

# Mobile Application Controlled Three Dimensional Robot & Automation

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**Abstract**— Mobile Robots & automation are used to pick and place objects with artificial intelligence. This is used to reduce man power and perform the task accurately and rapidly. This is also helpful in hazardous and high temperature area where human being can not work. [1]. Pick and place Robot is the most effective technology in industrial applications where it is specially designed to be used in manufacturing industries for pick and place functions. This will reduce the human efforts in industrial operations in case of lifting the objects. The pick and place robot consists of a robotic vehicle and robotic arm placed on it, with a soft catching grip to grab the objects with it [3]. The robotic movements and pick and place functionality everything can be controlled by the Mobile application. This pick and place function is most useful in the industries in abnormal conditions and unusual places where a human being cannot enter such as in high temperature and narrow areas.

The micro controller used in it receives the commands from the mobile phone and controls the DC motor connected to the robotic wheels and as well pick and place arm which is rotate in three dimensional [4].

**Keywords**—Hybrid Gripper Latest Technology; six to twelve degree of freedom; mobile app automation; Liquid handing technology; Automotive Guided Vehicle; modern software techniques.

## I. INTRODUCTION

Three dimensional Robot consists with hybrid arm with 6-axis degree of freedom and each axis has 360 degree movement. Hybrid ARM consists with robotic mechanical body, servo and DC motors, hybrid ARM gripper. It has measuring device attached to the gripper to measure the movement of ARM gripper in degrees. Due to this advance features it has much attention for Robotic and automation research. It consists with 6 motors and 6 relays to control and to follow the commands given by mobile application. Hybrid ARM gripper is mixture of parallel and angular ARM gripper. Hybrid gripper grab the object like human fingers. Hybrid gripper can rotate up to 180 degree. Automated guided vehicle type mobile application controlled robots are used in medical and chemical industry. Embedded C language is used to program the robot and one memory device is used to control and store the command given by mobile application. Pneumatic ARM and metallic magnetic gripper is used for carrying mechanical work. The output from transducers and object sensors may be too small, too noisy so artificial intelligence is given to the gripper and ARM. Self guided vehicle is used instead of automated guided vehicle. Self guided vehicle apply the action or

motion to mechanical processes through actuators and without any manual command. To lift cylindrical and spherical object torque is measured by sensors and then pick place operation follow. Linear actuators such as disc drivers, valves, solenoids are used in mobile application automation. Spherical robot works on the polar coordinates.

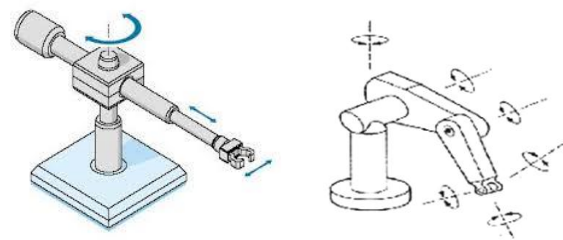


Figure 1 Hybrid Robotic ARM & Gripper

## II. SYSTEM OVERVIEW OF MOBILE APP CONTROL ROBOT

Motor control unit use full processor to control and observe motor speed. Motor driver compare the actual speed and standard speed of motor by using variable frequency drive. It gives a feedback to achieve zero errors in industrial automation. Mobile application Robot is differ from PLC and remote control Robot. It avoids more complexity and programming for each joint. Mobile application control Robot uses part programming which consists with list of co-ordinates values along the X, Y and Z directions of the entire tool path to finish the component. It can stop or run the programs immediately by using on-off controller. This electro-mechanical design can be used in CNC machine applications. Computer aided part programming is used to follow and control commands given by mobile application for automation. The range is decided according to various manufacturing processes and machines and knowledge of selection of picking and placing parameters. Automated guided vehicle (AGV) and latest version self guided vehicle (SGV) are used as robotic vehicle carried out this ARM with artificial intelligence.

### Hybrid ARM Gripper

It is combination of cylindrical and angular ARM Gripper. Instead of magnetic ARM gripper Hybrid gripper is used. With the help of this ARM gripper all type of materials (metallic and non-metallic) pick and place. Solid and liquid container easily handled. It is different from angular and

parallel ARM Gripper. We can adjust tilt angle with the help of Mobile Application system.

Cylindrical & Spherical objects can move from one place to other. Web-Cam is used to observe the functions. Highly Automatic object sensors are used to Run & Stop the process.

#### Techniques and Algorithms

1. Euler language algorithm and genetic algorithm are used to pick and place the objects. genetic algorithm is a latest & suitable techniques for handling liquid material carrying container.

2. Angle of tilt is adjusted as per liquid or solid quantity. Operations are observed on TV or PC screen with the help of Web-Cam.

3. Hybrid ARM gripper:- It is combination of cylindrical and angular ARM gripper. Instead of magnetic ARM gripper hybrid gripper is used. With the help of this ARM gripper all type of materials (Metallic and non-metallic) pick and place.

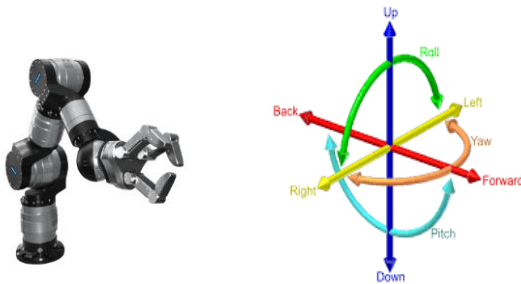


Figure 2 Hybrid ARM . Figure 3 Degree of Freedom.

4. Degree of Freedom:- It has six to twelve axis rotation. All joints have 360 degree rotation. Self Guided Vehicle is also have rotation of 360 degree.

5. Android developer like Mobi-one is used to develop mobile application to control this process.

6. Three dimensional Robotic ARM used with hybrid gripper. It is connected to Robot vehicle with clips and magnets.

Instead of auto or remote control self program control is provided. So avoidance of obstacle is possible.(SGV Algorithm and program).

7. An embedded memory device is used to store and utilize commands.

#### III. EQUATIONS

1. To empty vessel pot of liquid ARM Gripper or fingers should be rotated in 180 degrees. (consider capacity of vessel is of One Liter)

Vessel is used for this is in conical shape.

To empty 1Lt = 180 Degree angle.

To empty 1/2Lt = 90 Degree angle.

In this way

Approximately proportion is,

One degree tilt angle of gripper = 6 ml liquid poured.

2. Mobile application ARM has three main axes of control are linear and are at right angles to each other. Angle between two

sliding joints is 90 degree correspond to move the wrist up-down, back-forth. Points  $x, y, z$  are consists with a triangle of angle  $\angle xyz = 90$ .

$$\text{Distance } xz = (xy) + (yz)$$

Above formula is useful for ARM gripper to grab the objects and display pick and place operation,(3-D printing).

3. ARM gripper has sliding joints angle of 90 degrees so to pick the object best angle between two fingers is 90 degree and to place 0 degree.

$\cos(\text{angle between two joints}) = 0$  for picking the object.

$\cos(\text{angle between two joints}) = 1$  for place the object.

#### IV. 3-DIMENSIONAL MECHANICAL STRUCTURE

The main objectives of the project to design and construct a robotic ARM and to be able to control the robotic movements and pick-place operation. The first object is very straight forward it requires the modern designing capacities. The complete robotic arm was first designed and assembled in designing software. We have used wildfire re-engineer to design 3D model of the robot. The model is designed as per the actual dimensions of the robot. After designing and assembling the robot in probe, drawings are exported. Our objective is to construct physical parts of the robot and them assemble them as we assembled in the probe. The second objective requires knowledge of part or embedded programming through which commands are given. Mobile technology of application developer which design an application to perform the task. PID type controllers are used in industrial functions to control speed of motors, pick and place objects. Transducer switches are used to control movements of ARM while object sensors are used for self guided vehicle(SGV).



Figure 4 Sensors and Actuators.

Mobile controlled Robots are used in automobile industry with chain automation. It has 3 to 6 axis of degree of freedom. It rotates as per command in 3-D directions along X,Y and Z directions.

Degree of freedom is a term used to describe a robot's freedom of motion in 3 dimensional spaces specifically the ability to move forward and backward, up and down, left and right. For each DOF a joint is required. Degrees of freedom defined modes in which a mechanical device or system can move. The number of degrees of freedom is equal to the total

number of independent displacements or aspects of motion. A machine may operate in two or three dimensions but have more than three degrees of freedom. The term is widely used to define the motion capabilities of robots. Consider a robot arm built to work like a human arm. Shoulder(Elbow joint) motion can take place as pitch (up and down) or yaw (left and right). Elbow motion can occur only as pitch. Wrist motion can occur as pitch or yaw. Rotation (roll) may also be possible for wrist and shoulder. Such a robot arm has five to seven degrees of freedom.

If a complex robot has two arms, the total number of degrees of freedom is doubled. In an android, additional degrees of freedom exist in the end effector, the legs and the head. Fully functional androids and multi task mobile robots can have more than 20 degrees of freedom. An intelligent android designed for the consumer market . Our primary objective is to make the Robotic arm, having two servo motors and a DC motor to interface with the development of a micro-controller Robotic Arm. It provides more interfaces to the outside world and has larger memory to store many programs. More than 20 degree of freedom is used in automatic parking barrier system. End effector is the device at the end of a robotic arm designed to interact with the environment.

End effectors originates from robotic manipulators (robotic arm) It is the last link of the robot. It is a last link of the robot. It is similar to human hand with or without finger. It incorporates various sensors, transducers and follows all commands of mobile application. Reflective and transmissive sensors are used in chemical and high temperature areas. In hazardous and narrow area 12- axes degree of freedom Robot with capacitive and inductive sensors are used. 20-axes degree of freedom is used for specific robot which designed in consider of applications



Figure 5-Mobile Robot using DTMF Techniques.

## V. RESULTS

Component	Mechanism	DOF	Range
Hybrid ARM	VFD and Motor drives are used to control and monitor.	12-axes	Up to 5m & can be extended.
Hybrid gripper	COS(angle between fingers)	6-axes	Max=1 Min=0
SGV	3-D sensor, actuators & transducers with an auto artificial intelligence to avoid accidents in automation.	12-axes	200 meters and can be extended as per industrial application.
End effectors	Relay and drive control	6-axes	Spherical distance with radius 0.5 meter.
Actuators and sensors.	Measurement of angles, speed, rotation and distance .	-----	15 to 30 cm & can be extended.

Hybrid ARM and gripper can grab, pick and place the vessel of one liter & tilt degree by degree to pour liquid in milliliters. It pour the liquid with the help of command from mobile application and part programming of gripper and end effector. In cement industry all materials are collected and mixed properly by robot arm and gripper automatically with self intelligence. Hybrid ARM is ready to move in 360 degree with motor control of self guided vehicle. In medical and chemical industry this type of Hybrid ARM and gripper with self guided vehicle are useful.

Hybrid Gripper automatically identify the proportion and decide the angle of gripper to tilt the liquid vessel to pour required amount liquid . In chain automation pick and place robot works more superior than electronic hoist. In medical labs it is used as Robot vehicle and worked to carry various equipment.

## VI. CONCLUSION

In this presentation, the pick and place robot with android application control will be a smart robotic implementation in the field of robotics. It will be very useful in industrial purposes. It also consists with three dimensional moving arm robot. The android application interface added a smart finish to the pick and place robot. This robot is also an economic one where the featured phones in people hands are replacing by smart phones everywhere this day.

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