AUTO-TRACKING AND CONTROL OF LIGHT CHASING VEHICLE USING IOT

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ABSTRACT

This paper mainly discusses the application of Internet of Things (IoT) technologies; all the things around us are getting smarter. This project mainly discusses the application of Internet of Things (IoT) in mobile vehicle tracking. We combine embedded control and IoT technology to design and develop a smart light chasing vehicle that automatically chases the light source and tracks it moving direction and moving path. This light-chasing vehicle can be used with Arduino embedded control technology combined with four-azimuth light sensing component are used to design and develop a smart chasing vehicle that can automatically chases the light source from eight directions(N, E, W, S, NE, NW, SE, SW) and record the sensing value and moving direction. In addition through the IoT remote WiFi wireless communication function, light source parameters and the vehicle moving direction can be transmitted. The real time vehicle tracking system is to be implementing to monitor, the vehicle live location as well as vehicle tracking record through GPS (Global Positioning system).

1. INTRODUCTION

The Internet of Things (IoT) refers to a message connection and switching network formed by physical objects, such as vehicles, machines, household appliances, etc., through embedded control sensors and API devices. IoT can digitize the real world and has a wide range of applications. Its main application areas include transportation and logistics,industrial manufacturing, health care, smart environments (home, office, and factory), individuals and society, with a very broad market and application prospects. In order to explore the application of IoT technology in mobile vehicle tracking, this study combines Arduino embedded control and IoT communication technology. On the one hand, the four-direction light sensing components are used to design and develop a smart chasing vehicle that can automatically chase the light source from eight directions and record the sensing value and moving direction. In this paper, the system architecture and system development of this automated light-chasing vehicle will be described , and topics such as the light -chasing control process of the vehicle and the algorithm for determining the direction of movement when displaying the moving path will be discussed.

1.1 INTERNET OF THINGS (IOT)

The **Internet of Things** (**IoT**) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the

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ability to transfer data over a network without requiring human-to-human or human-to-computerinteraction. Wi-Fi provides higher data rates for multimedia access as compared to both zigbee and Bluetooth which provides lower data transfer rates.

2. SYSTEM DESIGN

The system architecture of this automated light-chasing vehicle is shown in Fig,.The functions of each component are described as follows:

2.1 MOTOR DRIVEN UNIT:

A dual-motor driven board is used to control the forward and reverse movements and the rotation speed of the left and right wheels of the vehicle body.

2.2 ARDUINO EMBEDDED CONTROL UNIT:

An Arduino control board that accepts Arduino code, performs various input/output operations, and performs decision, operation, and control actions. This is the embedded control core of the entire light-chasing vehicle. Light Sensing Unit: The front, back, left and right sides of the vehicle bodyare equipped with a photo resistanceelement for detecting the light source illumination in thefront, rear, left and right directions of the vehicle body.

2.3 IoT COMMUNICATION UNIT:

This is a PlayRobot IoT maker board that supports remote WiFi wireless communicationand control functions, and transmits the ambient lightsource parameters and moving directions monitored and recorded by the light-chasing vehicle to the IoT hostmachine.

2.4 ULTRASONIC SENSOR:

It transmits the high frequency sound wave to an object and then measure the reflected eco off the target. Vehicle parking sensors are equipped with this types of sensors.

2.5 GPS(Global Positioning System):

A GPS tracking system uses the global navigation satellite system network.This network incorporates a range of satellites that use microwave signals that are transmitted to GPS device to give information on location, speed,time and direction.

2.6 PROPOSED SOLUTION FOR THE HARDWARE PART:

The solution that we have adopted consists of the exploitation of the Arduino Uno controller . It is a single nano computer card ARM processor designed by designer David Braben video games, as part of its foundation "Arduino uno controller ". The following photo presents the Arduino uno controller .

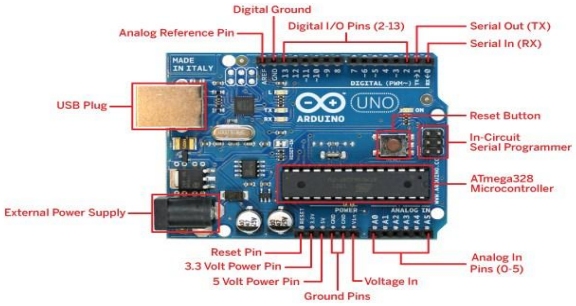

Fig -5: Arduino Uno controller

- **Arduino Uno controller Model.** A 700 MHz ARM-based Linux computer with 512 MB RAM. Ten programmable GPIO pins control the five relays: simply pulse the on or off coil for ~50ms. Another GPIO controls the IR diode.
- **IDE cable connector.** I cut up an old 40-pin IDE connector to connect to the 26-pin GPIO header.
- **DPDT latching signal relays.** Each relay controls left and right channels (hence dual poles). I opted for two-coil

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relays, so I could activate one coil to turn the relay on and the other coil to turn it off.

- **ULN2003A ICs to drive the relays.** The Arduino Uno controller 's GPIOs can't drive the relays directly, so we control them with this transistor array. Each chip has 7 NPN Darlington pairs. It also has built-in fly back diodes that will dissipate the inductive kickback from the relay coils.
- **Stick-on IR diode.** I had this emitter lying around. It came with a long cable that terminates in a mono 3.5mm headphone jack. I cut off a female headphone jack from a patch cable to make a plug for this and wired a 270 ohm current-limiting resistor to this.

3. BLOCK DIAGRAM

Fig ; Entity structure of Light-chasing vehicle

4. LIGHT-CHASING CONTROL PROCESS

The light-chasing vehicle is provided with a photo resistance element on the front, rear,left and right sides of the vehiclebody. It can be used to detect theillumination of the lightsource in the front, back, left and right directions of the carbody. In order to enable the vehicle to perform precisemovement control, the study has planned eight differentdirections of movement, as shown we developed an Arduino embedded program to performthe light-chasing control operation of the vehicle. The user can firstset a threshold, which will be determined according to theactual environment. In high brightness environments, thethreshold must be increased, while in low brightnessenvironments, the threshold must be reduced. The system firstdetects the photometric values of the front, back, left, and rightdirections, sorting and calculating the number of overthreshold. If it is a front/back (about 90 degrees). When two luminosities exceed thethreshold, if the two are in a front-rear or left-right relationship do not move.Otherwise, select the middle direction of thetime (about 45 degrees). For

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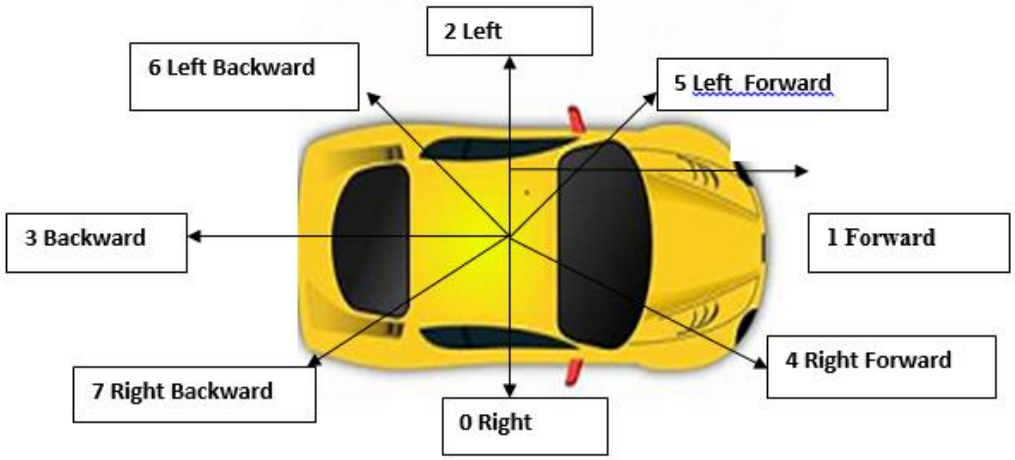
example, if the forward and rightto the Right Forward direction.



5. GLOBAL POSITIONING SYSTEM (GPS)

The Global Positioning System consists of 24 satellites, that circle the globe once every 12 hours, to provide worldwide position, time and velocity information. GPS makes it possible to pr identify locations on the earth by measuring distance from the satellites. GPS allows you to record or create locations from places on the earth and hp l you navigate to and from those places.

When a GPS receiver is turned on, it first downloads orbit information of all the satellites. This process, the first time, can take as long as 12.5 minutes, but once this information is downloaded, it is stored in the receivers memory for future use. Even though the GPS receiver knows the precise location of the satellites in space , it still needs to know the distance from each satellite it is receiving a signal from. That distance is calculated, by the receiver, by multiplying the velocity of the transmitted signal by the time it takes the signal to reach the receiver. The receiveralready knows the velocity, which is the speed of a radio wave or 186,000 miles per second (the speed of light).To determine the time part of the formula, the receiver matches the satellites transmitted code to its own code, and by comparing them determines how much it needs to delay its code to match the satellites code. This delayed time is multiplied by the speed of light to get the distance. The GPS receivers clock is less tomic clock in the satellite, therefore, each distance measurement must be corrected to account for the GPS receivers internal clock error.

Real-time DGPS employs a second, stationary GPS receiver at a precisely measured spot (usually established through traditional survey methods). This receiver corrects any errors found in the GPS signals, including atmospheric distortion, orbital anomalies, Selective Availability (when it existed), and other errors. A DGPS station is able to do this because its computer already know sits precise location, and can easily determine the amount of error provided by the GPS signals.

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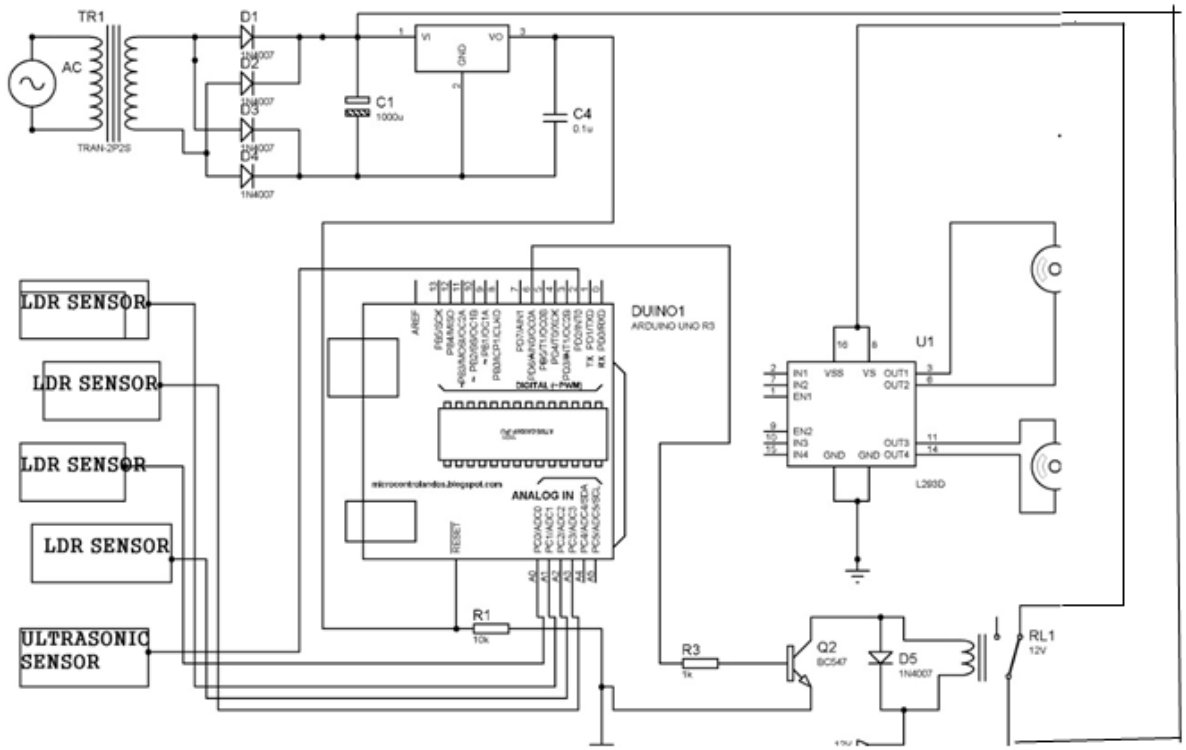
6. CIRCUIT DIAGRAM



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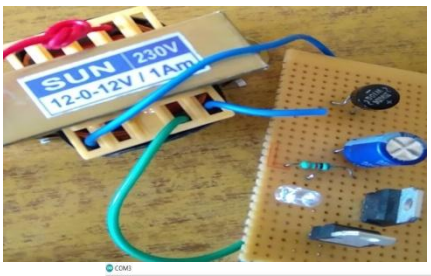
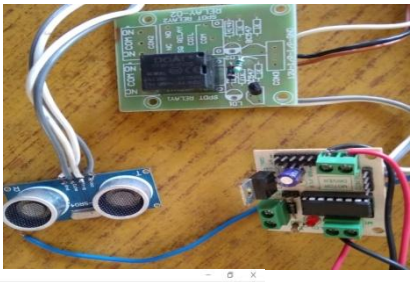
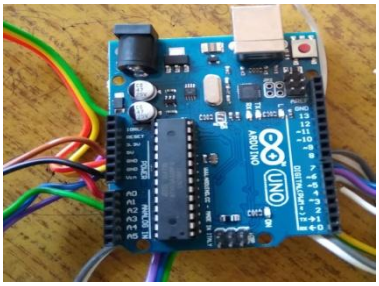
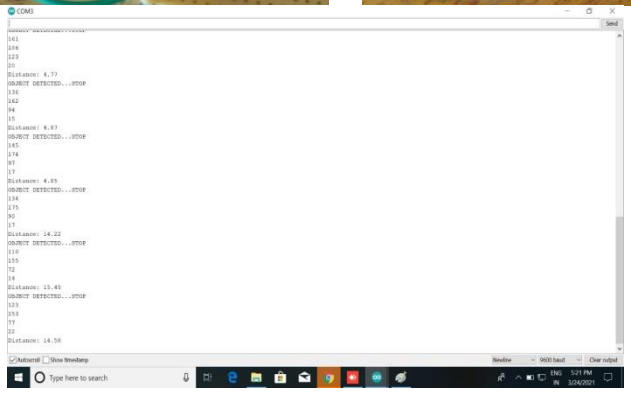
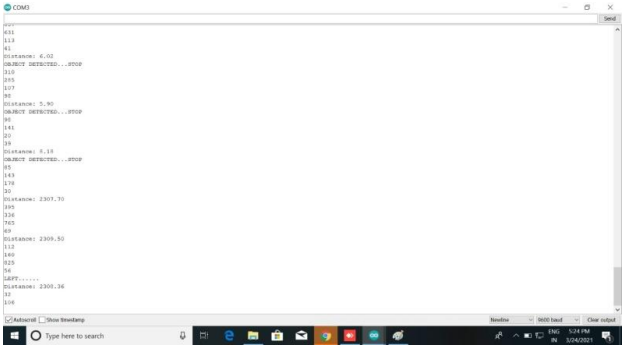
7. RESULT











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8. CONCLUSIONS

This paperfocuses on the application of Internet of Things technology in mobile vehicle tracking. Combining Arduino embedded control and IoT technology. We designed and developed a smart light-chasing vehicle that automatically chases the light source from eight directions and records the sensed values and direction of movement .In addition, we also developed a mobile path display system on the monitoring host, which can display the moving path of the vehicle according to the moving direction and sensing parameters transmitted by the light-chasing vehicle, andcalculate the path length, movement, distance and other information. The future research can be further combined with cloud databases to provide big data analysiscapabilities.

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