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Design and implementation of AI Based Robotic Car for Surveillance and transportation

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Abstract. The world of control is an exciting field that has exploded with new technologies where the Internet of Things vision becomes a reality. Today, IoT with AI is used to make applications such as intelligent transportation, smart security, and smart home. The wireless communication technique is beneficial in IoT nowadays. In this paper, the author proposed a model for android control robot car using wireless technology. Obstacle detection is advantageous in terms of avoiding accidents; the author has been introduced in this paper. This robot car also detects the AQI index of the place. The data is shared on the BLYNK cloud app as well for further decisions.

1. Introduction

Today, the Internet of Things (IoT) is an emerging 21st-century technological revolution. It allows devices, objects, and machines to communicate. Today, IoT is used to make applications such as intelligent transportation, smart security, and smart home. There are also some other domains where the internet of Things (IoT) plays a vital role and improves the quality of life. IoT can be used in health care, pollution monitoring, industrial automation, transportation, robotics, and agriculture. Nowadays, approx 9 billion devices (physical objects) are connected through the internet. In the future, this number is expected to rise to 20 billion [1]. In IoT applications, data is taken from the device installed through sensors; then this data further can be stored on the cloud. Big Data, Machine Learning is mainly used for the filtration of data. After the filtration of data, necessary decisions are taken by the devices.

1.1 Overview

The world of control is an exciting field that has exploded with new technologies where the Internet of Things vision becomes a reality. This is a simple robotics project. This project proposes a model of Android controlled robot car that uses an Android mobile phone for robotic control with the help of a Wi-Fi module. This project is a Wi-Fi, controlled robot. The wireless communication techniques used to control the car. This model provides us the distance from an obstacle in the way of the car, which will decrease the cause of an accident. It also provides the AQI index of the place where the car is currently present. This car can be used in those polluted places where dangerous gasses

are available like a coal mine. It sends the AQI index of places on the cloud, which will be visible on the screen of an android phone. It also detects the rain, which will be useful for the automatic cleaning of a window. In it, the user needs to connect the android mobile from a Wi-Fi network. The instructions are sent through the BLYNK app installed in android mobile.

1.2 Objective

The main objective of IROCA (IOT robot car) is to control the inbuilt sensors car through Android mobile using Wi-Fi. To get the data from sensors and take the decisions based on that data. The objective of this model is to use the Internet of Things (IoT) in robotics according to the requirements of society.

1.3 Scope

This proposed work is based on the field of robotics in IoT. This robotic car can be used in various filed like robotics, pollution monitoring, automatic obstacle detection, etc. This work can be used in the delivery of products as well. As we know, nowadays corona is spreading in the whole world and the world is facing a situation of lockdown. So, this robotic car can be used in the delivery of products.

2. Related Work

The world of control is an exciting field that has exploded with new technologies where the Internet of Things vision becomes a reality. Robotics is a technology for making machine which can do more than one task simultaneously, repeatedly. A robotic machine is a mechanical and virtual agent that is operated by computer and electronic power. Nowadays, robots are doing a dangerous task which a person cannot do i.e., survival in a hazardous environment [2][11]. Robot cars controlled by mobile phones will make work easier as the robot car can move from one position to another position in the touch of a mobile screen [2]. The work in this field is enhancing day by day.

A method for controlling a car from an android phone is already proposed in 2016. The robot car can be controlled using Wi-Fi, through an SMS as well [3]. The existing method used Arduino as the main part of the model. It's increased the efficiency to control the model with the Node MCU module [4]. In this filed, many robots have been developed for different requirements. Ultrasonic sensors and Bluetooth technology had been used for obstacle detection [5]. A robot had been developed for the military area to detect metal, to detect explosive things, and to view surroundings view from an android mobile camera [6]. IoT robots can be used in disaster management to save many lives [7]. In this paper; the authors proposed a AI based IoT robot car from android mobile phone using wireless technology. The authors used the BLYNK app for sending instructions to the motor driver.[14]

A robot using socket programming had also been developed; this is the way of controlling a surveillance robot from android phones developed in socket programming [8]. This paper presents a way of controlling a robot car from android phones using an Arduino, NodeMCU Wi-Fi module, and embedded C programming.

3. Proposed AI Based Robotic Car

This paper proposes a model for Android mobile phone control multisensory car using IoT. This work helps to automate the car using a touch of mobile phones. It senses the distance from an obstacle and sends the distance on the cloud, which displays on the screen of the user's mobile phone. It also senses the AQI index.

This will help in taking precautions. It will be very helpful for those places where a high AQI index is there, and a person cannot go there without knowing the situation. This project also gave way to the automatic cleaning of the window when it needs.

This proposed model shown in figure 1, this model captures data from the sensors and sends that data to the BLYNK cloud app for necessary decisions. This work uses the BLYNK cloud app to send instructions like moving forward, Move backward, Move left, and Move right.
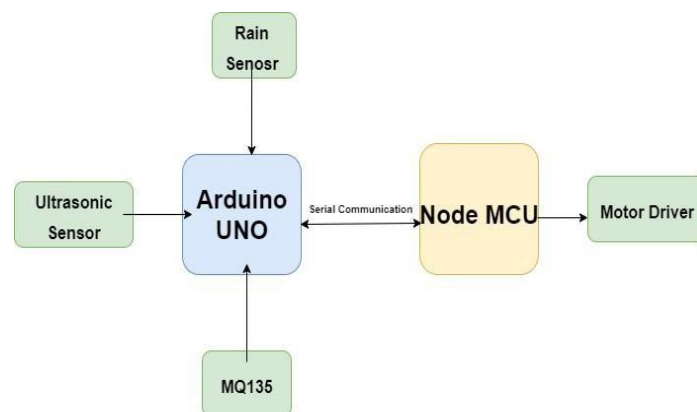

Figure 1: Proposed Model

3.1 Proposed Algorithm

3.1.1 Algorithm for Arduino UNO:

    1. Include Software Serial library for serial communication.

    2. Initialize serial communication pins. Generally pin 0 and pin 1 are used for serial communication.

    3. Initialize pins for sensors.

    4.Read Sensor data from all the sensors. Send this data to Node MCU through serial communication pins.

3.1.2 Algorithm for Node MCU:

    1. Include ESP8266 and BLYNK library.

2. Set BLYNK authentication key.

3. Initialize ssid [] and pass[] of the Wi-Fi network.

4. Initializeinput_1=LOW,input_2=LOW,input_3=LOW,input_4=LOW;.

5. Initialize forward=LOW, backward=LOW, left=LOW, right=LOW;

6. Read the instructions sent by the BLYNK app.

7. Read data coming from Arduino UNO. distance_obstacle, aqi_index,rain_data;

8. if (distance_obstacle > marked_distance)then

    if (forward==HIGH && backward==LOW && left=LOW && right==LOW) then

        Output_1=HIGH, Output_2=LOW,

        Output_3=HIGH, Output_4=LOW;

    if (forward==LOW && backward==HIGH && left=LOW && right==LOW) then

        Output_1=LOW, Output_2=HIGH,

        Output_3=LOW, Output_4=HIGH;

    if (forward==LOW && backward==LOW && left=HIGH && right==LOW) then

        Output_1=LOW, Output_2=LOW,

        Output_3=HIGH, Output_4=LOW;

    if (forward==LOW && backward==LOW && left=LOW && right==HIGH) then

    Output_1=LOW, Output_2=LOW, Output_3=LOW, Output_4=HIGH;

    if (forward==LOW && backward==LOW && left=LOW &&

    right==LOW) then Output_1=LOW, Output_2=LOW, Output_3=LOW,

    Output_4=LOW; Else

Output_1=LOW, Output_2=LOW, Output_3=LOW, Output_4=LOW;

9.   If (rain_data==HIGH)

   then Move servo();

10. AQI_Index=aqi_index;

11. Send all the data to the BLYNK cloud, which will display on the mobile screen.

4. Working Model Result Analysis

The proposed robot car consists of the ultrasonic sensor, MQ135 gas sensor, Rain sensor along with the motor driver (L23D). The sensors are connected through Arduino UNO, and the motor driver is connected to Node MCU Wi-Fi Module. Sensor data is coming from Arduino UNO to Node MCU using serial communication techniques. Node MCU Wi-Fi module is connected to the BLYNK cloud app installed on an android mobile phone. The user sends the instruction command i.e., Forward, Backward, Left, Right, to Node MCU Wi-Fi module through the BLYNK cloud app. Sensor data i.e., distance from an obstacle and AQI index of the place continuously displays on the screen of mobile phones.
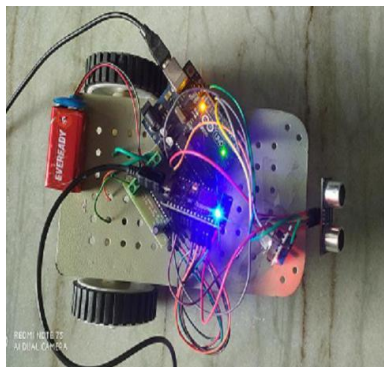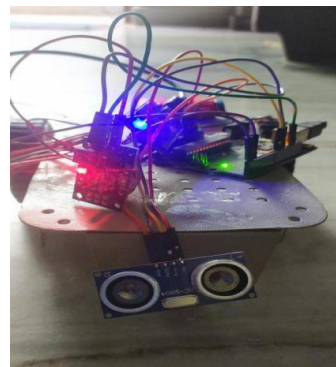
Figure 2   Figure 3

Figure2 and Figure3 show the working model of the proposed AI robot car.

4.1. Result Analysis

After getting data, from sensors into the BLYNK app. The data is displayed on the screen in a gauge form. The output screen consists instruction button i.e., Forward, Backward, Left, Right, and two gauge graphs, which are representing the distance from obstacle an AQI index of place, respectively. The snapshots of the output screen are given below.
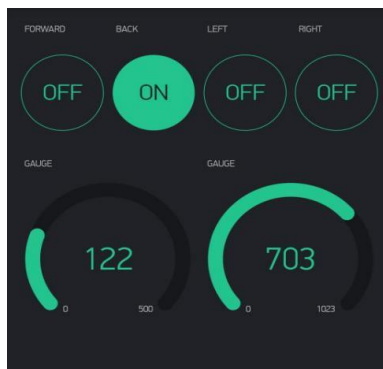

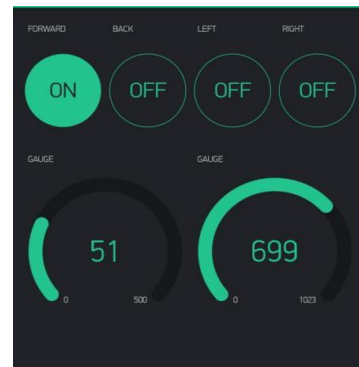Figure: 4   Figure:5

Figure 4 and Figure 5 show the BLYNK app screen, which is the input and output screen of the project.

Results: The proposed model is working fine, and all the outputs are in the required form. It is great to see that the ultrasonic sensor is working fine; the distance from the obstacle is accurate, but the AQI index is shown wrongly sometimes.

5. Conclusion

This paper proposes a model for Android mobile phone control AI car instructed by BLYNK cloud app. In this project, the robot car detects the distance from an obstacle, which will be helpful in avoiding an accident. This car gives the AQI index of the place and also automates the cleaning of the window itself. This car is helpful in a coal mine where dangerous gasses are present, and it is hard for a person to go inside without any prior information about the environment. The proposed model runs from the instruction generated by the BLYNK app, and the car follows the instructions accordingly.

Robotics is an emerging technology, and it can do tremendous work with the help of IoT. This project is not complete yet; it is more than this. This proposed car is not containing any camera on it. The Camera can be installed on this car, which will help in monitoring the path of the car. After the installation of a camera, this car can be used in the delivery of products. There can be the addition of more sensors like fire sensors for fire detection, water sensor for detecting water levels in underground places, which will be very helpful. There can be the addition of various technologies like machine learning, Big Data for the analysis of data. These technologies will help in an increase in the accuracy of the work.

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