Anti-Bug Robot using Spray Mechanism and Obstacle evading Expertise

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Abstract:

In this research paper, anti-bug wheeled robotics is introduced with the help of spray shower having advanced obstacle avoiding technology. Movement of robot is controlled with the help of gear motors. Gear motors allow it to move in the forward direction and spray anti-bug liquid in anticipated region over a wide range through shower. It is capable of spraying the anti-bug liquid contained in a tank, on the ground surface as well as on the walls. While moving in the forward direction, if it detects any hurdle in its path, sensors sense it and take appropriate action against it. Firstly, it moves a step back and then it changes its direction according to the hurdle's direction.

KEYWORDS—anti-bug spray, wheeled robot, Gear motors, automatic spraying machine.

I Introduction

Today, biosphere robotics is an amiable technology. It is also rapidly rising and stimulating field. Over a long time, several practices have been developed for its up gradation. Robots are making substantial influence on modern life in several areas. These areas include manufacturing industry, transport sector, healthcare for disables, astronomy and ocean exploration [1].The fundamental requirement for every autonomous mobile robot is the capability to avoid obstacle that allows mobile robots to move with no collision in unmodified environments [2]. DATMO (Detection and Tracking of Moving Objects) problem has been widely under study for numerous decades [3]. Since 1960s, the latest trend for automation has been to use industrial robot extensively along with computer aided design (CAD) systems, and computer aided manufacturing (CAM) systems [4]. Although, the advancement in the robotics market has slowed down in comparison with the early 1980's [5].

The proposed paper is related to autonomous robotics. It is about an anti-bug wheeled robot having capability to spray the insect assassin liquid improper manners and also covers very extensive region. It is especially designed for dengue spray because dengue virus is becoming a more serious issue in the world especially in Pakistan. It contains a large liquid tank to store excessive quantity of the liquid. Capacity of the tank is about 20 liters so that the process is continued for a long period of time. A shower is mounted over the tank to spray the liquid. A pump is used for pumping the liquid from tank to the shower with a reasonable pressure. Pump is placed into the tank which is connected to the shower with the help of a plastic pipe. It sprays over the ground surface as well as on walls of any construction and covers the proper altitude of the walls.

Robot carries sufficient intelligence mechanism as it changes its direction on its own. To develop a robot capable of passing through corridors and diverse terrain, the volume and weight of robot must be minimized [6]. Photocells and phototransistors are predominantly responsive in the infrared region, hence they are ideal allies for infrared LED and laser diode sources [7]. IR transmitter transmits IR signal uninterruptedly. When robot faces the obstacle, reflected IR light is sensed by the IR receiver diode. Robot has two IR sensors, one on the left and other on the right side. When it detects any obstacle in its way, sensors sense the obstacle and send the signal to microcontroller which takes right action. When robot looks any obstacle, primarily it moves a step back then action is performed by microcontroller according to the direction of obstacle by following way

- When hurdle is in front of robot, both sensors sense the reflected signal so that left motor moves in the forward direction and right motor moves in the reverse direction and as a result robot will move to the right.
- When obstacle is on the right side, right sensor sense the reflected signal so that right motor moves in the forward direction and left motor moves in the reverse direction so robot will move to the left.
- If barrier is on the left side, left sensor sense the reflected signal so that left motor moves in the forward direction and right motor moves in the reverse direction and robot will again move to the left.

Block Diagram

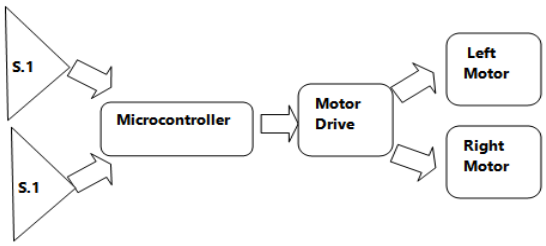

Figure 1: Block Diagram of Robot

There are two types of design for Robot:

- Circuit Design
- Mechanical Design

II. Circuit Design

This comprises of three main parts

A. Spray Part

B. Sensor Part

C. Governor Board

A. SPRAY PART

This part controls spray mechanism having different sub-part like liquid tank, shower, pump.

1) Liquid Tank: It is a large liquid tank to store excessive quantity of the liquid. Capacity of the tank is about 20 litters so that the process remains continue for a long period of time.

2) Shower: It is used to sprays the anti-bug liquid by rotating through the excessive pressure of pump and also covers long range of outward surface.

3) Pump: It forces the liquid with reasonable pressure towards the shower and a plastic pipe is used as a connector between them.

Figure 2:Spray Part of Robot

B. Sensor Part

Two IR senor circuits are used, one on the left and other on the right side. Each circuit has a pair of IR transmitter and receiver.

1) IR Transmitter: It continuously transmits IR signal through the complete process.

2) IR Receiver: IR receiver diode senses the reflected IR signal from any obstacle and send signal to the microcontroller for further process.

Sensor Part Diagram

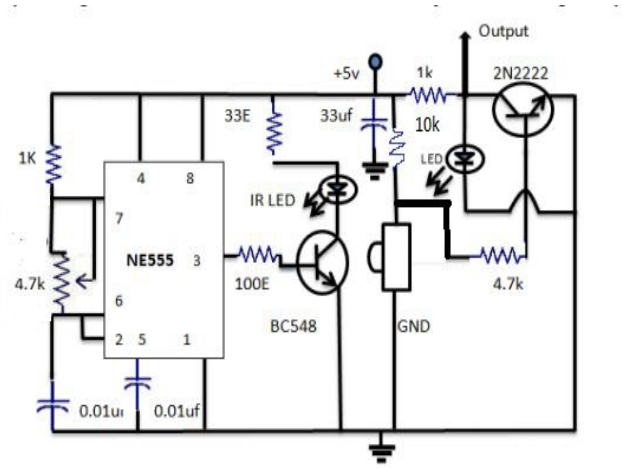

Figure 3(a):Sensor Circuit of Robot

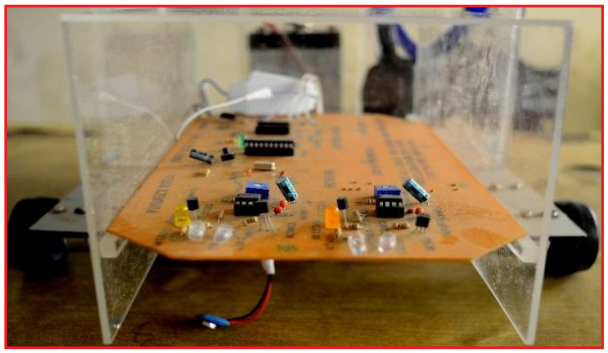

Figure 3(b): Sensor Circuit of Robot

C. Governor Board

It is the main part of robot. All Actions of robot are controlled by this part that consists of microcontroller of Atmel 89C2051 and the driver L293D.

Atmel 89C2051: This microcontroller enjoys special significance in the whole 8051 family of microcontrollers. It is ideal choice for making low cost mini projects. A simple 5V battery is sufficient to provide power to this controller and any 8051 programmer can be used to easily transfer hex file in the ROM of this microcontroller. It belongs to the 8-bit class of microcontrollers. Due to its inexpensive and easy availability, this is ideal for embedded applications. [8].

1) L293D: In order to rotate motors in both directions, an interface is required between microcontroller and motors. This driver interface is provided by H-bridge 16-pin IC [9]. It is a motor drive IC which drives motors according to microcontroller's instructions.

Sensors send the signal to microcontroller Atmel 89C2051, microcontroller sends command to L293D drive to start, stop or reverse the direction of the motors according to the program.

Circuit Diagram of Governor Board

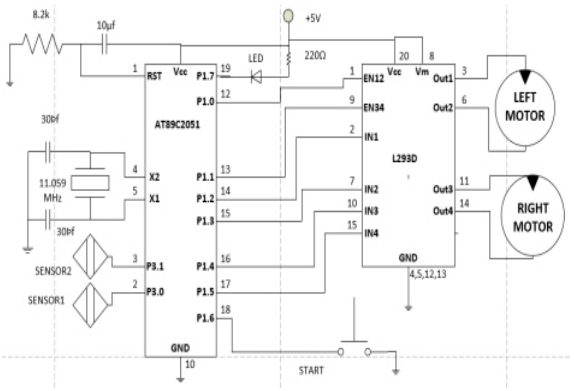

Figure 4: Governor Board of Robot

III. Mechanical Design

Mechanical design contains two DC gear motors. Two wheels are used, one for left side and other for right side. One freewheeling ball is also used which provide supports to the robot to rotate freely. Robot also has a body cover.

Design of Robot

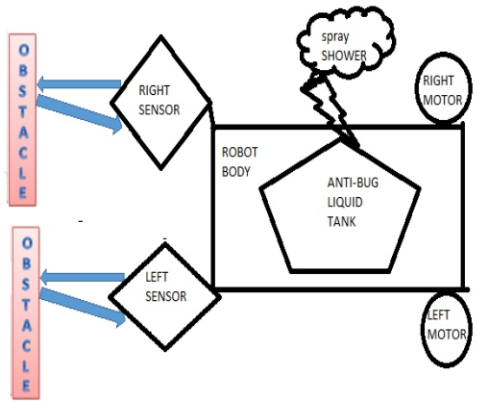

Figure 5: Descriptive Drawing of Robot

IV. Software Framwork

Algorithm and flow chart are shown as

A. Algorithm

- Start
- Initialize the input port (P3) and output port (P1)
- Set bit 1.0 and 1.1
- Set bit 3.0 and 3.1
- Set bit 1.2 & 1.4 and Reset 1.3 & 1.5
- Read data from port 3.
- When both bits receive no signal, Move in forward direction.
- When port 3.1 receives the signal, reverse the direction for specific time and then change the direction towards right and repeat step 5 & 6.
- When port 3.0 receives signal, reverse the direction for specific time and then change the direction towards left and repeat step 5 & 6.
- If port 3.0 and 3.1 both receive signal, reverse the direction for specific time and then change the direction towards right and repeat step 5 & 6.

B. Flow Chart

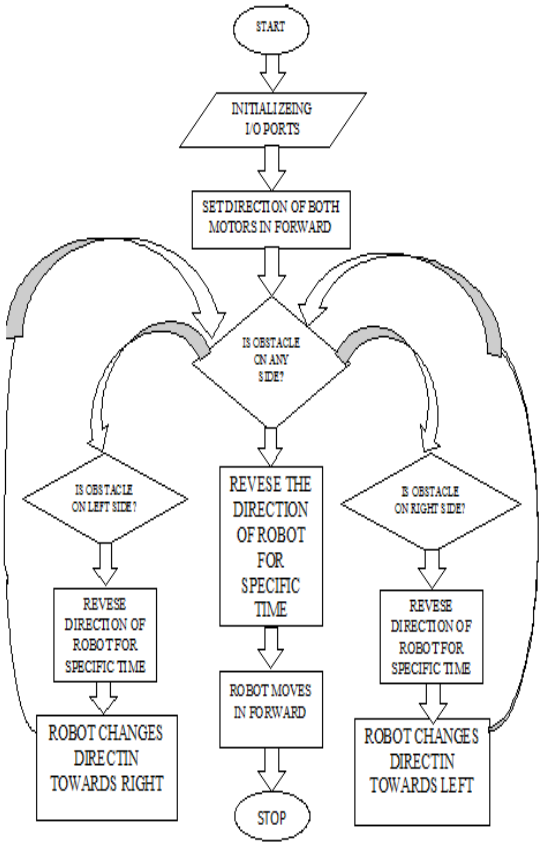

Figure 6: Flow Chart for Software

V. RESULTS

By pressing the start button, robot starts moving forward and spray anti-insect liquid around and also on its above surface. When a wall comes in front of it, robot continues its spray process on the wall by changing its direction in well-defined manners. It moves in the direction opposite to obstacle. This robot is an intelligent autonomous device. When bit 1.0 & 1.1 are set then robot moves in forward direction and by setting3.0& 3.1 robot changes its direction towards left and right respectively. It changes its direction according to obstacle coming in front of robot.

Diagram of Ready Robot

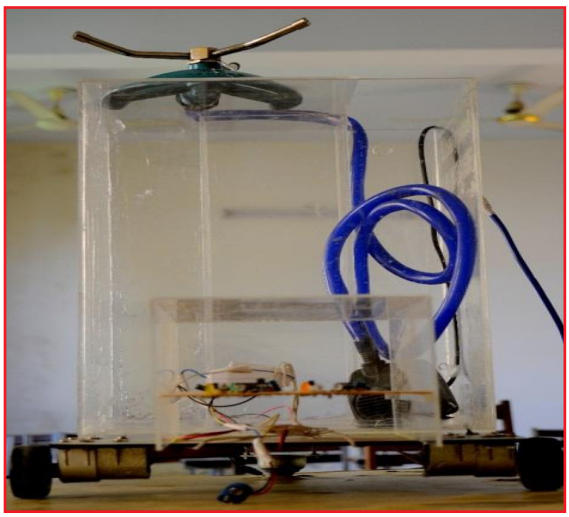

Figure 7: Robot is Ready

VI. APPLICATIONS

Robot is used to supply the water to the crops at large scale. We extend the application of these techniques to the coordinated motion of several mobile robots, and to the avoidance of two manipulators [10]. A Multi-robot system is developed to collectively perform a desired assignment in diverse applications [11-12]. Autonomous robot can be utilized to drive a vehicle in populated urban roads and accident free traffic control can be achieved. [13]. People with disability can be served by wheelchairs equipped with autonomous robots and proper navigation can be achieved [14]. The robotic wheelchair can also be utilized to serve the elderly patients unable to walk with ease. In this way health care facilities can be improved [15]. This technology is also used in various applications such as vacuum cleaner, path tracking and in mines.

VII. CONCLUSION

It is an intelligent autonomous robot having an ability to spray anti-bug liquid in various desired regions with sufficient amount of liquid carrying capability .Wide range of liquids can be sprayed for different insects in industries, homes and places which are the no go areas for human beings. By using sensors, gear motors and control circuit having unique functionality, it also has ability to avoid obstacles in its way in suitable manners. In future, weight lifting ability of robot can be increased by using more powerful motors, spray region can be enlarged by using more influential pump and sensing rang can also be increased.

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QUOTATIONS

- The best preparation for tomorrow is doing your best today.

  H. Jackson Brown, Jr
- The best and most beautiful things in the world cannot be seen or even touched - they must be felt with the heart.

  Helen Keller
- What we think, we become.

  Buddha
- Change your thoughts and you change your world.

  Norman Vincent Peale
- Try to be a rainbow in someone's cloud.

  Maya Angelou
- It is during our darkest moments that we must focus to see the light.

  Aristotle Onassis
- Perfection is not attainable, but if we chase perfection we can catch excellence.

  Vince Lombardi
- Let us sacrifice our today so that our children can have a better tomorrow.

  A. P. J. Abdul Kalam
- We can't help everyone, but everyone can help someone.

  Ronald Reagan
- From a small seed a mighty trunk may grow.

  Aeschylus
- Memories of our lives, of our works and our deeds will continue in others.

  Rosa Parks
- It is never too late to be what you might have been.

  George Eliot
- No matter what people tell you, words and ideas can change the world.

  Robin Williams
- The power of imagination makes us infinite.

  John Muir
- Shoot for the moon and if you miss you will still be among the stars.

  Les Brown
- Quality is not an act, it is a habit.

  Aristotle