



# An Interactive Perception Method for Warehouse Automation by Pick and Place Robotic Arm

Dr. Asma Parveen<sup>1</sup>, Noorunnisa Thereem<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Computer Science and Faculty of Engineering and Technology, Khaja Bandanawaz University, kalaburagi, India Karnataka (India)

<sup>2</sup>Student, Department of Computer Science and Engineering, Khaja Bandanawaz University, kalaburagi, India Karnataka (India)

**Abstract:** The smart city is an integrated environment that heavily relies on intelligent robots, which provides the basis for the warehouse automation. In this article, we develop a novel framework to integrate the interactive exploration with a composite robotic hand for robotic grasping in a complicated environment. The exploration strategy is obtained by a deep reinforcement learning procedure. The developed new composite hand, which integrates the suction cup and grippers, is used to test the merits of the proposed interactive perception method. Experimental results show the proposed method significantly increases the manipulation efficiency and may bring great economic and social and benefits for smart cities. A robotic arm is designed using arduino to pick and place the objects via user commands. It will pick and place an object from source to destination safely. The soft catching gripper used in the arm will not apply any extra pressure on the objects. The robot is controlled using android based smart phones through Bluetooth. Based on the commands given by the user the robot moves accordingly. At the receiver end there are four motors interfaced with the micro controller. Two for the vehicle movement and the remaining two are for arm and gripper movement. Blue control application is used for the controlling of robot.

**Keywords:** Robotic Arm, Arduino, DC motors, Bluetooth, Voltage.

## I. Introduction

THE Smart city is an incorporated hyper associated climate that unequivocally depends on wise robots, which can be utilized for completely mechanized waste evacuation, reconnaissance, coordinated operations, etc. They can likewise further develop the city administrations by offering more excellent types of assistance at a lower cost. Consequently, robots are currently becoming basic empowering agents particularly for nations confronting work deficiencies and maturing populaces. Among the different parts of smart city, stockroom mechanization, which is generally perceived as one of the best ways of diminishing work requests and further develop proficiency, is surely a significant element of a savvy city's organization. Distribution center mechanization will assume a basic part in a wide range of conveyance frameworks and is as of now being utilized for online business, grocery store, and so on. It frames the essential framework for shrewd urban communities.

Mechanical technology manages the plan of robots their production and applications. Mechanical technology acquired significance in the cutting edge time since it require less expense to work than a human work to do a similar errand, likewise once customized robot will perform better compared to an accomplished human work. Presently a day's industry is turning towards PC based observing of undertakings chiefly because of the requirement for the expanded efficiency and conveyance of the eventual outcomes with greatest quality. Because of the firmness and by and large significant expense of hard computerization frameworks lead to the utilization of modern robots. In this paper we are presenting a mechanical arm which is fit for getting and putting the items. The delicate getting gripper utilized here handle protests securely.

An android based PDA which has blue control application is utilized for the development of robot. Subsequently founded on the client orders the robot moves and pick and spot the articles. The mechanical arm utilized here is like a human arm which is customized to play out the pick and spot capabilities.

## II Literature Review

**As of [1]:** An arm is constrained by physically blemish control and heading control valve. Arm revolution and development is finished by pneumatic chamber utilizing helical space component. All out arm weight is 25 kg. Thi model is supposed to lift somewhere around 10 kg weight. This task expects to Plan and create pneumatic arm for pick and spot of tube shaped objects. The treatment of materials and components to pick wherever of articles from lower plane to higher plane and are generally tracked down in processing plants and modern assembling. There are number of pneumatic arms are accessible which comprises of such countless components consequently becomes costly. The planned pneumatic arm comprises of two chambers, as haft works with lead screw system fit for switching movement of cylinder over completely to rotational movement of arm with assistance of utilizing compacted air. The planned cycles are completed in view of coordinated data of kinematics elements and underlying examination of the ideal robot design as entirety. The profoundly unique pneumatic arm model can be effortlessly set at moderate situations by managing the tension utilizing the stream control valve. It very well may be utilized in stacking and dumping of merchandise in a transportation harbor as the development of products is finished from lower plane to higher plane. Watchwords - Pneumatic arm, Work volume, Tube shaped objects, Steel shaft A1 Chambers, C-45 cylinders, pilot valve, grippers.

**As of [2]:** Pneumatics is perhaps of the most involved framework in nowadays. Today gear and framework utilize this kind of impelling in light of the fact that it is an exceptionally protected, monetary and straightforwardness to carry out. Another benefit that suggests this sort of impelling is the decreased loss of intensity during the activating system. Material taking care of frameworks is described by tedious developments, speed and uprooting control and accuracy, prerequisites that suggest pneumatics driving. Certain attributes of packed air have made this medium very appropriate to be utilized in current assembling and creation enterprises. Experts and designers really ought to have decent information on pneumatic framework, air worked valves and embellishments. A pneumatic framework comprises of a blower plant, pipe lines, control valves, drive individuals and related helper machines. The air is packed in an air blower; and from the blower plant, the stream medium is communicated to the pneumatic chamber through a very much laid pipe line framework. To keep up with ideal proficiency of pneumatic framework, of imperative significance pressure drop among age and utilization of compacted air is kept extremely low. The exploratory arrangement comprises of four twofold acting pneumatic chambers. One of these chambers is utilized to incite rack and pinion gathering to such an extent that cylinder pole of chamber is associated with rack coincided with the pinion. By working the chamber, rack and pinion get together the entire gathering through almost 260°. The turning point of the get together can be adjusted by differing the length of the rack. Another chamber for example vertical chamber is utilized to build thi level of the arrangement; the level is restricted by the cylinder pole length of the chamber. Even chamber is utilized to expand the a safe distance.

**As of [3]** In this paper the author avoid negative influence on the total weight of the arm, the plastic material reinforced with fiber is used and vacuum infusion man process is used for manufacturing. Local reinforced elements must be included during construction of armshell. The mast light gear reducer, harmonic drive types are used but because of lack of alignment causes disassembly of gear package to avoid. Technology is developing in the same direction in line with rapidly increasing human needs. Much of the work in the industry is now done by robots. Even though they are able to do very precise work, difficulties appear when trying to do some of the tasks that humans do. This can be changed by making it easy for a human to control the robotic arm and to "teach it" how it's done. The work done to meet these needs makes life easier every day, and these studies are concentrated in robotic arm studies. Robot arms work with an outside user or by performing predetermined commands. A robotic arm that is easily controlled by the u\*ser. This is done by using the users own arm movement to control the robot. To make the usage more intuitive, a simple hectic feedback system will be implemented. This creates a greater experience where the user is able to "feel what robot feels". To be able to create such a system, development of an easy control unit, robotic arm and feedback system has to be made. The steering of the robotic arm is created from reading the user's arm movement with potentiometers, and mapping these values to servos on thi robotic arm. Nowadays, the most developed field of robot arms in every field is the industry and medicine sector. Designed and realized in the project, the robot arm has the ability to move in 4 axis directions with 5 servo motors. Thanks to the holder, you can take the desired material from one place and carry it to another place, and also mix it with the material it receives. While doing this, robot automatic control is provided by connecting to the controller. By recording the work the commands will be stored and automatically played by loop programming.

**As of [4]:** The CAD tools like Creo1.0 and Auto CAD are used to model the desire manipulator. To determine the end effectors position and orientation, theoretical analysis of inverse kinematics are carried out. Any software is used for FE Analysis.

Robotics researchers regularly endow robot platforms with new capabilities that increase the breadth of potential applications and push the boundaries of autonomy. In contrast, industrial automation is driven by a pragmatism dictated by the need to optimize throughput and reliability. The hope of both is that, as multi-purpose robotic platforms become more capable, they will be able to take over an increasing fraction of the tasks currently handled by application-specific, fixed installation automation, there by granting all applications a greater level. This project is designed to develop an Industrial Robotic Arm.

Typical applications of Industrial ARM include welding, painting, assembly, pick and place (such as packaging, palletizing and SMT), product inspection, and testing; all accomplished with high endurance, speed, and precision. This Industrial Robotic ARM has 3 Degree of Freedom and the end of ARM has a Gripper Mechanism, which is used to Pick and Place any Object. Geared Motors are used in this ARM

Mechanism of 3.5 RPM and 10 RPM. L293D Motor Driver is used to control the Motor of the ARM. This Robotic ARM can move in forward, backward, left and right Direction. It has user-friendly interfaces on its control using an Android Application. This Android Application can be installed in any Mobile Phone to get control over this Industrial Arm.

### III Objectives

- To design the automatic Pick and Place robot in order to work human hazards place and to skip need of personnel.
- To develop an autonomous robotics system using internet of things.
- To control the displacement of the robotic arm with servo motors so that the arm can be used to pick and place the elements from any source to destination.
- To control displacement and movement of robotic arm using Bluetooth control from smart phone
- To implement a robotic arm with six degrees of freedom.

### IV Methodology

- The project deals with implementing a pick and place robot using Robo-Arduino for any pick and place functions. The pick and place robot so implemented are controlled using Bluetooth.
- It mainly comprised of Arduino mega micro controller, Bluetooth module (HC-06), four DC motors with driver IC, voltage regulator.
- Here we are introducing a robotic arm with better wireless communication technology and soft catching gripper.
- The soft catching gripper used here reduces the extra pressure to be applied while picking the object, thus the objects can be carried without any damage and human effort can be reduced.
- The robot is controlled remotely using android based smart phone or tablets, so there is no need of complex hardwires to operate this system.
- The use of low power wireless communication technology, the system become more effective and user friendly.

### V System Analysis

#### Existing System

Robotic arm is a reprogrammable and multifunctional manipulator design to assist human in various surroundings. It is able to overcome human inefficiency in performing repetitive task such as pick and place operation. Thus, industrial in assembly and manufacturing have widely integrated robotic arm into their assembling line to overcome the problem of human inefficiency. Internet of things (IoT) allow data to be exchange between devices through the connection of many devices The purpose of this research is to design and build a three degree of freedom robotic arm with a mechanical gripper. The robotic arm can be controlled remotely through android mobile device to perform pick and place operation while Matlab provides the graphical movement of the robotic arm as a feedback. Human in various surroundings. It is able to overcome human inefficiency in performing repetitive task such as pick and place operation. Thus, industrial in assembly and manufacturing have widely integrated robotic arm into their assembling line to overcome the problem of human inefficiency. The integration of internet of things with robotic arm allows smart industry to be realized. The purpose of this research is to design and build a three degree of freedom robotic arm with a mechanical gripper. The robotic arm can be controlled remotely through android mobile device to perform pick and place operation while Matlab provides the graphical movement of the robotic arm as a feedback.

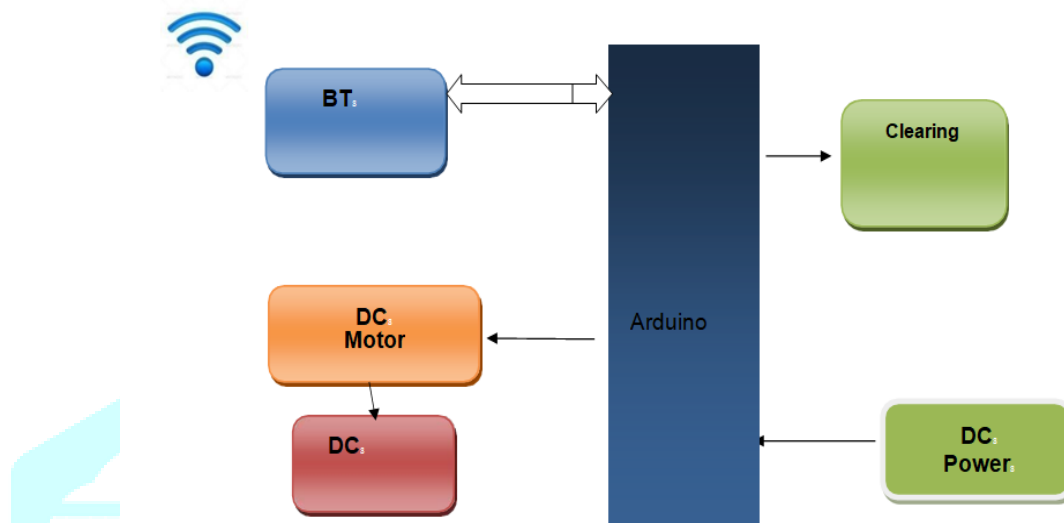
#### Disadvantages

- The robot lack capabilities to respond in emergencies.
- Losing security and privacy.

## Proposed System

For cost effectiveness and reducing harm to the objects, we introduced a robotic arm with better wireless communication technology and soft catching gripper. This soft catching gripper used here reduces the extra pressure to be applied while picking the object, thus the objects can be carried without any damage and human effort can be reduced. The robot is controlled remotely using android based smart phone or tablets, so there is no need of complex hardwires to operate this system. This increases the easiness of user. By the use of low power wireless communication technology, the system becomes more effective and user friendly.

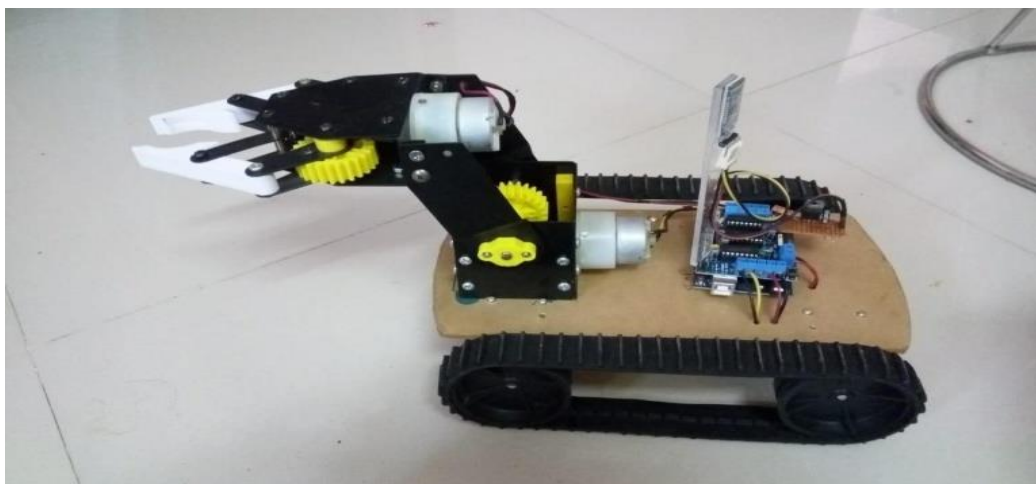
### V Block Diagram



**Fig 1: Block Illustration**

The block diagram shown is gives pictorial representation of proposed Pick and place robot. It shows how the components must be connected to fulfill the desired task. It describes the circuitry and clarifies the idea of the robot chassis. It shows the main structure of pick and place robot which consists of Arduino Uno, power sources, dc motors, Bluetooth module, Servo motor, rotating. Power supply is used to activate the system. After it is given to the system, the command from the user is sent to Arduino through Bluetooth module. Based on the given instruction Arduino calls the sent signals from the programming. Then motor driver controls the movement of wheels depending on coming instruction, mopper for product moment, ultrasonic sensor is for detecting obstacles, and servo motor for up-down movement of roller and mopper. The block diagram of pic and place robot consists of Arduino UNO R3 which is controller for the whole assembly as shown in block diagram. The lead-acid battery for storing energy and further it is given to power supply circuitry which is providing +5V for Arduino board and +12V supply for driving DC motors using l293d. Servomotor is used for Seed Sowing and Wi-Fi module CC3000 is connected with Arduino and wirelessly with RF module to controlling the whole assembly.

### VI Result Analysis



**Fig 2: Final Product**

## VII Conclusion

A robotic arm is implemented using arduino to pick and place objects more safely without incurring much damage. The robotic arm used here contains a soft catching gripper which safely handles the object. In the modern era time and man power are major constraints for the completion of a task. By the use of our product the industrial activities and hazardous operations can be done easily and safely in a short span of time. The use of soft catching gripper and low power wireless communication technique like Bluetooth

makes our system more effective when compared to other systems. The proposed system is capable of lifting only small weights; by introducing high torque providing motor large weights can be picked. A wireless camera can also be implemented to track the movement of the vehicle and thus it can be used in defense purposes. The range is also a limitation it can be enhanced by using a wireless communication technology.

## Future Scope

The robot so programmed for pick and place operation can be made versatile and more efficient by providing the feedback and make it operate on its own thought without any human intervention. The robot can be used for automated assembly lines, welding purpose, sorting, etc.

## References

- [1]. Design and fabricate the pneumatic arm for pick and place of cylindrical objects. Author: S. N. Teli, Akshay Bhalerao, Sagar Ingole, Mahesh Jagadale. International Journal of Latest Technology in Engineering, Management & Applied Science (IJLTEMAS) March 2018
- [2]. Pneumatic four axis materials handling robot. Author: Royston CLEATUS Mascarenhas. International Journal of Scientific and Engineering Research October 2019
- [3]. Purposes of work is to manufacture a light weight robot arm with a low cost budget. Author: S.C.Gutierrez, R.Zotovic, M.D.Navarra, M.D.Meseguer. Manufacturing Engineering Society International Conference 2017, MESIC 2017, 28-30 June 2017, Vigo (Pontevedra), Spain.
- [4]. Design and implement a four DOF pick and place robotic arm. Author: Ravikumar Mourya, Amit Shelke, Saurabh Satpute, Sushant Kakade, Monoj Botre. International Journal of Recent Research in Civil and Mechanical Engineering (IJRRCME) January 2015
- [5]. Design and Fabrication of Multipurpose Sowing Machine. Author: V.M. Martin Vimal, A. Madesh, S.Karthick, A.Kannan. International Journal of Scientific Engineerings and Applied Science (IJSEAS) - Volume-1, Issue-5, August 2018
- [6]. Design and Development of Template Row Planter. Author: Adisa A F, Braide F. G. Transnational Journal of Science and Technology .September 23 2019.
- [7]. CORTEX: A 3DOF Robotic Arm Controller Software. Author: Nazib Abrar, Raihanul Haque Rahi. International Journal of Emerging Trends & Technology in Computer Science August 15 2022
- [8]. A bluetooths controlled robotics arm with trainable feature. Author: Aditi Baural, Dr. Md. Tazul Islam, Md. Aidid Alam, Islam, International Conference on Mechanical Engineerings and Renewable Energy December 2021
- [9]. Implementation of smart phones environment. Author: Sungwookmoon, youngjinkim, hojunmyeong, changsookim, namjucha, and dong hwankim 2019 8th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)
- [10]. Integrated design of multi-robot system for pick and- place tasks. Authors: YanjiangHuang Ryosuke Chiba. IEEE International Conference on Robotics and Biomimetics (ROBIO) 2018
- [11]. SGS Thomson Microelectronics L293D - L293DD [Datasheet] push-pull four channel drivers with diode. June 1996.
- [12]. Takashi Yoshimi, Naoyuki Iwata, Makoto Mizukawa and Yoshinobu Ando, Member, IEEE, "Picking up Operation of Thin Objects by Robot Arm with Two-Fingered Parallel Soft Gripper", Proceedings of the 2012 IEEE International Workshop on Advanced Robotics and its Social Impacts, Technics Universität München, Munich, Germany, May 21- 23, 20