Research & Basic Implementation of Basic Manual Control for Auto Following Robocar using Arduino Nano

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Abstract— For the different options available in market for obstacle detection, fall detection and auto-following, finding the best suited option for making an auto following rob car for elderly people. The artificial intelligence has allowed us to perform various tasks and jobs which a human can perform and all of this can be done locally and remotely. Image processing is one of the concept that has find its mark in the technology for the various jobs like face detection, object detection, etc. Using all these concepts an efficient and robust rob car can be developed at very low cost. In day to day life population is increases rapidly and due to the work and school factors family members are not available at home to take care of elderly people and small kids. Therefore utilizing IOT and AI Technology to enhance the safety of elderly peoples. In this paper the Auto following robot car created to monitoring the elderly peoples when there is nobody in the house by using the Arduino, WIFI, Ultrasonic sensors, databases(MYSQL),Android based mobile application.

Key words: Obstacle, Image Processing, Auto Following, WIFI, Ultrasonic Sensors, MYSQL, Arduino

I. INTRODUCTION

In the modern age era, no one has time to look after the elderly people of the family. Everyone has to go out for job and make for the living. During this time, no one is at home to look after their parents. A smart and compact robocar can be made using the concepts of artificial intelligence, image processing and internet of things. Robocar will monitor the person and auto follow him/her. Live Streaming can be seen using the mobile and manual control can be used remotely. Notifications will be send to mobile if there is detection of fall.

The theory & the development of computer system to perform task normally requiring the human intelligence such as visual perception, speech recognition, decision making, translation between languages and so on.

In modern robotic system posseses the advanced features like signal processing for self-intelligence, wireless connectivity , biological sensors , gathering information and transmit into remote location and receive the information from remote location likewise the modern systems are work as per the command.

A useful healthcare system is for a fall detection system that can enhance the security of the elderly. There are available access points (APs) in an indoor environment. The robot-car is equipped with an Arduino UNO development board, a Wi-Fi Shield module, and an ultrasound sensor.

A robotic car with the simple architecture by assembling simple Open source hardware, Bluetooth module and advanced sensors. An android application running on remote device connected to Arduino UNO microcontroller ICL293D mounted over the robotic car via Bluetooth Module is used to access the sensor data. Ultrasonic range detectors are installed on the front end of of the robotic car to detect obstacle at the range of 5cm during motion in forward direction. The one wired DHT11 temprature and humidity sensor is installed to monitor the parameter under different environment through which it moves.

The system consists of three main modes:

1) auto-following mode;
2) manual control mode; and
3) data query mode.

In this paper, we proposed an auto-following robot-car system that follows the elderly around and provides services. The function of auto-following is achieved by positioning Technology. The RoboCar would be smart enough to auto follow person using image processing and during that detect obstacle using ultrasonic sensors.

II. LITERATURE SURVEY

Different image processing algorithms can be used for obstacle detection. Technologies like Laser projector with stereo system, single camera coupled with two SONARs, LIDAR, LIDAR with four cameras have already been implemented in the past but all these technologies work for indoor environment. For the auto following robot to be efficient, it should be able to work in indoor as well as outdoor environment.

In, novel segmentation algorithm is used to capture test cases from their camera. Shadow elimination is done by choosing right colour space and doing colour conversion. The saturation values are used to find difference between the intensity of two objects allowing obstacle to be detected in indoor and outdoor environments.

In, for fall detection, smart phone having accelerometer and gyroscope is used for sudden change in person's position. Robocar is proposed to provide medical tools in case of emergencies. Indoor mapping is used to find the location of person in the house and auto follow him/her. Three modes of operation are available through Android App on robocar: Auto follow, manual and data query mode. The robocar consists of single ultrasonic sensor for obstacle detection and arduino uno for processing.

In auto-follow mode,it determines the robot-car's location based on the RSSI signal; then the robot-car moves to the target automatically, i.e. without manual control. In manual control mode, the user provides manual controls for the movement of the robot-car In data query mode, the user can query the history of the robot-car movements.

The robo car can be easily moved from one place to another just by a single device. Robo car can be used for security purpose with the installation of a camera. We can make the car do various task like moving an object from one place to another without applying any physical force.

Authors Levinson, J., et al. have also used a LIDAR along with four cameras in their automation system. They have implemented the system on a fully functional automobile, with an obstacle detection rate 98%. Automated vehicles primarily use various sensors to observe their environment. These sensors will collect the raw data from the surroundings and pass it to the processing section of the

automated vehicle. The data captured will be converted to useable information using which an appropriate reaction can take place.

The experimental setup for the path-planning robot consist of a Turtlebot and a stargazer indoor GPS system. The Turtlebot is a low cost robot kit which runs on open source software ROS (Robot Operating System). The stargazer is a low cost indoor GPS which works on the principle of infrared image processing. Markers on the ceiling are read by an infrared camera on the stargazer and analyzed on board to provide the estimates of current position and orientation for the Turtlebot.

III. SYSTEM IMPLEMENTATION

In this paper we are implementing the first phase of Auto-following robot car. The design and implementation of an auto-following robot-car system is discussed in this section.

Fig.3 shows the robot-car is based on an Arduino NANO development kit and equipped with a Bluetooth and an ultrasound sensor.

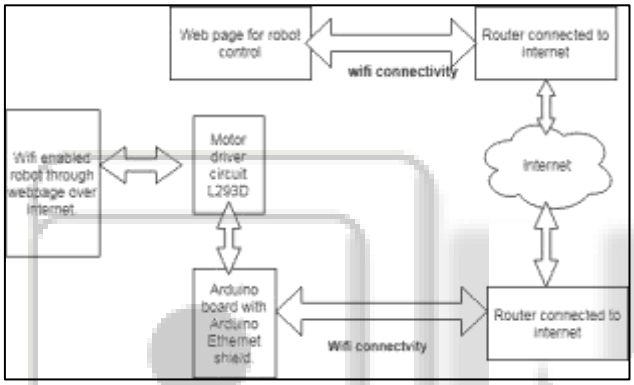

Fig. 1: Shows the System Architecture System has Two Modes

1) Manual mode.
2) Auto-following mode.

In manual mode there are five buttons to control the robot-cars movements as follows: forward motion, backward motion, turn left, turn right, and stop. These control commands are transmitted via the Bluetooth.

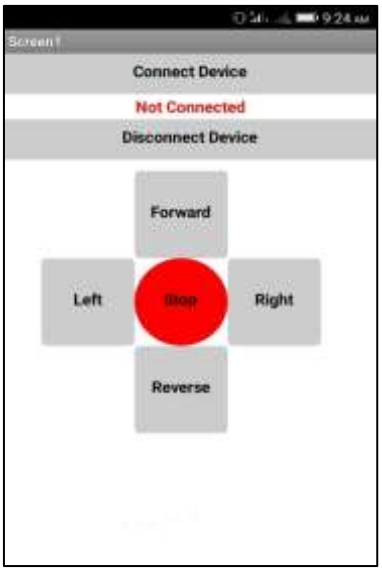

Fig. 2: shows the Manual Control Interface

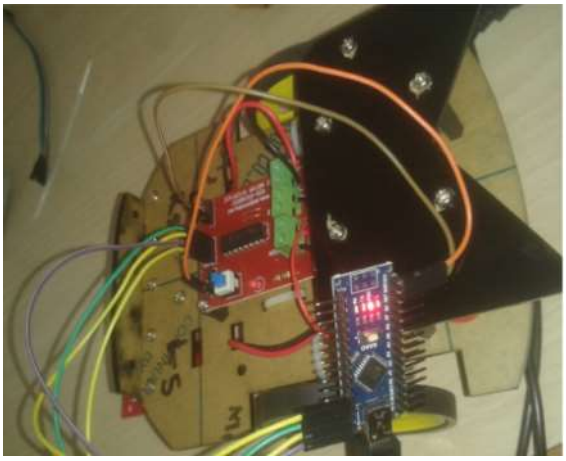

Fig. 3: Robot Car

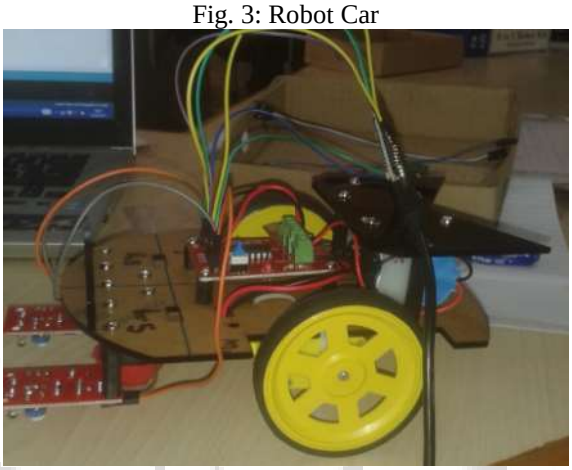

Fig. 4: Manual control Robot car

Following Fig. 3 & 4 shows the Manual Control Robot Car

The main idea behind this project is Robot car controlled by Wi-Fi will make our work much easier as we can make the robot do any work we need by just a single movement on our mobile phone on computer. In near future we can see such designs getting too common and being used extensively for household purposes.

A. Hardware Used

1) Arduino Nano

The Arduino Nano is a small, complete, and breadboard-friendly board based on the ATmega328P; offers the same connectivity and specs of the UNO board in a smaller form factor.

2) L293D

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D.

3) 12V DC Geared Motor

The 12V DC Geared Motor can be used in variety of robotics applications and is available with wide range of RPM.

4) HC-05 Bluetooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate)

3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

5) Other Components Used

- Castor Wheel
- Wires
- Breadboard
- Small PCB
- Male headers
- Female headers

B. Software used

1) Arduino

The open-source Arduino environment allows user to write code and upload it to the I/O board. The environment is written in Java. The Arduino development environment contains a text editor for writing code, message area, text console, and toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. Arduino programs are written in C or C++. Arduino features, capable of compiling and uploading programs to the Board with a single click.

2) Functioning

The circuit is built around an ATmega328 controller, ultrasonic transceiver module HC-SR04, Bluetooth module JY MCU BT, motor driver L293D (IC1), DC motors M1 and M2, and a few common components. Thecircuits uses two 9V batteries-one to power the ATmega328 controller and the other to power the motors. Regulated 5V supply for the restof the circuit is provided by the ATmega328 controller itself. LED on the board indicates presence of power supply.

A. Bluetooth module The module provides a method to connect wirelessly with a PC or Bluetooth phone to transmit/receive embedded data such as GPS data, ADC voltage reading and other parameters. Bluetooth module JY MCU BT used in the project can be connected to any device, via built in UART interface to communicate with other Bluetooth -enabled devices such as mobile phones, handheld computers and laptops. The module runs on a 3.6V to 6V supply.

For the home security system we are using ultrasonic sensor which will check the distance between the two points. If some intruder passes between the two points then the distance between the two points would decrease. The feedback of the distance is send back to the microcontroller. The microcontroller would send a feedback SMS to the owner through GSM modem and will also ring an alarm. The advantage in using this safety and security system is that the certain range at which the alarm rings and SMS is send is user defined so user can select any range accordingly at which the microcontroller will report.

IV. Conclusion

In this paper a robot car is proposed having two modes Manual and Auto-following mode. A user friendly interface is available as a mobile application and a web-based application. Auto-following robot-cars can be equipped with other useful sensors and follow around an elderly person to provide other servicesFor a small, efficient and robust robo car, obstacle detection can be done using ultrasonic sensor instead of image processing. Instead of single ultrasonic sensor, three ultrasonic sensors can be used on front side of robocar for the obstacle detection from three sides. Three operations can be provided without developing any android app by using Raspberry Pi VNC Server: auto follow, manual and live streaming. For a fixed camera, we can use rotating camera (vertical and horizontal rotation) can be used to remotely monitoring a person and for auto follow using Harr Cascade Image Processing algorithm.

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