Review on Industrial 6 Axis Arm Control using Web Browser

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ABSTRACT

There are increasing demands for industrial robots in many fields, ranging from spray, welding to transportation, handling, assembly and material processing. More complex and high accuracy demanding, that leads to the higher requirements for robots and controllers with new software implementation. As an appropriate design of robot controller may improve the performance greatly, the development of robot controller with new software and communication technology has become an increasing demand, especially now in India. In that PLC is the most predominant controller used for the industrial process purpose in all sectors, but it economic factor is too high and maintenance , programmer are huge demand. To resolve economic factor, simple devices and cost effective controller based industrial 6 axis robot is developed. In the same factor of PLC function are demonstrated with the help of Python programming and web development control with the interference of Raspberry Pi.

KEYWORDS: *PLC(programmable logic controller),Raspberry PI, Servo motor, PWM (Pulse Width Modulation).*

I. INTRODUCTION

Web provides a unique opportunity to attach the robot to the internet, permitting individuals everywhere the globe to manage and monitor system automation. This analysis aims to gather measurement of acquisition parameters of the robot's movement. The ways are because the followings: Raspberry Pi collects knowledge during a database and analysis of hold on information. this method can work primarily based on an algorithm developed to carry the object. Then, through a web-based user interface, internet users will control the robot arm in order to work the experiment instrument at anyplace and anytime. the event of this automaton is predicated on ATmega platform which will be connected to a microchip placed on the robot running as a server. The results that robotic arm is capable of placing the item at the required position accurately, and after testing, the importance of this robot is that it becomes an answer to many issues like selecting and placing dangerous objects safely, easily, and quickly.PLC is the prominent device used for industrial robotic processNowadays,robots are integrated into working tasks to replace humans especially to perform the certain task. The robotics are divided into two areas, industrial and service robotics. The International Federation of Robotics

(IFR) a service robot as a robot which operates semi or fully autonomously to perform services useful to the well-being of humans and equipment, excluding manufacturing operations. These mobile robots are currently used in many fields of applications including office, military tasks, hospital operations, hazardous environment[17] and agriculture.

The Robotic arm is used predominantly to complete task with lesser time Which is used to control with the help of PLC[1].SCADA is used to monitoring the process. Most of the robotic arm used to do pick and place object[4].The end of arm called as end effort.

In Arm control robots contain the links of the manipulator can be considered to form a kinematic chain. Its is also called End effectors and it is analogous to the human hand. The end effectors can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application[5].The Robotic arm contain several axis. Axis is based on degree of freedom like 4 DOF,5 DOF,6 DOF9[18][19].

Human labor for the loading and unloading of the goods within an industry and also for packing purpose will consume more time.Computer vision[2] and pattern recognition techniques are used in the past for industrial applications and robot vision.

Eventhough PLC is used for industries most of the small scale industries requires cost effective microcontroller.Robotic Arm using the Microcontroller[7] i.e. ATMEGA8 Microcontroller or PIC microcontroller using Arduino[8][9] programming. This process works based on principle of interfacing servos and potentiometers. Interfacing is done by using Arduino board. The remote[13][15] is fitted with potentiometers and the servos are attached to the body.Olden days people try to replace human work with machines. Robots are faster and more effective than people.They do different functions such as material handling, assembly, arc welding, resistance welding and machine tool load and unload functions, painting, spraying, etc. The elements of robots are built with inspiration from nature.Manipulator are

constructed as the arm of the robot is based on human arm. The robot had ability to manipulate objects such as pick and place operations. For the cost effective so many controllers are available like arduino[3], nodeMCU ,Raspberry PI.Raspberry Pi[10][11][12] is like a mini computer used to serial interface with sensors and motors.It is also able to function by itself. The development of electronic industry robot system technology has been expanded exponentially. The service robot with machine vision capability has been developed recently[16][17]. In industry 4.0 IOT is involved to do specific task, which will be operated wireless with the help of Android app, web browser[6].

II. METHODOLOGY

The main methodology used in this project is PWM pulses. A PWM signal consists of 2 main parts that outline its behaviour a requirement cycle and a frequency. The duty cycle describes the amount of your time the signal is during a high (on) state as a proportion of the entire time of it takes to finish one cycle. The frequency determines how briskly the PWM completes a cycle (i.e. 1000 hz would be a thousand cycles per second), and thus how briskly it switches between high and low states. By athletics a digital signal off and on at a quick enough rate, and with a particular duty cycle, the output can seem to behave sort of a constant voltage analog signal when providing power to devices. PWM signals are used for a large sort of management applications. Their main use is for dominant DC motors however it can even be used to management valves, pumps, hydraulics, and alternative mechanical elements. The frequency that the PWM signal has to be set at are keen about the appliance and also the reaction time of the system that's being powered. Below are a few applications and a few typical minimum PWM frequencies required:

• Heating system with slow response times
• DC electrical motors: 5-10 khz or higher
• Power provides or audio amplifiers: 20-200 khz or higher

III. REVIEW ON VARIOUS PUBLISHED PAPER

Table 1. Review on various research paper under the study

YEAR	TITLE	AUTHOR	ISSUE ADDRESSED	APPROACHES	MERITS/DEMERITS	CONCLUSION
2018	Design and fabrication of PLC and SCADA	Veena C D, Sharath H , Sree Rajendran ,Shivashankara B	To do more work to complete on lesser time.They constructed	Delta PLC SCADA **Software**	Only 3 axis is designed and developed.Design has been implemented and fabricated	The SCADA has been designed in such a way that the

	based robotic arm for material handling		3-directional robotic arm using Pneumatic cylinders which are controlled by the PLC for Picking and Placing.	Delta Digital Output Module DCV SMPS Double Acting Cylinder	with two pneumatic cylinders for horizontal and vertical motion and attached with a gripper at the end..	Process can be controlled from SCADA also. Degree of freedom is restricted.The monitoring and Controlling can be done.
2013	Vision Guided Pick and Place Robotic Arm System Based on SIFT	Girish G. Patil	In this paper problem addressed is Robots are unable to pick the exact location of the object.To overcome the above stated problem Scale invariant Feature Transform is used.	Machine Vision Algorithm is used to locate the object using Vision based. **Software:** Image Processing	Robotic arm with SCARA configuration having 4 DOF which is used for pick and place operation of an object having dimensions 20x20x50mm and payload capacity of 0.150kg.This type of robot can't do larger work.	The object can located and PIck and Place.The aim of this project to provide Robotic arm as a learning material to Engineering colleges at lowest possible cost.
2017	Pick and Place Robotic Arm Using Arduino	Harish K,Megha D,, Shuklambari M	Usually the transfer process of the heavy materials is being carried out, using man power and if the transfer process is repeated for a period of time, it can cause injuries to the operator. To eliminate human error in the specific task they developed the robot.For human interaction also been reduced in this.	Two degrees of robotic arm is developed. **Software:** Arduino IDE	It contains only two degrees of freedom. The arm controlled using RF playstationThe reliability of Robot work is less.	Controlling action provided to servo motor to lifts the object and locates the same at required destination.
2018	Design and fabrication of PLC and SCADA based robotic arm for material handling	Veena C D, Sharath H , Sree Rajendran ,Shivashankara B	To do more work to complete on lesser time.They constructed 3-directional robotic arm using Pneumatic cylinders which are controlled by the PLC for Picking and Placing.	Delta PLC SCADA **Software** Delta Digital Output Module DCV SMPS Double Acting Cylinder	Only 3 axis is designed and developed.Design has been implemented and fabricated with two pneumatic cylinders for horizontal and vertical motion and attached with a gripper at the end..	The SCADA has been designed in such a way that the Process can be controlled from SCADA also. Degree of freedom is restricted.The monitoring and Controlling can be done.
2018	Robotic Arm for Pick and Place Application	Kaustubh Ghadge, Saurabh More, Pravin Gaikwad	This project is to design and build a more compact, usable and cheaper pick and place robotic arm for educational purpose uses NodeMCU from Microchip Technology as the control system to control all the activities.	NodeMCU,Servo Motor **Software:** Catia	This project developed with 4 axis of freedom movement. This paper presents has discussed only the CAD modeling aspect of the robot and various parts of the assembly.	This robotic arm uses NodeMCU controller and is especially developed for pick and place applications.
2012	Internet Controlled Robotic Arm	Wan Muhamad Hanif Wan Kadir,Reza Ezuan Samin,Babul Salam Kader Ibrahim	In this they developed an internet controlled robotic arm.Robots are to help humans in doing work for	To work with robotic arm for connection via internet, relay infrastructure is used. **Software:**	The Robots are used for only household activity. The implementation of this process in domestic purpose is difficulty by the cost and	The main feature of this paper is robots are controlled Via internet and its suitable for

Year	Title	Authors	Description	Hardware/Software	Limitation	Outcome
			industries or just helping out household activity.In this Robots are unable to communicate to do household activities.To overcome the communication problem Arduino Uno controller used to control household activities through Robot.	Arduino Uno Arduino IDE HTML	maintenance.	household work.
2013	Design and Implementation of Pick and Place Robot with Wireless Charging Application	N. Firthous Begum, P. Vignesh	The object to be picked will be done by using android application where the camera of the android mobile will capture the objects. The output from the mobile will be send through Bluetooth to the microcontroller and that will allow the motor to move in order to pick the object.	The voice input is given to PIC microcontroller using HM2007 voice kit and it is been sent to receiver through RF transmitter. PIC microcontroller,camera,	Its restricted for smaller and particular object only.	The implementation of pick and place robot is been done by using android application via object detection application which is used to work in all environments
2015	Wireless Control of Pick and Place Robotic Arm Using an Android Application	Muhammed Jabir.N.K, Neetha John,Muhammed Fayas, Midhun Mohan , Mithun Sajeev	Robotics arms for handling radioactive materials.	Android application is used to control the arm. Microcontroller,DC motor,Bluetooth Device.	The android application used to control with the Bluetooth module only.It can be controlled only the short range of environment.	The aim of this work is the development of wireless control of a pick and place robot using android application.
2016	Wireless robot control with robotic arm using mems and zigbee	RakeshH.K,Shiva shankara.A.B.S	To give the material taking care of through robot without association of people, rather robot is made remote and controlled through expert board utilizing motion position and ZigBee module.	Keil-c,ARM,Zigbee module	The less number of axes is used,DC motor is used to control hand gesture movement.	The mechanical arm will copy the development of the controller. It will detect the object and motion detected for the one degree of motion.
2017	Design and Analysis of Intelligent Robotic Arm	N.Rishikanth,Sur esh Kumar,Srinath	To reduce the utilization of human energy for hazardous applications.	Software: CATIA	Design arm with the aluminium , controller not interfaced to control the Robotic arm	Lightweight robotic arm is designed with the help of aluminium material.
2015	Build and Interface Internet Mobile Robot using Raspberry Pi and Arduino	Prof. Dr. Nabeel Kadim Abid Al-Sahib,Moham med Zuhair Azeez	To collect the hazards sample in a space we can use this wheeled robot.Which we replace human interaction.	The Raspberry Pi and Arduino Mega will be interfacing for the mobile robot and can be controlled wirelessly Raspberry Pi Arduino Mega DC motor 5DOF	Its contains only 5 degrees of freedom and its controlled through DC motor.The two microcontroller is used.	To interface hardware and software for mobile robot arm controlled via the internet from any place, Controlling the robot does not require specific software
2015	Android Based Robot Using Raspberry Pi	Jayant Nivritti Patil, H. K. Bhangale	Mostly the robots are controlled by wired these wired robots have some space limitation. So	Raspberry Pi is used to control the 5 dc motor Raspberry Pi	With android app,DC motor is controlled .It carries small object and its do only left and right	The Raspberry Pi can be used for the control the Robot with Smartphone

			to avoid the limitation, the robotic control is made wireless that is; it is controlled by Wi-Fi.	DC motor.		from a remote area
2017	Raspberry PI Based Robotic Vehicle with Continuous Visual Feedback	Albin George Eldhose , Gavin Francis, Mobin P Abraham , Sachin K S, Jinto Mathew	To develope a system for the continuous surveillance and to monitor remote areas with the Tele robotic mechanism to visualize the situation happened in remote areas with internet based communication with the concept of controlling a Tele robotic system with web server to operate with a webpage based controlling automation system.	Raspberry pi Pi camera	2 DOF only used to control.DC motor is used for control the axis.The angel of of arm won't be reliable,because its not angel based.	This paper describes a controlled robotic arm from webpage with continuous surveillance of actions done by the telerobotic arm
2018	IOT Based Pick and Place Robot	Arbaaz Sultan, Chirag Acharya, Dipayu Mali, Suraj Suryawanshi	Automation provides reliable solutions for human errors such as lack of energy, and mistakes done by humans. The main feature of this automation is Robot. To avoid errors in automations robots are created. Robots are very reliable for use as well as are efficient to work greater than humans	Raspberry pi L298N	The Robot is a Prototype of overhead Crane for Picking and placing certain objects in Industry using Raspberry Pi.	This robot picks and places an object to a predefined location as per its programming. Our structure contains a robotic arm, DC geared motors and Raspberry pi
2019	Surveillance Robot using Raspberry pi for Defense	Dr M Senthamil Selvi,M.FaesaFat hima,S.Dhivyuaa	This project's main functionality is to deal with tough situations where human beings cannot handle situations like darkness, entering narrow and small places and detecting hidden bombs etc	Raspberry pi IR sensor, PIR sensor.	The robot can't with stand for high level temperature environment.for defence it need to undergo various test to check the stability.	The movement of a robot is also controlled automatically through obstacle detecting sensors to avoid the collision, and the system causes an alert at the time of metal detection through metal detecting sensor
2013	Design and Implementati on of Robot Arm Control Using LabVIEW and ARM Controller	C.Chandra Mouli1 , P. Jyothi1 ,K. Nagabhushan Raju,C. Nagaraja	The projected work was focused to control the end effector of the robot arm to achieve any accessible point in an amorphous region using LabVIEW, ARM (Advanced RISC (Reduced Instruction Set Computing) Machine) microcontroller and Dexter ER2 robotic arm	Robot Arm, LabVIEW, ARM microcontroller	LabVIEW uses the parallel communication to send the joint angles of the robot arm to the ARM. ARM microcontroller uses five PWM signals in order to control the robot arm, which was geared up with servo motors	Dexter ER-2 5DOF robotic arm, inverse kinematic model and control was developed using LabVIEW and ARM microcontroller

2015	Design and Development of a Mechanism of Robotic Arm for Lifting Part1	a.n.w.qi, k.l.voon, m.a.ismail, n.mustaffa, m.h.ismail	For cost-saving in fabrication. The robotic arm is equipped with 4 servo motors to link the parts and bring arm movement	Robotic Arm, Arduino	Degree of freedom is less.It not lifted 100 gram of weight	Result of the robotic arm of lifting with different weight is presented in this section. The load to be lifted in this experiment is a sand bag with different weight
2018	Design and Implementation of Robot Arm Control Based on Matlab with Arduino Interface	T.Rajesh, M. Karthik Reddy, Afreen Begum, D.Venkatesh	Rather than compromising on human lives, it is better to employ robotic systems for performing difficult tasks. Robotic systems are far superior in ensuring the accuracy of the system under adverse circumstances wherein a human operator	Arduino UNO, Servo motors, ATmega 328, matlab, pwm signal , robotic arm	Setting up the Arduino circuit ,control servo" s rotation angle with a slider in processing. In this project we can control the multiple servos with small time delay to robotic arm	The servo motor reached the specific angles of movement that we pre-programmed and it repeated it over and over. With this new found Knowledge of simple servo motor control
2018	Development of Mine Detection Robot with 4 Degree of Freedom Robotic Arm	Sharath Chandra G V,Santhuan Dheer,Raghavendra Sawant	Providing the operator to manipulate a 4 DOF robotic arm in order to inspect or defuse the bomb using the preferred end effector	Arduino, Servo Motors, 4 DOF Robotic Arm	Wired control is implemented.Wireless transmission need to include	The design, development and implementation of various concepts such as mine detection, haptics, and manufacturing concepts
2019	Design of Mobile Robot with Robotic Arm Utilising Microcontroller and Wireless Communication	Alit Swamardika,Budiastra, Setiawan, N. Indra Er	The robotic systems can be controlled manually using a system of data transmission via cable, or via a wireless connection and several studies on this approach have been done before	Mobile robot, 6WD robot, Robotic arm 6 DOF, Robot remote control	Data transmit through certain distance using Xbee.	The Six Degree of Freedom (6 DOF) has enabled the robotic arm to perform the designed movements very well.The mobile robot successfully follows the command from each input variable resistors via the remote control to move the robotic arm.
2019	IOT Controlled Robotic Arm	Asst Prof. G.Jyothsnadevi K.Chandisivapriya, B.Saikrishnateja, L.Nagajyothi, U.Dushyanthkumar	Proposes a method for controlling a robotic arm using an open source web application. It is controlled by using mobile application and for continuous monitoring and observing by the user we use IP web cam application.	MIT, L293D driver IC, ISP programmer, Arduino-IDE tool.	Designed dimensions length is 12Cms and it as a load bearing capacity of around 200Gms.For industrial application it not suitable.	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..
2018	Robotic Gripper Arm System with Effective	VirendraPatidar, Apoorva Mishra, Ritu Tiwari	Improvements over the existing methods by designing a	Grip Algorithm, Increase number of joints in the arm	Due to increase in number joints in A arm code of the robot is increased	Robotic arm with 7 DOF outperforms the traditional

	Working Envelope		robotic arm with 7 DOF (Degree of Freedom), and then starts working at arm envelope, space and increasing its efficiency.			methods of designing a robotic arm and has a great potential to be used in different applications.
2018	Android Based PLC Data Monitoring Interface with Industrial Data Communication Port	Arya KANMAZ veHalit ÖRENBAŞ	Bluetooth hardware and software are used to communicate with the Android mobile device. This data is viewed on designed low-cost system in real-time without cable.	Android-based monitoring of PLC (Programmable Logic Controller) digital and analog inputs and / or outputs with using Communication port which is widely used in the industry. Ladder Logic Programming.	Loss of transfer data fails to monitor real time. The delay occurred in the results.	Android-based monitoring of PLC (Programmable Logic Controller) digital and analog inputs and / or outputs with using communication port which is widely used in the industry.
2017	Design and implementation of a Pick and place robot for flexible manufacturing system (FMS)	Genger K. Tersoo , Olotu , Odinya J. Otengye	Robot was controlled with the pic 18F4680 micro controller which allow easy interface to the control electronics. Joints were moved using stepper motors. The operation of the microcontroller based pick and place robot is achieved through control software written in assembly language.	Robot, pick and place robot, microcontroller, stepper motor, assembly language, flexible manufacturing system (FMS), Pic18F4680,MPLAB IDE and PROTUES VSM	Recommendations for improving the project performance, namely in the areas of design review, incorporation of sensors, and integration with the FMS project are hereby itemised for optimal utilization of the objectives.	The revolute pick-and-place robot has been designed and developed following the logical engineering methods and steps envisaged.
2017	Development Of Robotic Arm Using Arduino Uno	Priyambada Mishra, Riki Patel,Trushit Upadhyaya, Arpan Desai	Arduino UNO board is programmed to control the servo motors and arduino's analog input is given to potentiometer.	Arduino Uno, Arduino IDE,Potentiometer	This project is a small scale production it can pick up only small and lighter objects.	Make use of servo motor to make joints of a robotic arm and control it using potentiometer and arduino UNO.

III. CONCLUSION

In this study, The Six Degree of Freedom has enabled the robotic arm to perform the designed movements very well. From the above review of various literature survey the Robotics and mechatronics system need more reliable methods to control and also need to develop the simpler network control. From this new innovative idea developed in terms of servo slider in a web page is adjusted with the help of angel, the values are transferred through the server and communicate the servo motor. For change the angel android application and system web browser also used.

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