IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AutoScout: Arduino-power GPS Adventure

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Abstract: The abstract for a project titled "AutoScout: Arduino-Powered GPS Adventure" can be summarized as follows:

In an ever more interconnected global environment, the fusion of wireless communication technologies has emerged as a prominent focus of research and advancement. The implementation of a Wi-Fi-controlled car with obstacle avoidance and GPS tracking operates through user commands sent over Wi-Fi, interpreted by a microcontroller. It incorporates several key functions. The aim of our project is to control a car using the fastest WiFi technology. Obstacle Detection Sensors monitor the car's surroundings for obstacles. The GPS Location module pinpoints the car's current location and captures images of the surrounding environment. Data processing is used by microcontrollers to process GPS data and obstacle detection to make navigation decisions. Obstacle Avoidance the system adapts to avoid real-time obstacles.

Key components of the system include Wi-Fi communication for user commands, an Arduino microcontroller for processing data, and GPS technology for location tracking. The combination of these technologies allows for real-time control, obstacle avoidance, and accurate route planning. This abstract highlights the significance of integrating Wi-Fi and GPS in the realm of autonomous vehicles, facilitating intelligent and autonomous car movement with broader applications in today's technologically connected world.

Index Terms - AutoScout, Arduino-power, pinpoint, avoidance, autonomous vehicles.

I. Introduction

Internet and WiFi technology play pivotal roles in connecting people, devices, and information globally. The Internet is a vast network of interconnected devices that communicate using standard protocols. WiFi, or wireless fidelity, is a technology that enables devices to connect to the Internet without physical cables.

Building a wifi-controlled car with obstacle and GPS tracking involves combining hardware and software components. To start, you'll need an Ardunio. Uno, Motor Driver,Shield , Wheels, 11-Gear Motor, Servo Motor Ultrasonic Sensor, 18650 Li-on Battery Holder, Male and Female Jumper Wire, and DC Power Switch. The aim of building a wifi-controlled car with obstacle avoidance and a GPS tracker is to create a versatile and remotely operated vehicle that can navigate its environment intelligently. The objectives are:

1) Remote Control.

2) Obstacle avoidance

3) GPS Tracker.

4) User Interface.

5) Data logging.

6) Expandability.

7) Security Measures.

The microcontroller processes commands received over WiFi, controls motor movement, reads obstacle sensor data for avoidance, and interprets GPS coordinates for tracking. Software-wise, you'll develop code to handle these functionalities, integrating libraries for motor control, obstacle avoidance algorithms, and GPS tracking.

Ensure a secure and reliable Wifi connection for real-time control. implement obstacle detection logic to navigate around objects and use the GPS data to track the car's location.

II. LITERATURE VIEW

The literature review is based on the study of various authors' work related to Wi-Fi-controlled cars with obstacle avoidance and GPS tracking, which emphasizes the integration of wireless communication with positioning technology for intelligent and autonomous vehicle systems.
[1] Zhen Feng Li developed an obstacle avoidance wheel design to achieve intelligent tracking, obstacle avoidance, and a multimodule system design. [2] Rohan Mahajan introduced a wifi control car. The aim of the project is to create a protocol for a smartphone-controlled robot automobile that carries out a variety of tasks for a robot that is extremely strong and adaptable. [3] Vishwa Pinnawala developed a wifi-controlled car Arduino concept to create a webpage with buttons for controlling the car that is user-friendly and allows the user to operate a car from anywhere within the local wifi network. [4] Mohammad Awais introduced a vehicle tracking system using GPS that allows the owner to track the vehicle through GPS and provides a simple and accessible means of monitoring authorized use. [5] Chaitanya Veer, an IoT-controlled surveillance robot car with face detection and a GPS module, introduced versatile surveillance with live video surveillance and face detection

III. METHODOLOGY

To create an Arduino-based power and GPS tracker for a vehicle using AutoScout, a systematic approach is essential.

To create an Arduino-based power and GPS tracker for a vehicle using AutoScout, a systematic approach is essential. Begin by defining the project requirements and detailing the functionalities required, such as real-time GPS tracking and power monitoring. Next, select the necessary hardware components, including an Arduino board, a GPS module (like the NEO-6M), a power monitoring module (such as the INA219), and any additional components.
Set up the GPS module by connecting it to the Arduino and installing the required libraries. Write code to read GPS data such as latitude, longitude, and speed. Similarly, set up the power monitoring module, calibrating it accurately to measure the vehicle's power consumption and integrating it with the Arduino. Setup Obstacle Avoidance. Connect ultrasonic sensors to the Arduino following their datasheets.Write code to read sensor data and implement obstacle avoidance algorithms (e.g., stop, turn, or reverse). Combine the GPS and power monitoring functionalities into a single Arduino sketch, ensuring proper data retrieval and storage/transmission. Decide whether data logging will be local or remote, using an SD card module or a GSM module, respectively. Test the tracker under various driving conditions and calibrate the sensors as needed for accuracy. For integration with AutoScout, determine the method to connect with its

platform, whether through an API or alternative means like email or SMS. Develop the necessary code to transmit data from the Arduino to AutoScout. Design an enclosure for the tracker, considering factors like accessibility to GPS signals and power, and install it securely in the vehicle. Lastly, establish a maintenance routine to ensure proper functioning of the tracker, conducting regular checks and updates to the software as needed for bug fixes or feature enhancements. It's crucial to document the methodology and code comprehensively for future reference and compliance with legal and privacy regulations regarding vehicle tracking.

Table 3.1:literature survey

Sr no.	Title	Methodology	Features	Disadvantages
1	Zhen Feng Li [2019]	Obstacle avoidance wheel	• Intelligent Tracking and Obstacle Avoidance • Multi-Module System Design	• Increased complexity can make the system challenging for users • Effective problem resolution may require a higher level of technical knowledge.
2	Rohan Mahajan [2022]	Wifi control car.	• Effective problem resolution may require a higher level of technical knowledge. • IO provide flexibility in operating the robot from a distance	• Despite cost efficiency in comparison to multiple fixed cameras
3	Vishwa Pinnawala[2021]	Wifi Control Car – Arduino concept	• The creation of a webpage with buttons for controlling the car offers a user-friendly • Allowing users to operate the car from anywhere within the local WiFi network.	• The current setup relies on a local WiFi network • Limiting the control range to the network's coverage area
4	Muhammad Awais	Vehicale tracking system using gps	• Allows owners to track the vehicle through GPS • providing a simple and accessible	• Implementation and maintenance of the

			means of monitoring authorized use	
5	Chaitanya veer	IoT Controlled Surveillance Robot Car with Face Detection and GPS Module	• Versatile Surveillance Robot • Live Video Surveillance and Face Detection	• IoT-based autonomous robots may face challenges in navigating highly complex • Dynamic environments where unexpected obstacles or changes occur

IV. COMPONENTS REQURIEMENT

Hardware Requriement:-

Arduino Uno:- The Arduino acts as the brain of the system, responsible for processing sensor data, making decisions based on that data, and controlling the motors accordingly. Arduino processes input from ultrasonic sensors and a GPS module to gather information about the surroundings.

Ultrasonic senser: The ultrasonic sensor is mounted on the car to detect obstacles in its path. The Arduino Uno processes the distance data from the ultrasonic sensor and decides whether the car needs to change its direction or stop to avoid collisions. The sensor emits ultrasonic waves and measures the time it takes for the waves to bounce back after hitting an obstacle. This information is used to calculate the distance between the car and the obstacle.

Moter Drive shield:- The Motor Driver Shield acts as an interface between the Arduino and the motors, providing a convenient and efficient way to control the direction and speed of the motors. The Motor Driver Shield receives commands from the Arduino and translates them into signals that regulate the speed and direction of the motors.

GPS Moter:- The GPS tracker in the car continuously determines the vehicle's current geographical coordinates (latitude, longitude, and often altitude). The GPS module communicates with satellites to provide real-time updates on the car's location.

Gera motor:- A gear motor is typically used as part of the drive system to control the movement of the car. The motor's output shaft can be connected to the wheels, allowing for precise control over the car's speed and direction. The gear motor is integral to the car's ability to avoid obstacles detected by sensors like ultrasonic sensors. When an obstacle is detected, the microcontroller can adjust the speed and direction of the gear motor to navigate around the obstacle.

Servo Motor:- Servo motors are commonly used for precise and controlled steering in robotics and vehicles.In the car, a servo motor can control the front wheels, allowing for accurate turning and navigation.The servo motor can be employed to turn the front wheels based on data from obstacle detection sensors like ultrasonic sensors. This allows the car to autonomously navigate around obstacles by adjusting the steering angle in response to detected obstacles.

Male Female Jumber wire:- Using male and female jumper wires in our project aims to enhance flexibility, ease of assembly, and overall manageability during the development and testing phases. They enable a modular and adaptable approach to connecting various components in the system.

Software Requriement

Arduino IDE:-The Arduino Integrated Development Environment (IDE) is essential for writing, compiling, and uploading code to the Arduino board. It's available for various operating systems, like Windows, macOS, and Linux.

Arduino Libraries:- Depending on your project's components and functionality, we need to install specific libraries through the Arduino IDE's Library Manager. For example, the NewPing library for ultrasonic sensor interfacing or TinyGPS++ for GPS functionality.

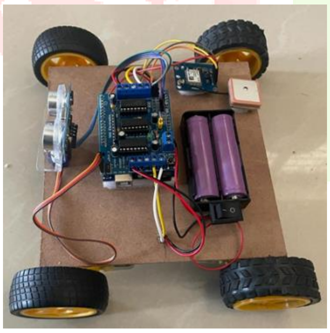
Additional Software for GPS Testing Software like Arduino Serial Monitor or a dedicated GPS data visualization tool to test and monitor GPS data received from your GPS module during development.

App Software:- Additional software is used to control the car. This could include platforms like Android Studio or Blynk for Android app development or Swift or Xcode for iOS app development.

V. RESULTS AND DISCUSSION

The Arduino obstacle avoidance and GPS tracker systems offer enhanced functionality by providing users with valuable insights into the vehicle's surroundings and precise location information. This integration enables applications such as autonomous navigation, where the vehicle can dynamically adjust its path based on real-time obstacle detection and GPS coordinates. Additionally, the system's ability to log GPS data allows for detailed analysis of movement patterns, route optimization, and geospatial mapping. Whether used in agricultural robotics to navigate fields autonomously or in urban environments for delivery drones, this combined functionality enhances efficiency, safety, and accuracy. Overall, the Arduino obstacle avoidance and GPS tracker system represent a powerful tool for researchers, hobbyists, and professionals seeking to develop intelligent, autonomous systems capable of navigating complex environments with precision and reliability.

Fig 5.1 model



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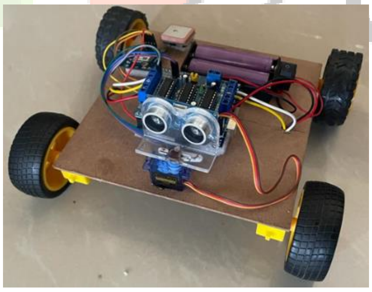

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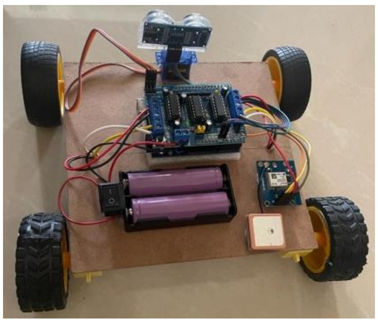
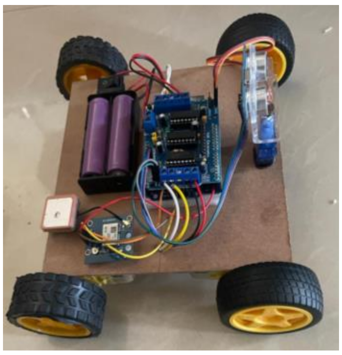


(c)



(d)

The integration of obstacle avoidance and GPS tracking functionalities into an Arduino-based system offers a versatile solution with a wide range of applications. By combining ultrasonic sensors for obstacle detection and a GPS module for location tracking, the system can autonomously navigate its environment while simultaneously logging precise location data. This integration enables the creation of sophisticated projects such as autonomous vehicles or asset tracking systems, where real-time monitoring of location and obstacle detection is essential. Whether deployed in robotics, transportation, or environmental monitoring, the Arduino obstacle avoidance and GPS tracker system provides a flexible and customizable platform for innovation and problem-solving. Through careful implementation and testing, this integrated solution empowers developers to tackle complex challenges and create intelligent, adaptive systems capable of operating effectively in diverse scenarios.

V. FUTURE SCOPE

- Implement machine learning for the car to learn and adapt to different environments.
- Integrate cameras for real-time image or video processing.
- Enhance the communication range of the Wi-Fi system.
- Develop a system where multiple Wi-Fi-controlled cars can collaborate and coordinate their movements.

VI. CONCLUSION

In conclusion, developing a WiFi-controlled car with obstacle avoidance and a GPS tracker presents an exciting intersection of robotics, IoT, and navigation technologies. This project not only addresses the immediate goals of remote control and obstacle detection but also opens avenues for future innovations. The integration of obstacle avoidance ensures a safer and more responsive navigation experience, while the inclusion of GPS tracking enhances the car's ability to provide real-time location information. These features collectively contribute to the adaptability and intelligence of the system. Looking ahead, the future scope of this project includes possibilities for autonomous navigation, AI-driven decision-making, and collaboration among multiple vehicles. The potential applications extend beyond entertainment to include smart home integration, remote monitoring, and educational purposes. As technology evolves, the WiFi-controlled car can serve as a platform for experimenting with new algorithms, sensors, and communication protocols. The customizable nature of the project encourages community involvement, fostering a collaborative environment for innovation. In summary, the WiFi-controlled car with obstacle avoidance and GPS tracking not only fulfills its immediate objectives but also lays the groundwork for a dynamic and evolving system with a broad range of applications in robotics, IoT, and beyond.

REFERENCES

[1] Zhen Feng Li developed an obstacle avoidance wheel design to achieve intelligent tracking, obstacle avoidance, and a multimodule system design.

[2] Rohan Mahajan introduced a wifi control car. The aim of the project is to create a protocol for a smartphone-controlled robot automobile that carries out a variety of tasks for a robot that is extremely strong and adaptable.

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