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Review on IoT Based Dual Arm Tele-Robotic System

Shivani Gawade[1], Manoj Sonune[2]

[1]ME Student, Dept. of Electronics & Telecommunication Engineering, Dhole Patil College of Engineering, Pune, Maharashtra, India
[2] Asst. Professor, Dept. of Electronics & Telecommunication Engineering, Dhole Patil College of Engineering, Pune, Maharashtra, India

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Abstract - *A robot gripper finds its applications in variety of areas to take away the processes which are highly multifaceted, repetitive and perilous, high-precision or of destructive in its nature. Robot grippers are intended to pick and place object applications because of its precision operation and high accuracy. Robot gripper shows many advantages when it is networked and automated with an embedded system. The present work gives the earlier, design considerations and current developmental status of existing pick and place module, designing and analysis of robot gripper, IoT based module with video surveillance in remote areas. The above mentioned significant areas are covered in the review. The intention of the present work is to develop the feature research work in the field of IoT based dual arm tele-robotic system. Tele-robotics is the area of robotics with the control of semi autonomous robots from distance chiefly using wireless network or tethered connections. Tele-robot is a combination of two major subfields the tele-presence and tele-operation.*

Key Words: **IoT, Embedded Control, Robot gripper, Tele-robot, Tele-presence, Tele-operation**

1. INTRODUCTION

In this modern era the industrial robot arms are extensively adopted in several application areas where the work is critical, complex, and repetitive. Industrial robot applications includes assembling of spares in automobile industries, pick and place operations of the objects to the desired location, process control operations in nuclear industries. Robotic pick and place automation will speeds up the process of picking parts up and placing them in new locations, by increasing production rates. With all end-of-arm-tooling options available, pick and place robots customized to fit specific production requirements. Moving heavy, large, hard-to-handle or small products can be an easy task to automate in the factory line. Consistency is also a beneficial of using a pick and place system. The robots can be easily tooled and programmed to provide multiple applications if required. An increase in output with pick and place robot module offers long-term savings to companies. With the affordability and advancements in technology of robots, many pick and place robotic cells are being installed for automation applications. The knowledge of robot comprises of three main engineering areas; mechanical, electrical and computing. The electrical contains the amplifying, sensing, displaying, filtering, and controlling schemes; mechanical composes of mathematical modeling of kinematics and dynamics of robot arm, computing consists of another two important fields in the form of software and hardware to design an electronic controller through programming for specified application in a time domain constraint which can also be called as embedded system. Robots show many advantages when it is networked using wireless communication, automated by providing vision and controlled through an embedded system. Pick and place systems remain essential in numerous areas with diverse applications such as in manufacturing industry, supermarkets, libraries, factories, pharmacies, warehouses etc. The main steps of proposed work for pick and place application involves two important systems they are internet of things embedded control system and robot system. The robot system which is a robot gripper manipulator performs the grasping and pick and place operations. The main aim of this paper is to deliver an outline of an embedded system based control for dual arm tele-robotic system for pick and place and online video streaming in order to recognize and takeout the subsequent:

1. Design and development of an object pick and place system using embedded systems for robot experimentations and exercise circumstances related to the operation, programming, and control.

2. Examine the literature on object pick and place systems which includes the research on mathematical modelling of the robot gripper, wireless communication system and embedded system based control.

3. Implement theoretical and experimental assessment on the robot gripper procedures and control logic, to progress the complete understanding of robot gripper manipulators.

2. LITERATURE RIVIEW

The Internet of Things (IoT) is a technology widely spreading in modern wireless Telecommunications. The basic idea of IoT is connectivity of variety of objects or things – such as sensors, mobile phones, Radio-Frequency Identifications (RFID) tags, actuators, etc.[13] through internet and thus we are using IoT for controlling the robot. The present work is aimed on providing the survey and design aspects of wireless object pick and place system which comprises of two stations transmission station and reception station. The transmission station is a Personal Computer (PC) or a cell phone, a microcontroller(Arduino Mega) and a wireless transmission module (Wi-Fi). The input device(webcam) will capture the video of the remote area and the video will be sent to PC for online streaming by the user to find out the obstacle. Reception station is an embedded system with a wireless network module and the robot gripper. The mobile phone and car are linked via wireless communication. By pressing or touching on the screen of an Android phone(with application installed), a manipulator can send commands to the Arduino microcontroller on the car through wi-fi and observe the corresponding executions accomplished by actuators, for example motors[5]. Two DC motors, four wheels, a 12V battery, a switch and a baseboard compose the chassis of the car. Compact and Uncomplicated operations user interfaces are preferred. Initially the commands include: move forward, move backward, rotate left, rotate right, activate obstacle detection, and deactivate obstacle detection. These commands can be given through user andriod application. It is possible to locate the car continuously in the UI and get the data and feedback regarding to the car[14].There is a provision of feedback signals to the controlling device like mobile in which the graphical control interface is installed thus avoiding collision and changing the path will be very easy in our design.

Sr. No	Year	Author Name	Paper Title	Work Done
1	2014	Kunal Borker	Wireless Controlled Surveillance Robot	The controlling of Robot was done using various buttons available on the webpage specifying various actions
2	2015	Ketan Dumbre	Robotic Vehicle Control using Internet via keyboard and Webpage	The Robotic vehicle guided via internet was implemented using TCP and UDP protocol for transport layer data transfer
3	2017	Renuka Kondekar	Raspberry pi based voice operated Robot	The Robotic vehicle was guided by voice via internet
4	2017	Maliha Rahman	Multiple Motion Control System of Robotic Car Based on IoT to Produce Cloud Service	The robot was based on IoT with multiple motion controlled through voice commands

John Iovine, in this book various aspects of designing a Robot is described. It deals with different types of Arm design, controlling techniques, vehicle design[1]. Er. Rajput, in this book the operation and control of robots is discussed[3]. Arduino cookbook, in this book details and methods of interfacing hardware components such as DC motor, Servo motor and RF Transmitter and Receiver is been discussed[2].

3. Applications:

3.1 Remote Spying:

The robot can be driven to places for spying and monitoring. It is also well equipped for surveillance at place where human cannot reach. It can also provide online/live feeds from the remote places to the user continuously.

3.2 Video Surveillance Robot in Agriculture:

Some areas need to be placed under video surveillance for a short duration only, and therefore equipping them with stationary CCTV systems is not viable. Such challenges often arise in agriculture settings. For the agriculture sector, mobile video surveillance robot is much more efficient than setting up stationary surveillance systems.

3.3 Manufacturing Robot:

- **Assembly:** During assembly processes, the pick and place robot grab an incoming part from a conveyor belt and then place this part onto another work piece, which is then carried away by another conveyor belt.
- **Packaging:** Similar to the process of assembly, a pick and place robot grabs a part on an incoming conveyor belt and the robot places it in a packaging container at a high speed.
- **Bin Picking:** During the bin picking pick and place robots equipped with advanced vision systems can grab a part out of a bin, sometimes even when parts are randomly mixed together in a bin, and place it on a conveyor for production.
- **Inspection:** systems with vision can monitor products moving on an incoming conveyor belt and detect defective products, and then a pick and place robot can remove the defective product before it reaches the final phases of production.

4. CONCLUSIONS

IoT and Robotics are two terms each covering a myriad of technologies and concepts. In this review we have added the importance of IoT, pick and place module together with video surveillance with its applications. The use of Robot technology has made an immediate and good impact on world in several ways. Robot technology is evolving rapidly into 21st century. Robot technology can be found in the hospitals, stores, work place, home, on battlefield and many more. Robots offer efficiency in which they have the ability to perform the tasks without wasting the time, energy, efforts and materials.

We hope that this survey may stimulate the researchers from discipline to start the work towards an eco-system of IoT, robots and cloud.

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BIOGRAPHY

Pursuing M.E. in VLSI & Embedded System, Dhole Patil College of Engineering, Wagholi, Pune