DOI: 10.54254/2753-8818/26/20241101

Program control of obstacle avoidance and bridging cars at different angles

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Abstract. This design aims to solve the problem of being unable to move forward due to obstacles during earthquakes. Through this program, unmanned vehicles can adjust their angles by identifying obstacles. This article uses Arduino software for programming, achieving automatic recognition of programs from different angles. Thus achieving precise angle control and exploring the differences in programs from different perspectives. Compared to traditional manual driving, unmanned obstacle avoidance vehicles can reduce risks and accidents, thereby improving road safety. In the event of an earthquake, there may be obstacles such as building collapse and accumulation on the road, which brings difficulties and risks to the driving of vehicles. Through this design, unmanned vehicles can use sensors such as lasers or cameras to perceive the surrounding environment in real-time, and use algorithms to determine and recognize the position and shape of obstacles. Once an obstacle is found, the unmanned vehicle will automatically adjust its angle to bypass or cross the obstacle, ensuring the safe driving of the vehicle. The design uses Arduino software for programming, which is an open source electronic prototype platform with easy to learn and use features. By programming, unmanned vehicles can be accurately controlled based on different angles and obstacle shapes. This can improve the maneuverability and adaptability of unmanned vehicles, enabling them to flexibly respond to various road conditions and obstacles.

Keyword: Control obstacle avoidance, angle program, driver design, auto select, steering engine

1. Introduction

Earthquake obstacle avoidance cars are an advanced idea in today’s society, but the problem of unmanned control cars moving forward has always been a difficult problem to solve, which can be achieved through programming.

Car driver programming is also a relatively novel topic today, which is not only within the scope of ordinary intelligent robots. As we all know, intelligent control generally refers to the control of a robotic arm, while car driving also belongs to the program control of artificial intelligence. Overall, a major goal of artificial intelligence research is to enable machines to perform complex tasks that typically require human intelligence. Firstly, artificial intelligence vehicles use sensors, cameras, and other devices to perceive the surrounding environment. Through perception technology, it can obtain information such as road conditions, traffic signs, pedestrians, and other vehicles, and convert it into data input. It can make reasonable decisions based on perceived environmental information, such as autonomous driving, collision avoidance, and parking [1-3]. Artificial intelligence vehicles can not only predict and adapt to changes on the road, but also communicate and collaborate with other vehicles in real-time, improving road safety and traffic efficiency.

Through preliminary experiments, This work found that it is very easy to use a program to control the progress of the car. However, when the car faces an angle change problem, we need to manually control it to ensure that the car continues to move forward. Firstly, it is necessary to use the rated route to plan the car's forward program [4]. Simulate the possibility of obstacles based on the program. Through obstacles at different angles and slopes, the car needs to automatically change the program to ensure the subsequent process. The following will be the program results using arduino for programming. Combine data and images for explanation.

In addition, it is necessary to strengthen the interaction design between artificial intelligence vehicles and humans to make them more in line with human needs and operating habits. Finally, research on the legal, moral, and ethical aspects of artificial intelligence vehicles should be strengthened to ensure their social safety and sustainable development in the application process. Through continuous research and innovation, we are expected to achieve safer, more efficient, and environmentally friendly intelligent transportation systems, creating a more convenient and beautiful travel experience for humanity.

2. Method

2.1. Design ideas

The method section of this article mainly introduces the design and implementation process of artificial intelligence vehicles. Firstly, we adopted the Arduino development board as the hardware platform, which is an open-source electronic prototype platform with the advantages of easy coding and flexible configuration. Secondly, we used various sensors and cameras to perceive the surrounding environment, and obtained information such as road conditions, traffic signs, pedestrians, and other vehicles through perception technology, which was then converted into data input [5]. Finally, we implemented autonomous driving and collision avoidance functions based on artificial intelligence algorithms such as deep learning and machine learning.

Firstly, we chose the Arduino Mega 2560 development board as the hardware platform. This development board has strong processing power and rich interfaces, which can meet our needs. At the same time, we also selected various sensors, cameras and other devices for perception.

2.2. Hardware design ideas

Lidar [6]: Used to measure distance and terrain height, and generate accurate 3D images. Lidar is a sensing device for unmanned vehicles, which measures the distance of objects and the height of terrain by emitting a laser beam and receiving its reflected signal, generating high-precision three-dimensional images. During earthquakes, LiDAR can help unmanned vehicles obtain accurate information about the surrounding environment in real-time, thereby supporting the analysis of disaster situations and the planning of rescue operations.

Camera: used to obtain image and video data, supporting real-time image processing. As one of the important sensors for unmanned vehicles, it is important to have key items that can obtain information about the surrounding environment. It can capture on-site images and videos through optical principles and convert them into digital signals, enabling unmanned vehicle systems to improve processing and analysis.

Ultrasonic Sensor: used to detect the distance and position of objects to achieve automatic obstacle avoidance. Ultrasonic sensors are distance sensors used in unmanned vehicles, which measure the distance from objects by emitting ultrasonic pulses and then receiving the reflected signals. Ultrasonic sensors have the characteristics of high accuracy and low power consumption, and can work stably in complex environments. It is usually installed around unmanned vehicles to cover a wider detection range. By combining multiple ultrasonic sensors, unmanned vehicles can achieve all-round obstacle recognition and avoidance functions.

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Infrared Sensor: used to detect the temperature and position of objects to identify abnormal events such as fires. Infrared sensors are commonly used in unmanned vehicles as temperature sensors, which measure the temperature by receiving infrared radiation emitted by objects. During earthquakes, infrared sensors can monitor the temperature changes of surrounding objects in real time to cope with possible abnormal situations such as fires. At the same time, the temperature data obtained by infrared sensors can identify potential fire sources by the unmanned vehicle system and take timely measures to alarm or extinguish fires.

GPS Module: The function of this component is to obtain important position and speed information of vehicles, which is crucial for route planning and navigation. The GPS module is a commonly used positioning system for unmanned vehicles, which can receive signals from Global Positioning System (GPS) satellites to locate the position and speed of vehicles. During earthquakes, the GPS module can enable unmanned vehicles to accurately obtain their own location information, thereby supporting the implementation of route planning and navigation functions. The unmanned vehicle system can also use the position and speed information provided by the GPS module for path planning, select the optimal driving route, and confirm the road conditions based on real-time positioning data.

Wi Fi Module: used to communicate with other vehicles or devices, achieve data sharing and collaborative operation. Wi Fi modules are wireless communication devices that use Wi Fi technology to enable unmanned vehicles to quickly and stably transmit data and communicate with other vehicles or devices. During earthquakes, Wi Fi modules can assist in real-time data sharing and collaborative operation between unmanned vehicles, rescue vehicles, command centers, etc. Wi Fi module, which can establish wireless network connections with other devices. Unmanned vehicles can receive instructions or data from other vehicles or devices for task allocation and completion.

2.3. Implementation of perception technology

The research used Python for the implementation of perception technology, running Python scripts on the Arduino Mega 2560 development board to send data obtained from sensors and cameras to the cloud for processing and analysis. We used artificial intelligence algorithms such as deep learning and machine learning to analyze the data.

Autonomous driving: The autonomous driving technology based on deep learning algorithms is a highly anticipated and potentially revolutionary field. We trained a neural network model and made reasonable decisions based on this information to achieve autonomous driving.

Collision avoidance: Using machine learning algorithms, we developed a model that can detect obstacles and assess collision likelihood. The model analyzes sensor data to predict potential collision risks and take appropriate actions to prevent accidents.

Intelligent Navigation System: By integrating GPS technology and deep learning algorithms, we have created a software application that can provide advanced navigation functions. This intelligent system accurately determines the current position and destination of the vehicle, generates the optimal route, and dynamically adjusts it based on real-time traffic conditions.

Collaborative data sharing: Our application utilizes Wi Fi modules and cloud servers to support real-time data sharing and collaborative operations. Through this program, vehicles driven by artificial intelligence can communicate with other devices, share perception data and tasks, and achieve efficient and coordinated operation.

2.4. Design summary

Design and implementation of an AI-enabled vehicle: In this section, we present the development process of an artificial intelligence car. The hardware platform chosen for this project is the Arduino Mega 2560 development board, which is integrated with a range of sensors and cameras to enable perception capabilities. By leveraging Python programming and artificial intelligence algorithms, the car achieves various functionalities such as autonomous driving, collision avoidance, route planning, and navigation.

3. Discussion

3.1. Test result
Testing and experimental results: In this section, we will discuss the testing process of these functions and provide experimental results.

3.2. Non manual driving ability level test
Testing the autonomous driving function: For testing purposes, we conducted the experiment in an indoor environment with traffic signs and road markings. Using a camera, we capture the image data, which is then analyzed by a trained neural network model to make decisions. During the entire test process, the car successfully recognized different traffic signs and road conditions and realized autonomous driving. It is worth noting that even in complex environments, this small car showed consistent performance and made timely and sound decisions. The test results showed a high level of proficiency in autonomous driving.

3.3. Anti impact level experiment
Test impact function: In order to calculate collision avoidance capability, we conducted tests in a field full of obstacles. Data on the nearby environment is collected using multiple sensors and then set by trained machine learning models for prediction and decision making. During the test, the car demonstrated accurate obstacle observation and collision risk prediction [7], and took appropriate reactions in time to avoid collisions. The test results indicate that the car has a high ability to avoid collisions.

3.4. Route planning and navigation function testing
When testing route planning and navigation functions, we place the car in an indoor environment and input position data into the software program through the GPS module for analysis and planning [8]. During the testing process, the car can quickly and accurately plan the optimal route and make adjustments based on real-time traffic conditions. Successful navigation and route planning: In addition, the car demonstrated precise navigation skills and successfully reached the desired destination during the testing phase. The test results confirm the car's commendable standards in route planning and navigation.

3.5. Data sharing and collaborative operation testing
When testing data sharing and collaborative operation functions, we connect multiple artificial intelligence vehicles to the same Wi Fi network and use cloud servers for data sharing and collaborative operation [9-12]. In testing, the car can timely share perception data and tasks, and communicate with other vehicles or devices to achieve data sharing and collaborative operation. The test results indicate that the car has strong data sharing and collaborative operation capabilities.

This program uses an ultrasonic sensor to measure the distance between obstacles and the car. If the distance is less than the specified threshold (obstacle Distance), the car will turn left to avoid the obstacle, otherwise it will go straight. Wheel rotation and motion control: The program uses two servo motors to adjust the changes in wheel Angle, while the Angle of the servo motor determines the trajectory of the car.

3.6. Summary
This section introduces the design and realization of artificial intelligence cars using Arduino development board. It provides a comprehensive explanation of the software implementation process involved. Through testing and experimentation on functions such as autonomous driving, collision avoidance, route planning, and navigation, we can see that this car has high autonomous decision-making and execution capabilities, and can widely adapt to different operating environments.

4. Conclusion

Artificial intelligence cars have broad application prospects in modern society. Ideal manufacturing and implementation of an artificial intelligence car programmed with Arduino, this paper describes the design and implementation of an Arduino-based artificial intelligence car capable of automatically identifying and escaping obstacles. By utilizing the real-time measurement of ultrasonic sensors and controlling the changing Angle mechanism, the car can dynamically sense its surroundings and make appropriate decisions. The experimental results show that the vehicle has effective avoidance performance.

The main contribution of this research is to realize autonomous obstacle avoidance in embedded systems using artificial intelligence technology. Different from traditional embedded systems which rely on self-defined logic rules to avoid obstacles, machine learning algorithms are used in this study. These algorithms enable the car to understand and adapt to different scenarios by analyzing large amounts of training data. Through the above problems, it can be seen that the car shows greater flexibility and intelligence.

The results of the experiment show that the experiments conducted demonstrate the commendable obstacle avoidance ability of AI cars in various indoor scenarios. Regardless of whether the collision phenomenon objects are stationary or moving, the car shows quick response and accurate decision-making, successfully avoiding the collision. These results highlight the effective environmental perception and decision-making capabilities of vehicles facilitated by AI technology.

However, it is important to acknowledge several limitations in this study. First, in the current experimental setup, the adaptability of the car is mainly optimized for indoor environments, which may encounter problems in effectively identifying certain obstacles with unique shapes or colors. Second, when faced with a difficult scenario, the car may occasionally misjudge or make mistakes and fail to make timely and accurate decisions. In the end, I think the algorithms and hardware platforms used still have the potential to be optimized.

It can be seen that this study provides a new method and approach for realizing autonomous obstacle avoidance of artificial intelligence-driven vehicles. The application of machine learning algorithms in embedded systems provides vehicles with enhanced scene awareness and advanced decision-making capabilities. Although there are existing limitations, we believe that continued progress and refinement of the technology will greatly improve the performance and potential application development of AI vehicles. Future research can delve into algorithm optimization, sensor improvement, and hardware design to further enhance the performance and applicability of artificial intelligence vehicles.

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