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# IoT Servomotor Enhanced Pick and Place Robo Arm

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**ABSTRACT**: The technology is advancing so unstoppable even in times of crisis. Sometimes it is difficult to take advantage of it because in no time a new and improved version of the above techniques appears to continue this progress. Within educational technologies aimed at enhancing remote laboratories is the same. From HTTP to web sockets communication protocols the technology offers new alternatives to improve bidirectional communications between the client and the server. This paper shows how an integrated development initially HTTP has evolved to lead to a web sockets-supported system for controlling a servomotor. The introduction of this communication technology is simplified to allow reuse existing laboratories, thus allowing reuse HTTP previous architectures, hardware and services, including a more advanced environment that uses web sockets as communications support. How couldn't it be otherwise, the characteristic of the IoT hardware, in this case Arduino and Raspberry Pi, has been essential in this task. The goal: to reuse existing remote laboratories improve their communication protocol and expand the possibilities of client-server interaction retaining its character as an educational tool.

**KEYWORDS:** HTTP,IoT,Rpi,Arduino.

## I.INTRODUCTION

Over the past twenty years, as robotics has become a scientific discipline, research and development have concentrated on stationary robotic manipulators, primarily because of their industrial applications. Less effort has been directed to mobile robots. Although legged and treaded locomotion has been studied, the overwhelming majority of the mobile robots which have been built and evaluated utilize wheels for locomotion. Wheeled mobile robots (WMRs) are more energy efficient than legged or treaded robots on hard, smooth surfaces and will potentially be the first mobile robots to find widespread application in industry, because of the hard, smooth plant floors in existing industrial environments. Wheeled transport vehicles, which automatically follow paths & fed by reflective tape, paint, or buried wire, have already found application. WMRs find application in space and undersea exploration, nuclear and explosives handling, warehousing, security, agricultural machinery, military, education, mobility for the disabled and personal robots. Distinguished from common mobile robot in structured environment, these robots are a class of internet controlled robots that have sufficient mobility to enable then control as per command received from the server.

## II. LITERATURE REVIEW

**"From RGB led laboratory to servomotor control with Web sockets and IoT as educational tool"**, 12th International Conference on Remote Engineering and Virtual Instrumentation 2015 IEEE.

Recent studies show that pupils are very enthusiastic when using robotic systems and robots in schools. However, these are mainly used only in extracurricular activities to learn about the robots, take part in different contests or for research purposes. The research and practice of integrating web enhanced learning environments and inquiry learning with robots is almost absent. Pupils used web-based worksheets, robots and a programming environment to conduct an inquiry experiment in physics. These worksheets consisted of two principal parts that followed the hypothesis and the experiment space of inquiry cycle. First results indicated that pupils manage fine in such an environment and acquire more knowledge through practical tests and inquiry learning with the use of robots.

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Technology surrounds us wherever we look, nonetheless it is necessary to facilitate its use in places where a greater public can enjoy, know and learn with it. As a first prototype to bring technology closer to young students and schools, UNED has developed a Arduino based smart device that facilitates the integration of remote laboratories in learning scenarios. Initially, the Arduino smart device was designed for robotics laboratories, but finally it was decided to expand it to other laboratories. This paper intents to achieve internet controlled robot arm by manual instruction at anywhere from the world.

This article will analyse how robots are controlled through remotely. The following achievements are have done by adopting embedded system with web components to do pick and place a object from worldwide. The project may enclose controller, pc application and some hardware parts. Here the project has accomplished with an ardiuno module. An ardiuno is open source development hardware and it can be easily programmed by the developer. At pc side application has developed with visual studio which is a new development programming language for UI developments. Finally the pc application and hardware are sync through RS232 application for near field control and it can be operated on remotely if it enclose with iot technology.

**"DESIGN AND WIRELESS CONTROL OF ANTHROPOMORPHIC ROBOTIC ARM",** IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems.

The design and implementation of a gesture controlled anthropomorphic robotic arm is proposed. The robotic arm is designed in such a way that it consists of four movable fingers, each three linkages, an opposing thumb, a rotating wrist and an elbow. The robotic arm is made to mimic the human hand movements using a hand glove. The hand glove contains 5 linear slide potentiometers for controlling the finger movements and an accelerometer for the wrist and elbow movements. The actuators used for the robotic arm are servo motors. The finger movements are controlled using cables that act like the tendons of human arm. The robotic arm is controlled from a distant location using a wireless module. A prototype of the robotic arm was constructed and tested for various hand movements. The mechanical structure of the Robotic Arm is made of readily available low cost aluminum sheet. It was designed in such a way as to accommodate the actuators and the control circuit. The fingers consist of three linkages so that its movement resembles that of the human finger. The opposing thumb was designed in such a way that it was connected to the palm using a hinge joint. Hence it moves similar to a human thumb. The entire unit was then attached to a ply wood base to keep it in position.

The human hand glove consists of a triple axis accelerometer and five linear slide potentiometers attached to it to control the hand movement. The entire unit was then made wireless to enable it to be operated from a distant location by using an RF transmitter-receiver module. This project can be implemented for long distance communication a zigbee or other protocols are used by alternate for RF module.

## METHOD

This has a robot arm attached to it for the purpose of pick and place operation. Arm has two degrees of freedom project involves kinematic and dynamic analysis of the robot arm having two degrees of freedom. robot that covers the following points:

a) Mobility: It should be able to run on different terrain without any and climb stair.
b) Tele-operation: It should be able to be remotely operated via wireless communication using R.F. Module or zigbee.
c) Payloads: It should be able to lift a load at least 2 kg.
d) Analysis: It involves kinematic analysis and dynamic analysis of the system, finding specifications of different parameters

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## III BLOCK DIAGRAM

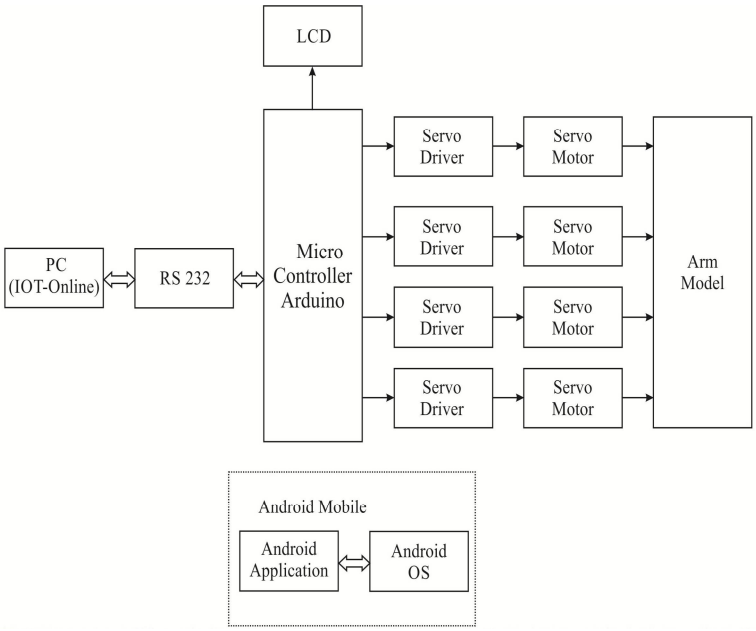


Fig 1 Block Diagram

## EXPLANATION

Since the system should allow reuse in other laboratories, it was decided to replace the ARM led by a servomotor. The result allowed us to check the possibilities of integrating the system with a new communications technology, its versatility by reusing it with new hardware, and adaptability to technological progress. No modifications to the source code of the Arduino, which remains its basic hardware, the new laboratory "Remote Servo Control" allowed one step in the reuse of hardware/software preserving educational use. The success of this intermediate step is allowing, currently, developing an integration of a robotic arm that uses Raspberry Pi, Arduino and web sockets to let students/teachers in schools can access it and control it remotely. The user prompted commands are perceive from server through visual application. The necessary task such as pick and place are done according to the hand shaking code received from the GUI application. Four more servo motor are used here to right, left, up, down accordingly. A servo grabber has attached with final end of robo arm to handle various objects.

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## IV.CIRCUIT DIAGRAM

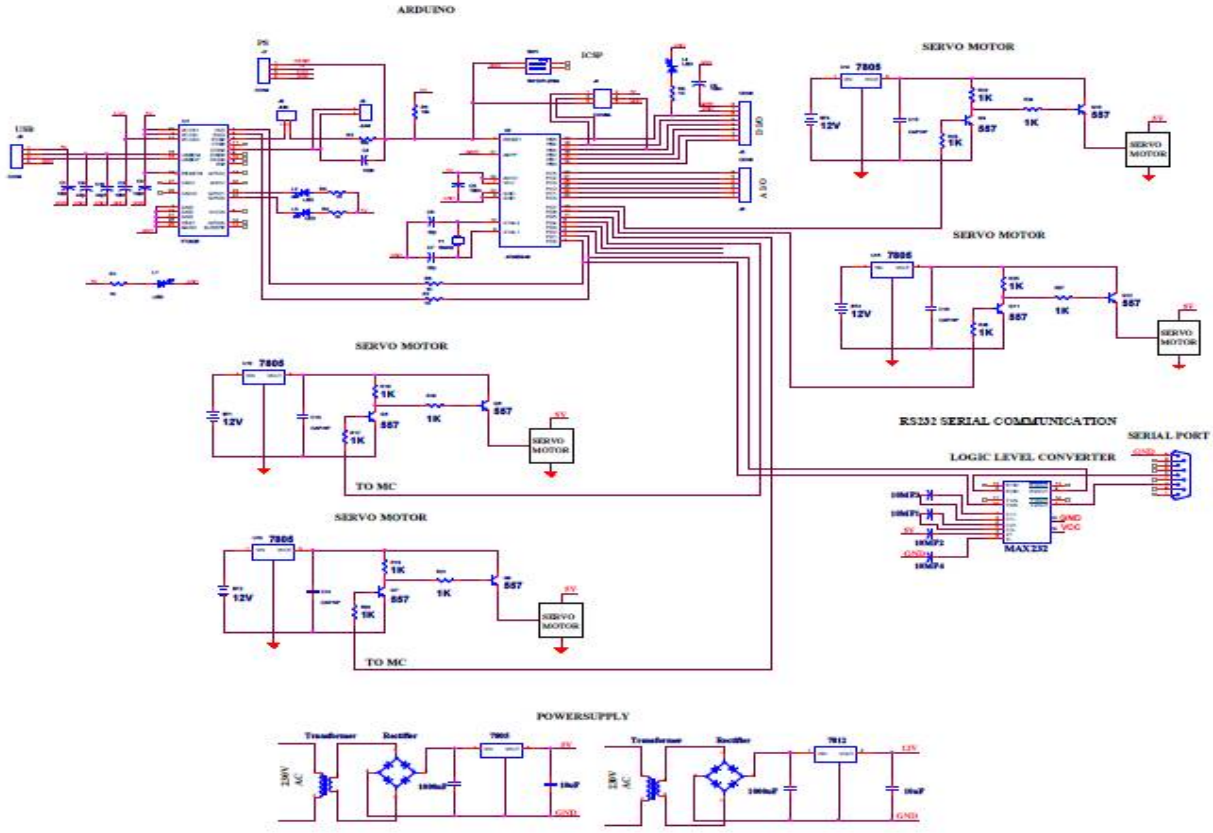


Fig 2 Circuit Diagram

## V. HARD WARE

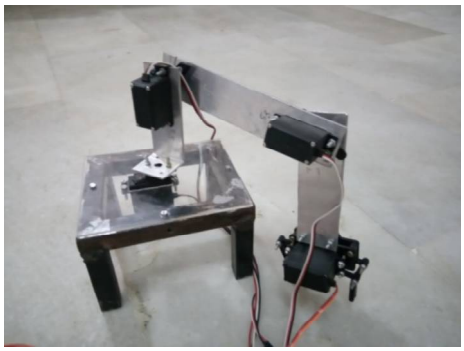

Fig 3 Hardware

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## WORKING / HARDWARE:

Allow reuse existing laboratories, thus allowing reuse HTTP previous architectures, hardware and services, including a more advanced environment that uses web sockets as communications support. How couldn't it be otherwise, the characteristic of the IoT hardware, in this case Arduino has been essential in this task. The goal: to reuse existing remote laboratories improve their communication protocol and expand the possibilities of client-server interaction retaining its character as an educational tool. The input give through the mobile phone use internet the comment receive PC then send received data to ARDIUNO controller. The controllers control the servo motor to get the input values or receive corresponding comments signals.

## ARDIUNO:

The Arduino microcontroller is an easy to use yet powerful single board computer that has gained considerable traction in the hobby and professional market. The Arduino is open-source, which means hardware is reasonably priced and development software is free. This guide is for students in ME 2011, or students anywhere who are confronting the Arduino for the first time. For advanced Arduino users, prowl the web; there are lots of resources. The Arduino project was started in Italy to develop low cost hardware for interaction design. The Duemilanove board features an Atmel ATmega328 microcontroller operating at 5 V with 2 Kb of RAM, 32 Kb of flash memory for storing programs and 1 Kb of EEPROM for storing parameters. The clock speed is 16 MHz, which translates to about executing about 300,000 lines of C source code per second. The board has 14 digital I/O pins and 6 analog input pins. There is a USB connector for talking to the host computer and a DC power jack for connecting an external 6-20 V power source, for example a 9 V battery, when running a program while not
connected to the host computer. Headers are provided for interfacing to the I/O pins using 22 g solid wire or header connectors.

The Ardiuno programming language is a simplified version of C/C++. If you know C,programming the Ardiuno will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions.

An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.

## SERVO MOTOR

The Servo Motors come with three wires or leads. Two of these wires are to provide ground and positive supply to the servo DC motor. The third wire is for the control signal. These wires of a servo motor are color coded. The red wire is the DC supply lead and must be connected to a DC voltage supply in the range of 4.8 V to 6V. The black wire is to provide ground. The color for the third wire (to provide control signal) varies for different manufacturers. It can be yellow (in case of Hitec), white (in case of Futaba), brown etc.

Futaba provides a J-type plug with an extra flange for proper connection of the servo. Hitec has an S-type connector. A Futaba connector can be used with a Hitec servo by clipping of the extra flange. Also a Hitec connector can be used with a Futaba servo just by filing off the extra width so that it fits in well.

Hitec splines have 24 teeth while Futaba splines are of 25 teeth. Therefore splines made for one servo type cannot be used with another. Spline is the place where a servo arm is connected. It is analogous to the shaft of a common DC motor.

## LCD (LIQUID CRYSTAL DISPLAY):

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily

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programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

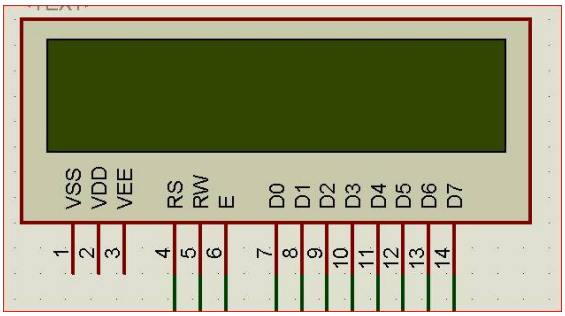


**Fig 3 LCD Display**

**POWER SUPPLY UNIT**

Power supply is an integral parts a vital role in every electronic system and hence their design constitutes a major part in every application. In order to overcome mal-operation which results due to fluctuations in the load and discontinuity in the supply proper choice of power supply is indeed a great need in this hour.
The present chapter introduces the operation of power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes.

A diagram containing the parts of a typical power supply and the voltage at various points in the unit is shown in fig The ac voltage, typically 120 V rms, is connected to a transformer, which steps that ac voltage down to the level for the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit can use this dc input to provide a dc voltage that not only has much less ripple voltage but also remains the same dc value even if the input dc voltage varies somewhat, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of a number of popular voltage regulator IC units.

Power supply components employed in this section includes

- Transformer
- Fullwave rectifier
- Voltage regulator
- Filter circuit
- Easy to deploy
- Simple hardware requirement

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## VI. RESULTS AND DISCUSSION

The following images are shows the output has gathered from the hardware side and pc side by apply necessary command through the mobile application.


Fig 4 Robo ARM move in Right Direction

The fig 4 shows the Robo arm movement in the right direction by get the command from the Mobile application or PC .Based upon the command the arm moves in the right direction.


Fig 5 Robo arm move in the Left Direction

In the fig 5, the robo arm move in the left direction by the command received from the mobile application or PC .

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## VII. ADVANTAGE

- Easy to deploy
- Simple hardware requirement
- Internet Based Control
- More accurate
- High Efficiency.

## VIII. APPLICATION

- This project is very useful for
- Military to handle hazardous Weapons
- Hospital to succeed minute surgery and it can be used for industries also.

## IX. CONCLUSION

In this paper ROBOT control model by IOT online communication through mobile phone. It's very useful to many application process without present that particular place to operate the ROBOT model. The objective of the project have accomplished with remote control application. The control system may also allow us the robo arm both near field and via web too. The controller here used in this system enrich the object oriented program so control the task are easily programmed and burned for ardiuno as so compact. It much better than other tools to accomplish the same project.

## REFERENCES

[1] Carro, G.; Castro, M.; Sancristobal, E.; Diaz, G.; Mur, F.; Latorre, M.; haparro, M.; Lopez-Rey, A.; Salzmann, C.; Gillet, D., "The color of the light: A remote laboratory that uses a smart device that connects teachers and students," Global Engineering Education Conference (EDUCON), 2014 IEEE , vol., no., pp.854,860, 3-5 April 2014 doi:10.1109/EDUCON.2014.682.

[2] Fernandez, G.C.; Gil, M.C.; Perez, F.M., "Remote robotic laboratory as nexus between students and real engineering," Interactive Collaborative Learning (ICL), 2012 15th International Conference on, vol., no.,pp.1,4, 26-28 Sept. 2012 doi: 10.1109/ICL.2012.6402136

[3] Carro Fernandez, G.; Gutierrez, S.M.; Ruiz, E.S.; Gil, M.C.; Perez,F.M., Formation in robotics, the key to integration in industrial environments, "Interactive Collaborative Learning (ICL), 2012 15th International Conference on, vol., no., pp.1,4, 26-28 Sept. 2012 doi: 10.1109/ICL.2012.6402135

[4]HTTP Protocol, refernce site: http://www.w3.org/Protocols/ consulted on 8th january 2015.

[5] Fernandez, G.C.; Gil, M.C.; Perez, F.M., "Remote robotic laboratory as nexus between students and real engineering," *Interactive Collaborative Learning (ICL), 2012 15th International*

[6] Raspbian, offcial site: http://raspbian.org/ consulted on 8th january 2015.

[7] Web Sockets protocol, reference site: http://www.w3.org/TR/2009/WDwebsockets 20091222/ consulted on 8th january 2015.

[8] Node.js, official site: http://nodejs.org/ consulted on 8th january 2015.

[9] Tornado, official site: http://www.tornadoweb.org/en/stable/ consulted on 8th january 2015.

[10] NPM repository, official site: https://www.npmjs.com/ consulted on 8th january 2015.

[11] Autobahn Web Sockets Test suite Report: http://autobahn.ws/testsuite/reports/clients/index.html consulted on 8th january 2015.

[12] Carro Fernandez, G.; Gutierrez, S.M.; Ruiz, E.S.; Gil, M.C.; Perez, F.M., "Formation in robotics, the key to integration in industrial environments,"*Interactive Collaborative Learning (ICL), 2012 15th International Conference on*, vol., no., pp.1,4, 26-28 Sept. 2012