Six Wheel Drive Pick and Place Robot using Arduino

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ABSTRACT - *By the yesteryears experiences and seeing the future scopes, there are many domains and areas where robotic manipulators are finding their scopes for deployment, thus achieving required precision. Frequent picking and placing action is a repetitive action where picking and placing robotic vehicles can be used, in manufacturing and many other industries. Along with lot of industrial application robotic vehicles also find their applications in many other domains like safety and surveillance in difficult terrain surfaces where human personal intervention is difficult, but process has to be operated in controlled manner. Our project primarily focuses on mounting and implementation of pick and place robot on six wheeled drive chassis for making it compatible for both Industrial and Non Industrial tasks. The robotic arm implemented has six degree of freedom. As a modular design, changes can be made in robotic arm and end gripper as per required applications. Our robotic vehicle also consist of storage area on six wheeled drive chassis for picking and placing objects in a bulk, thus saving time in operation.*

Keywords: - **Six wheeled drive chassis, Picking and placing Robotic vehicle, Modular design, End gripper, Storage area, Six degree of freedom.**

1. INTRODUCTION

In last few years repetitive human operation are tried to automate for increasing efficiency and precision of those processes, as robots can be used for monotonous tasks, there is lot of scope for deployment of robots in many industries. The term robotics is industrially understood as subject involving designing and use of robotic manipulators for their industrial tasks. Along with industrial monotonous work, robots can also be used in different situations for specific purposes like in operations in hazardous situations and also for surveillance purposes. Some of the application of robots is spray painting, different types of welding, packaging and material handling. End effectors can be changed according to the applications thus making robots widely approved option.

Mostly pick and place robots are stationary in industries, our basic idea is to mount a robotic arm having 6 degree of freedom on 6 wheel drive chassis for increasing its application. In this highly competitive and developing society, time and man power are critical factors for completion of tasks in large scales. Robots are playing important role to save efforts and time of humans in monotonous tasks, and also improving quality of the end result because of high precision and accuracy in their actions.

The robotic pick and place manipulator moves as it is mounted on vehicle chassis, to the initial location where it has to pick the desired object and then reaches to the final position where object needs to be placed , this complete task is carried out through human controlled based system. Due to presence of storage tank, multiple objects can be picked and placed at a time, thus again saving some valuable time by doing the action in bulk.

2. LITERATURE REVIEW

John Iovine's book PIC ROBOTICS [1] this book consists of many different aspects for designing a robot. It consists of various types of arm design, controlling techniques, vehicle design. Through this book we got our basic idea how to do design components for our pick and place robotic manipulator and also how to assemble them .Arduino cookbook, in this book various methods and their details regarding interfacing different hardware components in the project, like different types of motors like DC and Servos and transmitter and Receiver is been discussed [3]. Also studying through research papers from "International journal of advanced research in computer science" titling "All terrain robotic vehicle with robotic arm for dangerous object disposal" [2] we understood many other applications of robotic arm. The other references listed in references sections discusses similar concepts in their respective fields such as robots used for surveillance purposes, pick and place robot controlled through using android etc. For designing the six wheel drive chassis we got help from various websites in various aspects like material selection etc.

Following is a table of some reviewed papers which we used for references, respective work done by them is specified there.

Sr. No	Paper Title	First Author	Year	Work Done
1	Design & Analysis of a remote controlled Pick and Place Robotic Vehicle	B.O.Omijeh	2014	A prototype of Four wheeled robotic chassis was made along with robotic manipulator with 5 degree of freedom.
2	All Terrain Robotic Vehicle with Robotic Arm For Dangerous object Disposal.	Vidyashree.H	2018	A robotic vehicle along with robotic arm was built,for dangerous object disposal.It had roger bogie suspension.
3	Pick &Place robotic Arm Using Arduino.	Harish .K.	2017	A robotic arm having two degree of freedom was mounted on robotic vehicle chassis.For picking and placing application.

3. PROBLEM DEFINITION

1. Navigation:

The complexity of navigation in some autonomous and line following robots is increased because of some uncertainties as follows.

- Presence of some obstacles in defined path.
- Lack of complete knowledge about alternate ways to be taken to complete the task, during presence of obstacle in defined path.

2. Exploration of Robotic arm.

- Robotic manipulators are restricted to manufacturing floor. And they are constrained at one place in the industry.

3. Limitation of 2 wheel drive:

- Finds problem during rough terrain maneuver. And if powered wheels are stuck there is no extra pair of powering wheels.

4. Human being safety in dangerous situation:

- There are many dangerous situations where human life is at danger while doing those tasks like bomb diffusing, Military surveillance, dangerous object disposal.etc
- There are also many tasks of lifting heavy objects in industry which might causes heavy injuries to the workers.

5. Absence of storage capacity in "Pick and place robotic vehicle".

- Due to absence of storage capacity the robotic vehicle picks and places singular objects at a time and cannot do the action of pick and place in bulk.

4. OBJECTIVES

The main objectives of this project are

1. To control navigation and exploration of robotic pick and place robot using Arduino.
2. To mount robotic arm with 6 degree of freedom on 6 wheel drive chassis to increase its industrial as well as outside industrial applications.
3. To design a robot with very good off-road capabilities by designing six wheel drive chassis.
4. To design a robot that can be used in many hazardous situations.
5. To design a robot having storage capacity for picked objects to perform work in bulk.
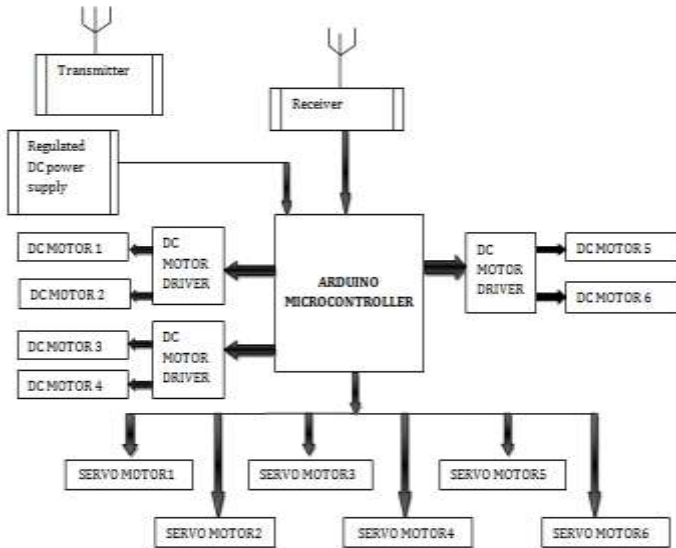
6. WORKING

FIG 1: BLOCK DIAGRAM OF OUR PROJECT.

The block diagram of our project is shown in fig1 .It consist of Arduino UNO Atmega 328 microcontroller, six Direct current motors(DC), six servo motors, DC motor driver (L298), receiver(Node mcu) , and dc power supply.

Six wheel drive pick and place robot consists of robotic manipulator with 6 degree of freedom mounted on all terrain vehicle chassis. This vehicle chassis can maneuver through any surface irrespective of its nature of terrain, as it has six powered wheels. These six wheels can be operated in controlled manner by the virtue of six DC motors. And the robotic manipulators different actions can be achieved through six servos attached at different positions on the robotic manipulator. At the end of manipulator, there is a gripper attached which opens and closes its claws to pick and place an object on its desired position. Servo motor 1 is 360(MG 996R) degree motor which moves the arm in 360 degree, this motor is attached at the base of robotic manipulator .Servo 2, servo 3, servo 4 are 180(MG 995R) degree motors, these motors are placed at different joints on robotic manipulator. Servo 5, servo 6 are 360, 180 motors respectively, through these motors different motions of gripper are achieved.The controlling signal is given through a Smartphone by virtue of android compatible app. This controlling signal is interfaced with microcontroller by a RF receiver module. This message is firstly decoded in microcontroller and appropriate signal is send to motors (Servo,DC).

6. DESIGNED CONCEPT
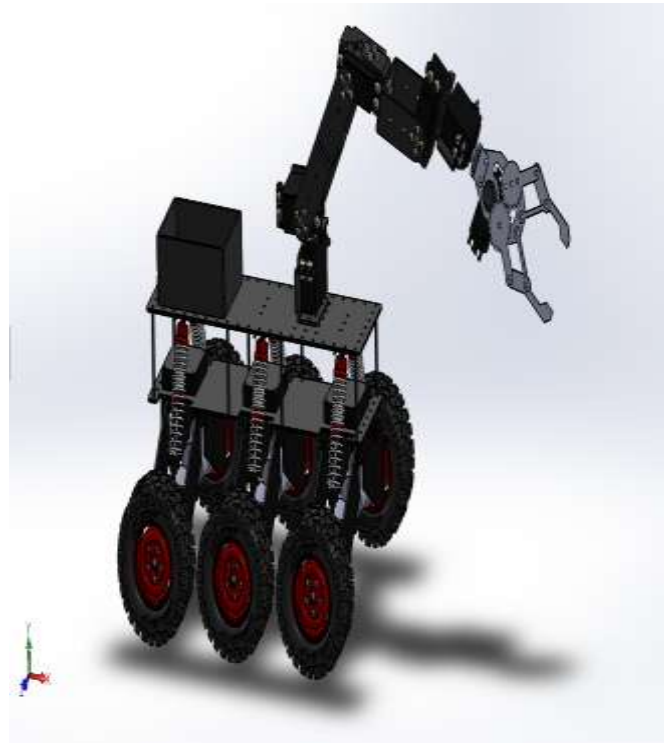
7. CONCLUSION

Above shown designed concept is been implemented using Arduino UNO Atmega 328. Thus we found that our project has the ability to reach at the location from where object needs to be picked or placed, by the virtue of six wheel drive chassis and six DC motors. Thereafter according to the motion of servos the robotic manipulator lifts and locates the required object. Thus it is an appropriate integration of locomotion and automation.

8. FUTURE SCOPE

1) Furthermore advancements can be done by adding a feedback system and making it work independently without any human interventions.
2) Different types of sensors can be added like obstacle sensors, metal detector etc.

9. REFERENCES

[1] John Iovine's book "PIC Robotics"
[2] "INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN COMPUTER SCIENCE" "All terrain

robotic vehicle with robotic arm for dangerous object disposal" Vidyashree .H,Chaithra K.B, Umesh S, Nagamayuri B.S. ISSN NO. 0976-5697.Sept-Oct 2018, volume 9, No.5

[3] Arduino cook book.

[4] "INTERNATIONAL JOURNAL of Engineering Research and Development." Design analysis of a remote controlled "Pick and Place" robotic vehicle. B.O.Omijeh, R.Uhunmwangho, M.Ehikhamenle, e-ISSN: 2278-067X, p-ISSN: 2278-800X.

[5] Journal of Field Robotics "NIMBRO EXPLORER: SEMI AUTONOMOUS EXPLORATION & MOBILE MANIPULATOR IN ROUGH TERRAIN."
Jorge Stucker, Max .S, Markschadler, Angelika .T.K, Sven. Behnke, 2016.

[6] http//:www.robotics.org.

[7] "Pick And Place Robotic Arm Using Arduino." Harish .K, Megha D, Shuklambari.M, Amit K, Chaitanya K Jambotkar.
"International Journal Of science, Engineering and Technology Research", Volume 6, Issue 12, December 2017, ISSN: 2278-7798.