IDENTIFICATION AND PREVENTION OF PITFALLS ON ROAD USING ADVANCED ROBOTIC SYSTEM

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Abstract
Robotics is an interesting and fast-growing field. Being a branch of engineering, the applications of robotics are increasing with the advancement of technology. In robotic car, real time obstacle detection and obstacle avoidance are significant issues. In this study, design and implementation of a robotic car have been presented with regards to hardware, software and communication environments with real time obstacle detection and obstacle avoidance. Arduino platform, android application and Bluetooth technology have been used to implementation of the system. In this paper, robotic car design and application with using sensor programming on a platform has been presented. This robotic device has been developed with the interaction of Android-based device. Arduino Uno has been used as the robot's brain. The robot has many hardware components such as Bluetooth module, PIR sensor, ultrasonic sensor, and buzzers. It also consists of the software component that uses a mobile application. The desired direction or mode by mobile application can be selected by the user of the robotic car to control the movement of the car. The user can control the robot movements from his/her own intelligent device or take the robot in automatic mode and let the car drive its own way. Thus, the robot can flee from the obstacle and also detect live objects. The purpose of this article is to alert the civilian and military personnel to potential terrorist attacks especially in military areas with live detectable sensors. The concept of Mobile Robot is fast evolving and the number of mobile robots and their complexities are increasing with different applications.

Keywords: Robotics, Arduino platform, Sensor Programming.

I. INTRODUCTION

The application and intricacy of portable robots are gradually developing each day. They are bit by bit making their way into true settings in various fields, for example, military, restorative fields, space investigation, and ordinary housekeeping [1]. Movement being an indispensable normal for portable robots in snag evasion and way acknowledgment majorly affects how individuals respond and see a self-governing framework. This empowers a self-sufficient robot to have the capacity to explore starting with one spot then onto the next without human mediation. PC vision and range sensors are essential item recognition techniques utilized in versatile robots' location. PC vision as a snag location technique is increasingly thorough and costly system than the range sensors' technique. In any case, most business self-sufficient robots use extend sensor to identify snags. The utilization of radar, infrared (IR) sensor and ultrasonic sensor for building up a snag location framework had begun as ahead of schedule as the 1980's [2]. Despite the fact that, subsequent to testing these advancements it was presumed that the radar innovation was the most reasonable for use as the other two innovation choices were inclined to natural imperatives, for example, downpour, ice, snow, residue and soil. The radar approach was additionally a very practical innovation both for the present and what's to come. [3] introduced a technique

utilizing a solitary charge-coupled gadget (CCD) camera in combination with a roundly molded bended reflector which empowers ultra-wide edge imaging. The sensors are not restricted to hindrance location. Different sensors might be used to extricate distinctive highlights in plants for plant portrayal, enabling an independent robot to give the appropriate compost in the correct adds up to various plants as clarified by [4]. [5] likewise made utilization of cameras to help route and snag recognition for a robot in seeking for shooting stars on the Antarctic landmass. [6] utilized stereo vision to help in dead retribution for planetary meanderers. [7] utilized (five) CCD cameras for surveillance and reconnaissance on All-Terrain Vehicles. The significant disadvantage of stereo vision is the requirement for a satisfactory enlightenment for obstruction identification. Because of this deficiency, cameras are frequently utilized as a reinforcement talked about in [8, 4, 9]. In [10, 11, 12, 13, 14], sonar was utilized for vehicle limitation and route individually. [15] built up a calculation for hindrance recognition and shirking utilizing a sonar ring put around the robot. Sadly, the significant disadvantage of sonar is that a solitary sensor is lacking to get enough data about condition around a self-governing vehicle. As a rule, a few rings of sonar sensors are associated together for ideal execution as introduced in [16, 17, 18, 19].

This is generally awkward and costly for usage. In any case, in spite of the previously mentioned confinements, sonar is as yet a decent security net for deterrent identification. Additionally, the utilization of vision and laser scanner for unmanned ground vehicle to evade impediment has been introduced in [20]. Bolster Vehicle machine (SVM) has been proposed by [21] for making nearby way for an unmanned ground vehicle. Additionally, the advancement of an unmanned ground vehicle framework for remote-controlled reconnaissance has been displayed by [22]. An unwavering quality and disappointment tests in unmanned ground vehicle has been conveyed out in [23]. An examination on the utilization of modern robot in different ventures in America has been directed in [24, 25]. At long last, the utilization of ultrasonic sensor for a snag shirking robot vehicle to make an unmistakable way for headway has been displayed in [26]. The focal point of this examination is set on structuring a basic, practical deterrent evasion independent framework utilizing Two (2) sets of heterogonous sensors and assess its execution.

II EXISTING SYSTEM

There are many types of mobile robot navigation techniques like path planning, self localization and map interpreting. An Obstacle Avoiding Robot is a type of autonomous mobile robot that avoids collision with unexpected obstacles.

III PROPOSED SYSTEM

The compositions of the hardware components and software implementations used for designing and constructing the project. The fabrication of the chassis and casing of the system are also discussed.

Hardware design

The system consists of Power supply unit, IR led receiver sensor pair, Ultrasonic Sensor, Arduino Microcontroller and the Geared DC Motors. The Arduino Uno is a microcontroller board based on the ATmega328. It consists of 14 digital input/output (I/O) pins (6 of the pins can be used as PWM outputs), 6 analogue inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. This is a preferred choice because of its power consumption and relatively cheap. Two types of sensors were used namely: the ultrasonic and infrared sensor in order to improve on sensitivity and reliability of existing systems.

The infrared sensor uses the principle of reflection of incident light ray for detection of an obstacle.

An ultrasonic HC-SR04 whose primary function is to send a ping signal at regular intervals and wait for response. Two sets of power supply were used in the system, a 9V volt battery which supply power to the microcontroller module and a 12V source regulated to 5V which was used to power the infrared and ultrasonic sensor. The circuit was designed using Proteus8.5

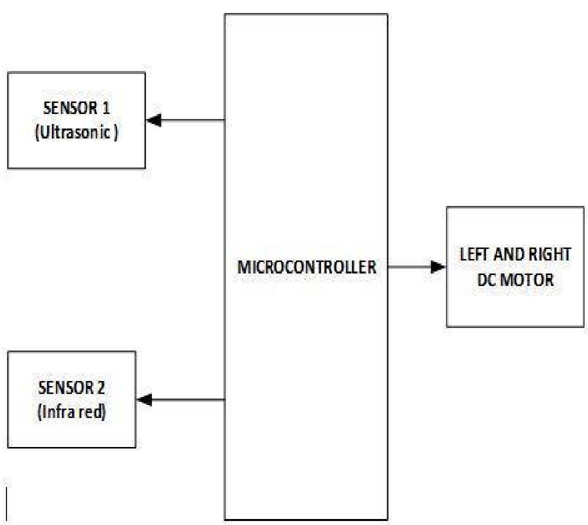

Fig. Block diagram of the system.

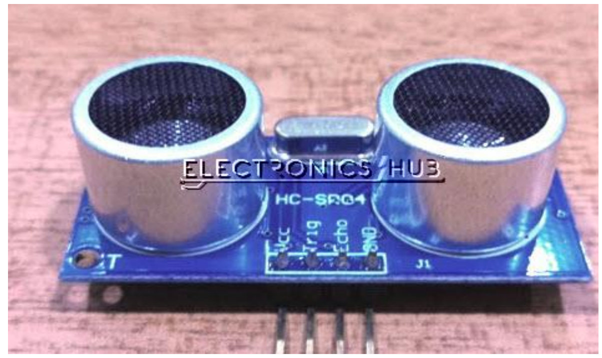

Fig: HC-SR04 Sensor

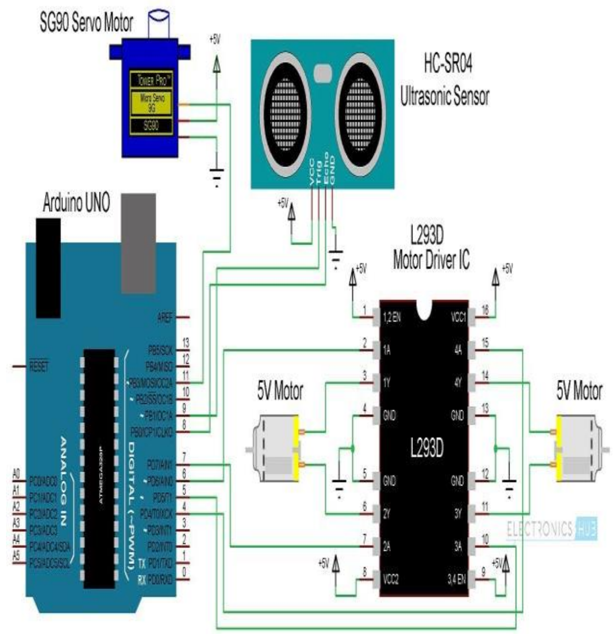

Fig: Schematic diagram of the system in Proteus.

IV METHODOLOGY

DATA COLLECTION

Data collection was possible through the use of two different sensors which were placed to read data from the environment and send digital information to the microcontroller which then reads the data and carries out the necessary instructions as designed by the users. The sensors for collecting data include the IR sensor module and the Ultrasonic sensor.

The IR sensor module consists of an IR emitter and an IR receiver placed side by side and when a reflection is received the IR receiver sends a low output and a high output when an input signal is received. Hence, a pair of the IR sensor module is placed at the bottom of the frame work to face the ground and monitor just above the grass level for any obstacle on the path that the robot should be following, an IR sensor module is also placed at an opening at the front of the robot as an obstacle detection to identify when an obstacle is on the path. A single Ultrasonic Sensor is also placed just on top of the robot high enough to follow the pavement of the lawn to avoid hitting the lawn, the microcontroller reads the distance of the pavement from the ultrasonic sensor and turns right and left after each time it reaches the end of the wall.

SIGNAL PROCESSING

The outputs from all sensors used on the board are all connected to the Arduino microcontroller board. Since the data obtained from the sensors are digital i.e. the IR sensor module sends a high bit signal when no reflection is received. These are the input devices used in the vehicle avoidance system and since they are digital, they are connected to the digital pins of the Arduino. On receiving these data from the sensors, the Arduino microcontroller is able to decide on what decisions to make with the data using a set of instructions that have been put into the memory. The output devices in control by the Arduino microcontroller are dc motors to control direction of car and for the blade cutting the grass.

Chassis design and fabrication

A sketch of the car was designed using Autodesk investor software shown in Figure-5. During this design process, various modifications were made to the sketch and errors were corrected to enable proper meshing of parts and simulation.

The design was fabricated using Aluminum plate with a thickness of 1mm. The robotic frame work is triangular shape with two rear wheels and a front wheel. The rear wheels are made up of plastics, which are attached directly to the servo motor.

V CONCLUSION

This paper exhibited a straightforward, practical hindrance recognition and evasion framework for an unmanned land mover. Two sets of heterogonous sensors were utilized to recognize obstructions along the way of the versatile robot. A level of precision and least likelihood of disappointment were gotten. The assessment on the independent framework demonstrates that it is fit for staying away from obstructions, capacity to keep away from impact and change its position. It is clear that, with this structure greater usefulness can be added to this plan to perform different capacities with practically no mediation of people. At long last, the robot was made to be remote controlled utilizing an IR recipient and a remote controller. This task will be useful in threatening condition, barrier and security segments of the nation.

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