

AUTOMATED HOOVER ESCORT WITH BT CONTROLLER (THE BLUEBOT)

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ABSTRACT- This project is aimed to save time in daily cleaning activities for working people and also physically disabled people. The existing vacuum cleaning devices are used to reduce the work force and also saving the time. But, those vacuum cleaners are Heavy to lift, bulky in size, cumbersome machines that often hard to move around the home and also Running electricity bill. Depending on the type of vacuum cleaner (dry vacuum cleaner, wet vacuum cleaner and can perform both operation), it consumes hundreds to thousand watts of electricity. With the help of Arduino microcontroller and the flavours of robotics, we made a robot called Automated Hoover Escort with BT Controller. This robot is used for wet cleaning purpose in both automatic and semi-automatic manner along with the several security functions as the name indicates "ESCORT". The control for the robot is provided by means of the Bluetooth device and an Android mobile. Additionally, PIR sensors are used to detect the human motion at the cleaning surface, while the robot is in idle state without performing the cleaning operation, PIR sensor will detect the human motion and produce the sound act as a security alarm. This robot can suitable for everyone to buy. This is very useful for people with mobility issues.

Keywords: pir sensor-passive infrared sensors, BT-Bluetooth, hoover-cleaning, escort-security

I. INTRODUCTION

Today people are living in a busy environment. They do not have enough time to do their daily work. Robots are the significant example of modern technology. But, still it is believed that robots are high in cost and suitable for high class people. The main objective of this robot is to reduce the cost in order to make feasible to buy by the middle and low class people. Robotic

cleaners have taken major attention in robotics research due to their effectiveness in assisting humans in floor cleaning applications at homes, hotels, restaurants, offices, hospitals, workshops, warehouses and universities etc. Basically, robotic cleaners are distinguished on their cleaning expertise like floor mopping, dry vacuum cleaning etc. Some products are based on simple obstacle avoidance using infrared sensors while some utilize laser mapping technique. Each cleaning and operating mechanism of robotic floor cleaners has its own advantages and disadvantages. The benefits of robots have increased their flexibility with being capable of performing variety of tasks and applications. This robot is designed in such a way to adopt for adding some more functionality. In one of the mode this robot is fully automatic and can make decisions in autonomous manner without any manual instruction by means of various sensors connected to it. In another mode, Human interact is enabled with the robot. Control for the robot is provided by means of the android mobile. For autonomous mode special command is given by the android application. The main objective of this project is to provide a substantial solution to the problem of manufacturing robotic cleaner utilizing local resources while keeping it low costs. Manual work is taken over the robot technology and many of the related robot appliances are being used extensively also.

II. LITERATURE REVIEW

This robotic vacuum cleaner is an autonomous as well as semi-autonomous device. Idea for making this robot has come from the previous researches.

But in order to make it feasible to buy by all kind of people Bluebot is designed with simple logic and components. Some of the available products are discussed below

A. iRobot

In 2002, iRobot launched its first floor vacuum cleaner robot named Roomba. Initially, iRobot decided to manufacture limited number of units but Roomba immediately became a huge consumer sensation. Due to

its increased market demand, a series of following robots have been launched in the market:

1. Roomba
 - Launch Date: 2002
 - Manufacturer: iRobot (American)
 - Type of Use: Dry Vacuum
 - Technology: IR, RF and auto-charging mechanism
 - Price: \$500
2. Scooba
 - Launch Date: 2005
 - Manufacturer: iRobot (American)
 - Type of Use: Wet Washing of Floor
 - Technology: IR with virtual wall accessories
 - Price: \$500
3. Braava
 - Launch Date: 2006
 - Manufacturer: iRobot, KITECH, Sony
 - Type of Use: Floor mopping for hard surfaces/Dry clean
 - Technology: IR with virtual wall accessories for industrial cleaning
 - Price: \$700

B. NEATO Robotics

With the advent of robotic vacuum cleaners, many countries had started manufacturing robotic cleaners. China also started manufacturing these robots with more reliable technology and advanced features.

- Neato XV-11
- Launch Date: 2010
- Manufacturer: Neato-Robots XV series (California)/China
- Type of Use: Vacuum Cleaning
- Technology: Laser range finder technology, SLAM (Simultaneous localization and mapping) and auto-charging
- Price: \$399

C. Dyson

In 2001, Dyson built a robot vacuum known as DC06 which was never released to the market due to its high price. In 2014, Dyson launched a new product named as Dyson 360 Eye which uses a different technology for path finding as compared to products manufactured by NEATO Robotics or iRobot.

1. EYE-360
 - Launch Date: 2016

- Manufacturer: Dyson (UK)
- Type of Use: Vacuum Cleaning
- Technology: It uses a 360 degree panoramic vision camera to monitor its environment in real time and a turbo brush for efficient cleaning along with an auto-charging mechanism (Benchmark in history of cleaning robots)
- Price: \$1000 (approx.)

III.DESIGN METHODOLOGY

While considering the design methodology, it mainly focused on reduction of cost of the robot .They are discussed below:

A.BRUSHING

This robot is dedicated for wet cleaning purpose. So, the mopping brushes are designed in such a way suitable to mop .Two separate mops are connected at front of the robot for mopping

B.COVERAGE AREA

Coverage area for the Bluebot is around 9 meters since the receiver used is HC-05 Bluetooth. It has designed for faster connections between an Android device and an Arduino board, the Bluetooth module can be up and running in minutes.

C.DATA TRANSMISSION

As we said before control for the robot is provided by means of Android mobile .For that purpose, specially designed applications are available at online .Since, it is Bluetooth based device and we prefer Bluetooth serial controller application.

D. AUTONOMOUS OPERATION

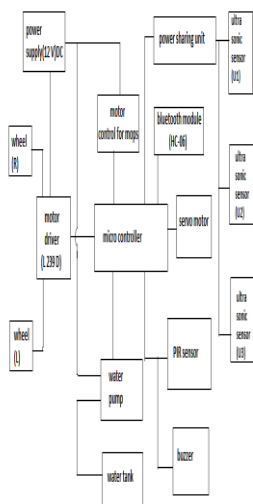
Manual operations are simply done by the signals received by the Bluetooth receiver .For autonomous operation, separate ultra-sonic sensors and PIR sensors are located in front of the robot .ultrasonic sensor detect the obstacle at the path of the robot that prevent the robot being stuck by the obstacles.PIR sensor detect the motion at the cleaning surface and alert the people from walk through the surface .Autonomous mode triggered by send the auto command from mobile.

E .SECURITY FUNCTION

When compared with the other vacuum cleaning robots, Bluebot is something different in the sense of

functioning .PIR sensor is connected along with buzzer it will act as a security alarm .During the working condition in both autonomous and semi-autonomous mode pir sensor find the motion at the cleaning surface and buzzer alert the people about the cleaning process is in progress .But in idle state even the cleaning process is not doing ,it will perform the same function act as a alarm .since it is a initial development of Bluebot motion detection only added as a security feature but we can add some more feature like gas detection, water level indication and so on .

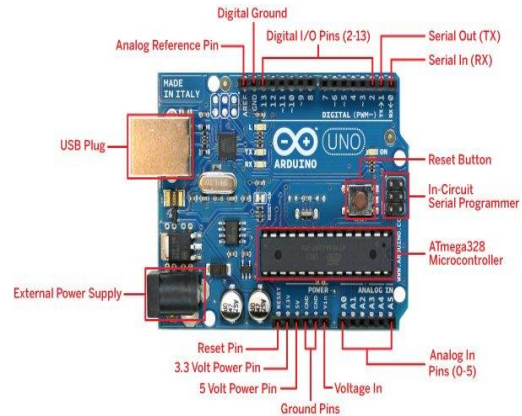
III.BLOCK DIAGRAM



A.MICRO CONTROLLER

Arduino UNO R3 is the Micro controller used for controlling the operation of Bluebot.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button.



It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started .Arduino is open source prototyping platform based on easy to use hardware and software.

B.MOTOR DRIVER

Motor driver is the component used to provide control for the wheels in both clock wise and anti-clock wise direction .Here, L239 D Motor driver is used.

In a single L293D chip there are two h-Bridge circuit inside the IC which can rotate two dc motor independently-bridges is a circuit which allows the voltage to be flown in either direction’s-bridge IC are ideal for driving a DC motor. Due its size it is very much used in robotic application for controlling DC motors.

C.CONTROL FOR MOPS

Mops are the important part of the robot since it is performing the cleaning operation .TIP 31C is the transistor used to provide supply for the mops.

Some transistors can amplify a small current which will then be powerful enough to operate a lamp or other high current devices. These devices are also able to detect a change in voltage and act as a switch. The TIP31 is a common transistor that is inexpensive and easy to use for **multiple** applications. Supply is connected to the collector, control output of micro controller is connected to the base and emitter is connected to ground.

D.WATER PUMP

Water pump is the essential one to supply water to the mops .12 V DC power battery is used

to pick up water from the water tank .The same TIP 31C transistor is used to regulated the power and control operations between the water pump and micro controller.

E.POWER SUPPLY

12V DC battery is used as supply .supply from the battery is distributed to all the components in the circuit deliberately.it is a rechargeable Lead Acid Battery ,since it is rechargeable it consume only less power and cost is also very less.

IV.FLOW GRAPH

A.STOP

Stop command will stop the wheel motion and controls for all sensors are shut down

B.FORWARD

Forward command enables the wheel to rotate in clock wise direction

C.BACKWARD

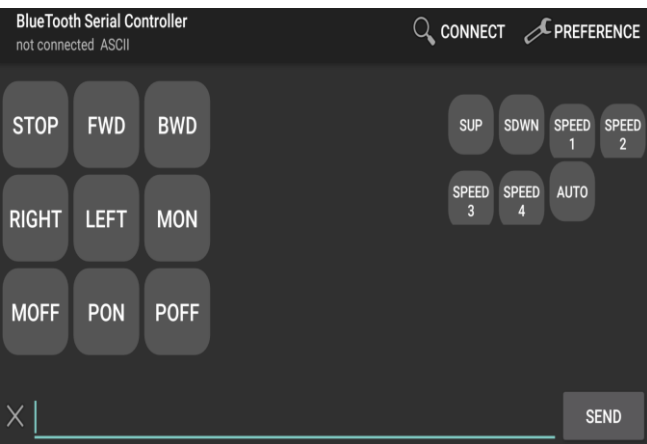
Backward command enables the wheels to rotate in anti-clock wise direction

D.RIGHT

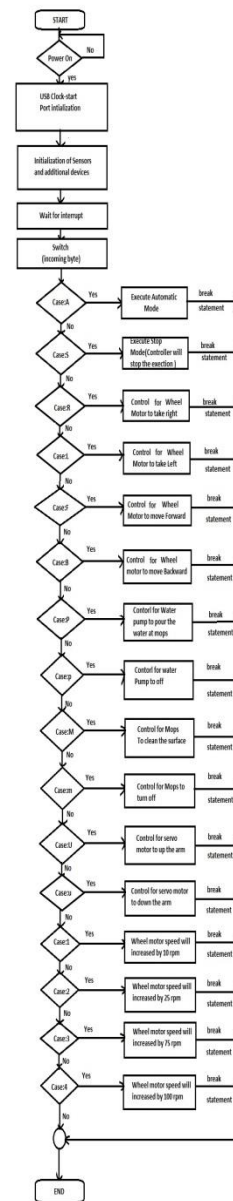
Right command allows to turn the wheel in right side

E.LEFT

Left command allows to turn the wheel in left side



Bluetooth serial controller



The control flow graph of the Bluebot is shown above.

F.MOP ON and MOP OFF

MOPON command allows the mops to ON and MOPOFF command allows the mops to OFF

G.PON and POFF

PON command allows the water pump to pick up the water from the water tank and POFF command stop the water supply to the mops

H.UP and Down

Separate servo is connected at the back of the robot for clean sweep .the motion of the servo is provided as up and down

I.SPEED CONTROL

Speed control for the wheel is provided as speed 1, speed 2, and speed3 and speed 4 .It increase and decrease the speed of the wheel gradually .By which rpm of the motor is varied

H.AUTO

This is the special command enable the motor to function in autonomous manner, while the auto mode is triggered, ultra sonic sensor take control of the wheel motion

V.FUNCTION

The Bluebot is a smartphone controlled robot that cleans the house's floor. The rotating mops on the front of the robot along with a foam roller (used to paint walls, not here) at the back can do the job perfectly. There's also a water pump and water reservoir which can be switched on when required to throw water on the floor and make the mops moist for a proper clean. The foam roller is movable, which means you can lift it when not in use. We've also added speed controls for the driver motors. The project uses Bluetooth communication via an HC-06 Bluetooth module to send the commands to the most commonly used microcontroller- Arduino UNO. The robot is powered on a 12V lead acid battery, the ideal voltage for all motors used here. The driver motor pair are 100rpm ones while for the mops We've used 75rpm plastic ones. This consists of a 12V water pump which carries the water from the reservoir and spills it near the mops on the floor. The pump can be switched on/off via the smartphone just like other controls. The purpose of roller here is to stick small dust particles to itself. It will not be needed every time the robot is moving so we decided to make a simple mechanism which can lift it up or down via a servo motor. For the mop geared motors and the water pump to be controlled via arduino, there has to be an external circuit as both of them need 12V to run but arduino can only provide a 5V output. The two mop motors have to be connected in parallel such that the left one runs anticlockwise and the right one turns clockwise when seen from the front. Ultra sonic sensors are activated when the auto mode operation is triggered .PIR sensor will work even when the stop command is send. STOP command will not interrupt with PIR sensor operation and MOPS rotation .it will only stop the wheel motion .we can disable the

auto mode operation by using the stop command .While the robot work in autonomous mode ultra-sonic sensor only take care of wheel motor functioning and at semi-autonomous mode each command will send to the robot separately .

VI.CONCLUSION

This setup of hardware with a combination of software gives better accuracy and reduces the work load. Man power is minimized. Most of the component used at Bluebot is simple and less in cost .At the same time, both autonomous and semi-autonomous mode operation of the robot made this robot more functional. Since the local resources are utilized very efficiently in this robot ,it can be offer able everyone to buy .

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