally referred to a process that deposits a binder material onto a powder bed with inkjet printer heads layer by layer. More recently, the term is being used in popular vernacular to encompass a wider variety of additive manufacturing techniques. United States and global technical standards use the official term additive manufacturing for this broader sense, since the final goal of additive manufacturing is to achieve mass-production, which greatly differs from 3D printing for Rapid prototyping.

SIMULATION AND DESIGN

5.1 OUTPUT

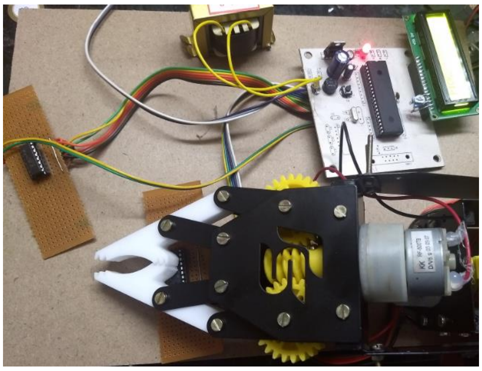


Fig 5.1.1. Hardware Setup

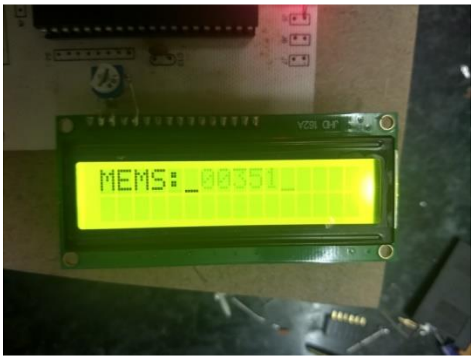
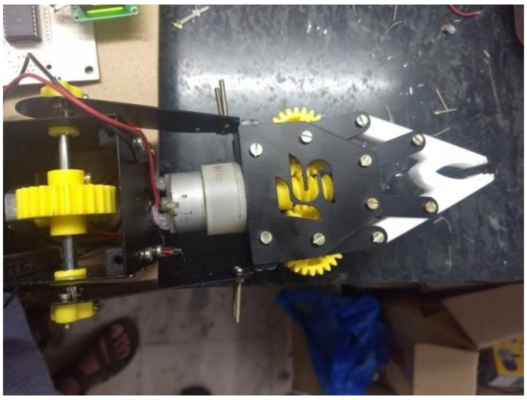


Fig 5.1.2. LCD Display



APPLICATIONS

• Bio-Medical Applications. • Industrial Applications. • Mechanical Applications. • Educational Purpose.

FUTURE SCOPE

• We can create our own remote server instead of using ThingSpeak Cloud Server. • We can create a web interface application too with a camera to remotely view the operations of Robotic Arm.

CONCLUSION

The prepared mechanism has been successfully constrained and executed to carry out the required work of picking up the weight of the object like box and put them in to placed at different location. This robot can be modified using some of latest techniques to make it more flexible and addition of IP cam app invented by MIT is helpful for continuous monitoring of the Robotic arm by the user. The designed dimensions length is 12cm and it as a load bearing capacity of around 200g. The pick and place robot being implemented to ease process of sorting. This can be helpful to various industrial application where machines need to be controlled from distant places. Virtually reality concept can also be included in this implemented to explored the human accessibly region.

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