

Multipurpose Robot

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Abstract - Since the invention of robots, this field of science has fascinated many people. Robots were initially designed to do primitive and repetitive jobs on behalf of humans. But over time, the constantly evolving technology has successively blurred the lines between fantasies and reality. Today, robots coexist with us, a program with capabilities to exceed human excellence even designed in appearance similar to humans. They can intercept environmental stimuli and generate an accurate response with precision. This paper presents the idea of a multipurpose robot that can simultaneously perform many useful tasks. Arduino Uno interface is used to perform and implement algorithms to control the speed of the motors, steering the robot to travel along the line smoothly. This project aims to implement the algorithm and control the movement of the robot by proper tuning of the control parameters and thus achieve better performance.

Key Words: Arduino UNO, Control movement, Algorithm, Precession.

1. INTRODUCTION

The project mainly focuses on reducing the workload for all kinds of people. Nowadays, many industries use robots instead of a human. This is because robots have accuracy in their work also they complete their work in less time. Robots are also used in risky work. Anyone can use this project for reducing their load. The project is feasible to handle with simple voice commands leading to high accessibility to all age groups. The project has a wide range of functionality that can be used anytime with regular intervals of charging its batteries.

The robot is pre-programmed to perform specific tasks and will lead to performing multiple tasks. The paper focuses on the all in one concept in a single robot. The robot comprises the Bluetooth model HC-05 which results in easy communication with the robot. The ultrasonic sensors ensure that there is no

obstacle in front of the robot. The servo motor is in alignment with the ultrasonic sensors to rotate the sensors at 90 degrees. The telescopic rod gives it the freedom to change the height of the upper deck which carries the goods. The vacuum cleaner ensures that there is no dust left behind when switched on for cleaning. The robot can be even equipped with wipers to wipe the floor after the vacuum cleaner cleans the floor or surface.

The wheels with high traction help to make a firm grip on the floor or surface.

The project is small and compact leading to storage of space and it can be even installed with other accessories as per the user requirement. This can be used at offices, homes and at commercial spaces to save time, money and avoid repetitive work.

2. LITERATURE REVIEW

Robots play a substantial role in industries, homes, and commercial spaces too. They reduce the workload resulting in a high amount of production of certain necessary goods. The robots also decide the business competitiveness which can make a drastic change in the manufacturing of the product. The application of the robot is of wide range resulting in multifunction. The scientists, researchers and engineers are mainly developing technology that is more enhanced and that can reduce the human workload. The enhancement in the technology which goes hand in hand with the robots leads to highly functional robots which can do highly accurate work and with more precision than humans [1]. The paper focuses on the wireless communication systems using the Bluetooth module HC-05. In general, the GSM module can also be used for communication purposes instead of the Bluetooth HC-05 for a better communication process. The wireless robots can be more developed and increased as per the technology

advancement. The operator can control the robot with the Mobile phone using an application for the moment of the robot. The control of the robot has main three phases those are the Perception, Processing and Action [2]. The Robot can be used in general activities hence it is multipurpose in various ways but the accessories should be according to the applications. The General-purpose robots can be used and perform various activities as per the program and can reduce a lot of work. They can navigate their path since they are programmed in that specific way resulting in the movement as per the path decided by the robot or preprogrammed path. They can even handle their re-charging issues with solar powers or can manage their power management with the sensors. The interface of the robot with the doors, elevators and can perform their basic tasks. The linking between the sensors and the robot is done by the microcontrollers which act as the brain of the robot [3]. The main Humanoid designs of the robots are the latest technology developed with loads of sensors, actuators and other accessories which are required for the main motion of the robot with controlling the stability leads to higher cost of the robot. Human interaction is the main point where robots are developed nowadays. These sensors and other accessories help the robot to sense the environment in which it is presently acquiring the human interface. In this system, advance monitoring of the home can be done. They monitor the moment of the robot and work according to it. The robots can be configured a lot according to the users and will result in a high end of accessibility towards the features and the overall performance of the robot. The software development of the programs for the robots leads to the higher precision of the robot resulting in more user-friendly configurations [4].

3. METHODOLOGY/EXPERIMENTAL

3.1 Materials/Components

The project is to reduce the workload. The telescopic rod helps to increase the size of the robot. The robot also consists of a vacuum cleaner which

clears all the dust and garbage. The robot is completely voice-controlled leading to higher feasibility. The Arduino is used to load the entire program which will control the movement of the robot in a more accurate manner.

Arduino Uno can detect the surroundings from the input which is received. The input in this project is a variety of sensors and these can affect its surroundings through controlling motors, lights, other actuators, etc. Bluetooth module HC-05 is used for communication purposes. The Bluetooth module can receive and transmits the data from a host system with the help of the host controller interface (HCI). The motor shield driver is used to communicate the Arduino with all the motors. Motor drivers act as an interface between the motors and the control circuits. The ultrasonic sensor is also used to sense the surrounding. Ultrasonic Sensor (HC-SR04) offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package from 2 cm to 2 feet's. To detect the obstacle ultrasonic sensor turns right or left according to the user's wish and checks if there is any kind of obstacle, if an obstacle is present the robot doesn't move. The turning of the sensor is possible due to the servo motor. The vacuum cleaner is made with a high RPM motor and a Blade with the wingspan turned inside so that the air is sucked by the blades to ensure that the dust particles get cleaned this is done to reduce the cost. The fan-driven propeller sucks the dust and garbage inside the bottle, the wire mesh is used to separate the garbage from entering the propellers. The telescopic rod is controlled by a double pole double throw switch. The platform can hold weight up to 1.5 kilograms approximately. Motors used are 100rpm so that high torque can be generated. The higher torque results in a higher amount of force to hold up goods. The payload weight can be increased by increasing the torque of the motor so the motors with low RPM can be used which are below 100 RPM.

The Arduino UNO is connected to the Motor Shield Driver by adding extra header pins to the Motor shield driver. The Servo motor is connected to the

servo motor pins of the Motor Shield Driver. The 100 ROM motors are joined in series so that out of 4 connections only 2 connections can be collectively joined to the Motor shield diver. The 5V VCC and the ground pin are connected to the Bluetooth module HC-05 respectively so that the power source can be supplied to the HC-05. The Receiver and the Transmitter pins are connected to the respective pins of the Arduino via the motor shield driver. The extra header pins are added to the motor shield driver so that the receiver and the transmitter pins can be connected to the Arduino via the Motor shield driver. The ultrasonic sensor is connected to the Arduino Uno via servo motors since the servo motors control the direction of the sensors while turning left or right.

The low RPM helps to carry more loads which results in more the robot is made efficient and can carry a load as per the user. The wheels of the robot can be also used at low RPM resulting to carry a higher weight. There is a high amount of weight at the base of the robot since the load on the base can be changed as per the user requirement hence to tackle this amount of load the motors should be of low RPM and high torque. The motors with metal gears are required for the base. The high RPM small motors have gears made up of plastic resulting in less strength. Thus the metal gears result in high protection against the wear and tear of the motors. The wheels can be reinstalled and changed easily as per the user convenience. The robot specifications can be changed as per the need of the user. The robot can change its direction after the servo motor and the ultrasonic sensor check whether any obstacle is present or not. The accurate angle of the servo motors helps the robot to cover the majority of the area while turning right or left. The top base can be made up of acrylic sheet or high-density cardboard material which will hold the weight of the entire load which will be kept on the top base of the robot. The robot can be recharged using the normal lead-acid adapter and the batteries for the vacuum cleaner and the telescopic rods can be replaced once dead.

Block diagram:

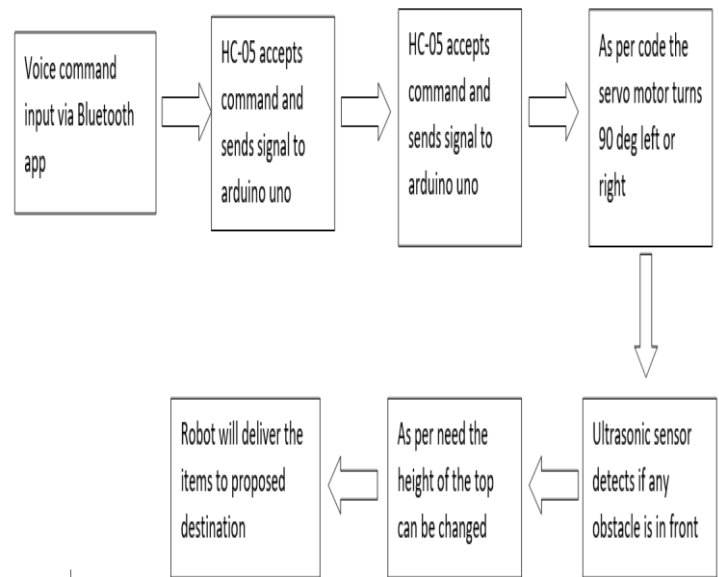


Fig -1: Flowchart for the entire working

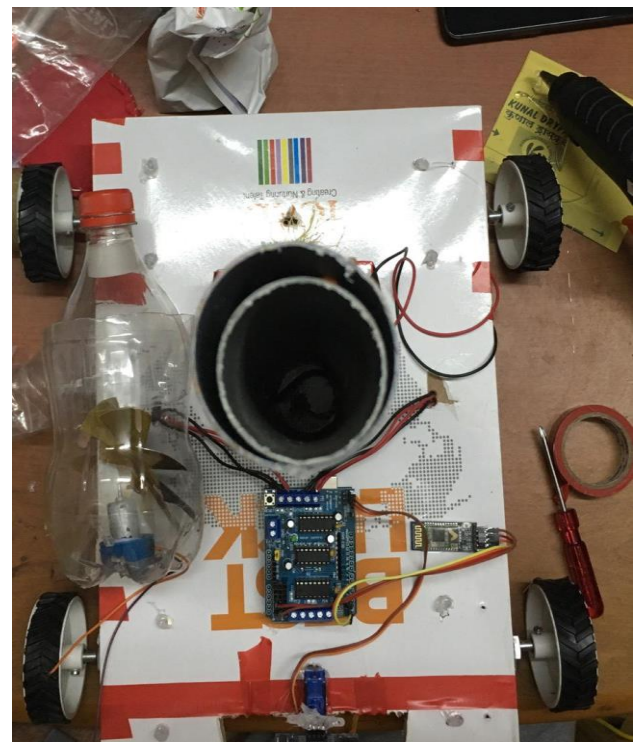


Fig -2: Top view of the Robot

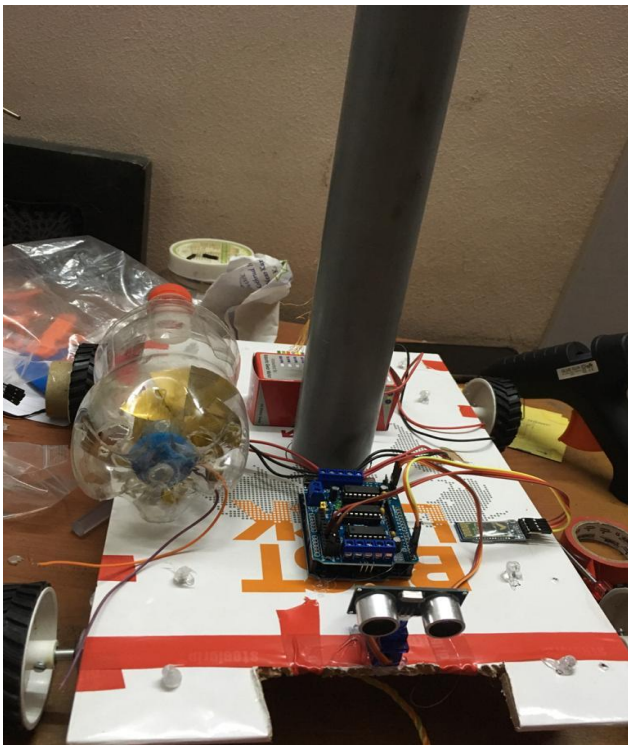


Fig -3: Side view of the Robot



Fig -5: Top view of the Vacuum Cleaner

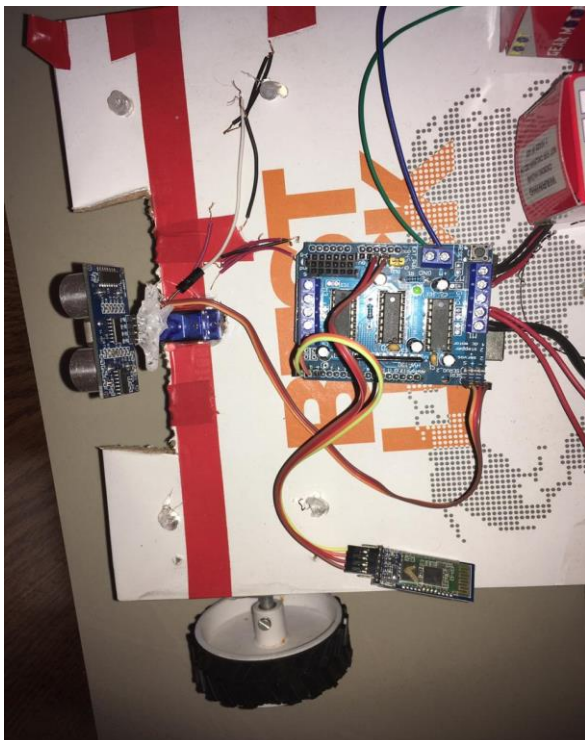


Fig -4: Top view of the Arduino UNO and other sensors

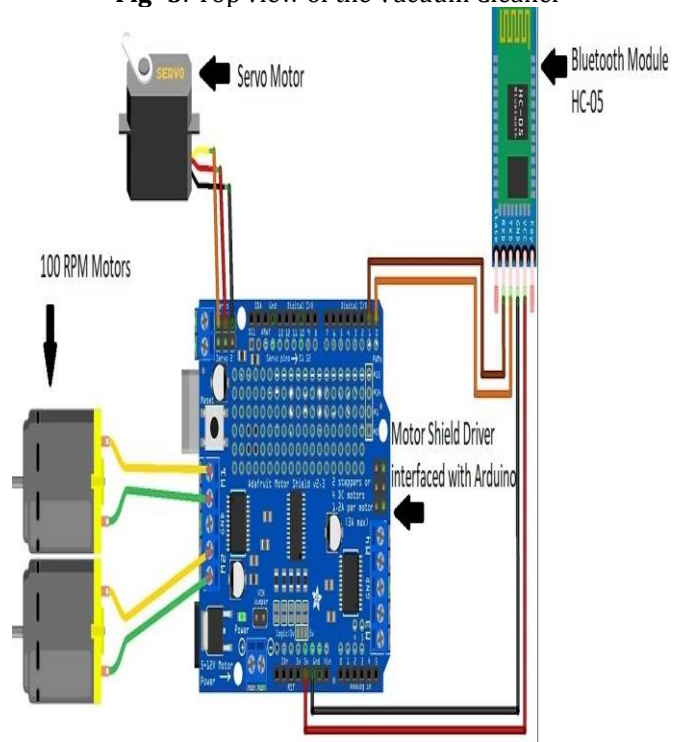


Fig -6: Circuit diagram of the Robot

6. FUTURE SCOPE

The future generation robots can be stronger and can carry more payloads with the lot of trimming of the components using various tools.

The Vehicle can be useful for different fields and in one domain lot of facilities can be attached and detached which can be useful for a lot of assemblies and purposes.

7. ADVANTAGES

The main advantage of the project is that it is multipurpose which makes it much more useful and easy to use.

The voice commands and the Bluetooth module help for a better communication. This will enhance the interaction with the robot and will make it more useful.

8. RESULTS

This robot can perform various tasks from cleaning to transporting things from one place to other. It can carry around 1 to 1.5 kg on the platform. The Arduino is preprogrammed for specific tasks and will work according to the program. The ultrasonic sensors have a range of 4cm to 2 feet's so within that range if any obstacle comes in front of the robot will avoid it and choose another path by itself. The servo motor rotates at 90 degrees in the left and the right directions so that the ultrasonic sensors can check to its right and left side whether any obstacle is present or not. It accepts voice commands so the person can operate it by sitting in one place. It can run for up to 2 to 3 hours on one charge. It is controlled by an Arduino and input is given through a Bluetooth module. The robot having a high capacity of payload hence it will prove a key aspect for the feasibility of the project. The working hour of the robot can be increased by the increment in the batteries. Rechargeable lead-acid batteries are more cost-efficient and useful.

9. CONCLUSIONS

At a time when the people have a lot of work to do like the life today is moving fast they cannot perform all the household work on their own. This is where the robots come in as this project can help to perform various household activities without the person having to move from his place. Also, this

robot is cost-effective and requires very less or no maintenance.

The robot is a very useful and best solution for the current scenario where everyone has less time and is busy with their schedule. This robot can be also used for restaurant purposes which can replace the waiters and waitresses and will reduce the load of the restaurant and will prove financially effective for the owners.

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