Realization of Self Driving Vehicle with Microcontroller

M.Gowthami[1], Pazhanivel.R[2], Bhuvankumar.R[3], Muruganandam. K[4]
Assistant Professor[1], Department of Computer Science and Engineering
Vel Tech High Tech Dr Rangarajan Dr Sakunthala Engineering College, Avadi, Chennai, Tamilnadu
UG Scholar[2, 3, 4], Department of Computer Science and Engineering
Vel Tech High Tech Dr Rangarajan Dr Sakunthala Engineering College, Avadi, Chennai, Tamilnadu
gowthamim@velhightech.com, bhuvankumar.rbk@gmail.com,
pazhanivel1796@gmail.com, muruganand@gmail.com

Abstract-**The main objective of this project is to design, analyses and implement an autonomous vehicle using microcontroller.This project is carried out with slight modification from Waymo which is designed and executed by Google. Though this model is successful, the design had some other disadvantages, for example, the liar technology cannot spot some potholes or discern when human, such as the police officer, are signaling the car to stop. [1]The robotic cars of Google use liar system. Another design known as Amazon Prime Air is a cargo airline and conceptual drone-based delivery system currently in development by Amazon.com.This will use multicolor Miniature Unmanned Air Vehicle (miniature UAV), otherwise known as Drone, technology to autonomously fly individual packages to customer's doorsteps within 30 minutes of ordering. [2]Implementation of autonomous vehicle with microcontroller is all about a robot making decision on its own. The brains of the robot will be a microcontroller-Arduino. This model has several advantages such as less human resource, faster transportation and quicker react time.**

Keywords-**Autonomous vehicle, Drone based delivery system, Miniature unmanned air vehicle (miniature UAV), Arduino**

INTRODUCTION

Self-Driving Autonomous vehicle is a transport medium without any human intervention. The title itself is enough to acknowledge the core concept .Every mighty company like Google, Amazon are working on this project. Both of these are autonomous making use of machine learning algorithm.

Fig.1 an Autonomous Vehicle

REQUIREMENTS

The hardware requirements of the project implementation of autonomous vehicle with microcontroller includes Arduino UNO/mega, PS module, Ultrasonic sensor/IR sensor and servos,motors,chassis,etc.,

Arduino Uno R3

Arduino is open-source hardware. Arduino is a PC equipment and programming organization, venture, and client group that outlines and produces microcontroller units for building computerized gadgets and intelligent articles that can detect and control protests in the physical world.

Fig.2 Arduino Uno R3

GPS Module Arduino

The NEO-6 module arrangement is a group of remain solitary GPS recipients highlighting the elite u-bloc 6 situating motor. Their minimal design and power and memory choices make NEO-6 modules perfect for battery worked cell phones with exceptionally strict cost and space limitations. Current electrical power into mechanical power. The most widely recognized sorts depend on the strengths delivered by attractive fields**.**

DC Motor

A DC engine's speed can be controlled over a wide range, utilizing either a variable supply voltage or by changing the quality of current in its field windings.

Fig.3 DC Motor

Fig.4 GPS Module Arduino

Ping Sensor

Ultrasonic sensors (otherwise called handsets when they both send and get, however more for the most part called transducers) chip away at a guideline like radar or sonar which assess properties of an objective by translating the echoes from radio or sound waves individually. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

Fig.5 Ping Sensor

The software requirements include Arduino IDE, Eclipse IDE and Google map API.

RELATED WORK

Waymo, the Google self-driving car project-stands forward in mobility. Google's self-driving car just got way better at driving themselves

Fig. 6 Waymo-Google's self-driving car

Waymo, Google's new self-driving car company, reported a huge drop in disengagement in 2016 despite an almost equally huge increase in the number of miles driven. Google says that since 2015 Way MO's rate of safety-related disengages as fallen from 0.8 per thousand miles to 0.2 per thousand miles in 2016.

Amazon has developed Prime Air-a delivery system which is designed to get packages to customers in 30 minutes or less using unmanned aerial vehicles(aka drones).The five major limitations of amazon air prime includes the battery life, protection, delivery, weather and timing.

Fig. 7 An overview of Amazon Prime Air

PROPOSED WORK

The implementation of autonomous vehicle is carried out using a microcontroller in this project. A microcontroller is a small computer on a single integrated circuit. It is a system on a chip or Sochi contains one or more CPUs along with memory and programmable input/output peripherals. Microcontrollers are used in automatically controlled product and devices, such as automobile engine control system, implantable medical devices, remote control, office machines, appliances, power tools, toys and other embedded systems.

ISSN (ONLINE):2395-695X
ISSN (PRINT): 2395-695X

International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST)
Vol.3, Special Issue.25, February 2017

Software Part

The prototype model of this project gets the destination point from the user and forms a path (shortest path with the help of A* search algorithm).This user interface (UI) is designed in eclipse with java. For each turn to take the system instructs the vehicle accordingly.

Hardware Design

The hardware is designed in such a way that it automatically detects obstacles and finds a way ahead. The GPS module on it helps positioning the vehicle.

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world.

WORKING

The Autonomous vehicle with a microcontroller is all about making decision on its own without any human intervention. The brain of the robot will be Arduino. The autonomous vehicle is moved from source to destination by using the GPS module. The GPS module automatically senses the source of the vehicle and the destination is given by the user. Obstacle avoidance plays a major role during transporatation.This module includes two ultrasonic SR-04 sensor compatible with Arduino Uno. Ultrasonic sensor has four pins power (5V), ground, trigger, and echo. When the trigger is set high, the sound waves are emitted. Then the trigger set to low. After that to receive the emitted sound waves, the echo pin is set to high. Christo Ananth et al. [5] discussed about Intelligent Sensor Network for Vehicle Maintenance System. Modern automobiles are no longer mere mechanical devices; they are pervasively monitored through various sensor networks & using integrated circuits and microprocessor based design and control techniques while this transformation has driven major advancements in efficiency and safety. In the existing system the stress was given on the safety of the vehicle, modification in the physical structure of the vehicle but the proposed system introduces essential concept in the field of automobile industry. It is an interfacing of the advanced technologies like Embedded Systems and the Automobile world. This "Intelligent Sensor Network for Vehicle Maintenance System" is best suitable for vehicle security as well as for vehicle's maintenance. Further it also supports advanced feature of GSM module interfacing. Through this concept in case of any emergency or accident the system will automatically sense and records the different parameters like LPG gas level, Engine Temperature, present speed and etc. so that at the time of investigation this parameters may play important role to find out the possible reasons of the accident. Further, in case of accident & in case of stealing of vehicle GSM module will send SMS to the Police, insurance company as well as to the family members.

DESIGN AND ARCHITECTURE

The design process for implementation of autonomous vehicle in this project is prepared using a microcontroller. As the magnetometer is sensitive to electrical interference, it must be

positioned in such a way that the DC motors does not affect the readings of the compass in any way. With the current location from the GPS and the current heading from the compass, we calculate the path to our destination.

- The basic algorithm behind it will be
- Go fast if no obstacles were found
- Turn left if the right ping detects obstacles and is far.
- Reverse to right and move left if right ping detects obstacles and is near,
- Turn right if the left ping detects obstacles and is far,
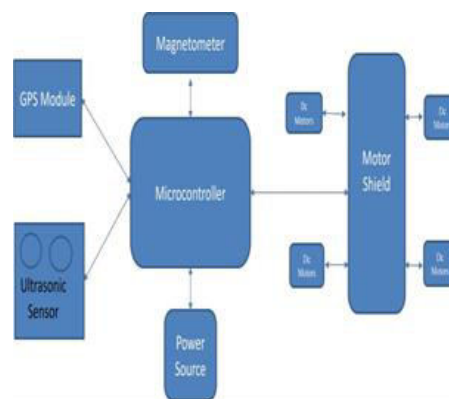

Fig. 8 Architecture

- Reverse to left and move right if left ping detects obstacles and is near,
- Slow down if both the ping detects obstacles and is far,
- Stop if both the ping detects obstacle and near.

RESULT AND CONCLUSION

This paper presents an autonomous self-driving vehicle which is designed using a microcontroller.This use of microcontroller Arduinomakes the project unique and effective. The autonomous vehicle thus designed can handle any kind of obstacles on road. The DC motors used in this model helps the system in providing higher starting torque and fairly constant speed. These motors are made used in fans, pumps, lifts, etc., in order to produce uniform speed.

The GPS module made used in this project uses the Global Positioning System to determine and track precise location and its carrier at intervals. This project has certain properties as that ofWaymo and Air prime by Google and Amazon respectively. But unlike these two models the designed model will be able to recognize any kind of obstacles in its way, in this way it is unique from the other models. The only disadvantage of this model is that it would not be able to stop at any traffic light signals and hand signals. This Autonomous car with microcontroller is very much efficient, cost effective and also time consuming. The disadvantage of this model could be surely cleared on further experimentation.

REFERENCES

[1] Base paper- Tong chen, Ruili Wang, Bin Dai, Liu, and Jinee song, "Likelihood-Field-Model-Based Dynamic Vehicle Detection and Tracking for Self Driving,"VOL17,NO.11,NOV 2016.

[2] Lee Gomes (August 28, 2014). "Hidden Obstacles for Google's Self-driving Car"

[3] "Amazon Unveils Futuristic Plan: Delivery by Drone". *Sinews*. 1 December 2013.Retrieved 6 May 2014.

[4] Lassa, Todd (January 2013). "The Beginning of the End of Driving". Motor Trend. Retrieved 1 September 2014.

[5] Christo Ananth, C.Sudalai @ UtchiMahali, N.Ebenesar Jebadurai, S.Sankari@Saranya, T.Archana, "Intelligent sensor Network for Vehicle Maintenance system", International Journal of Emerging Trends in Engineering and Development (IJETED), Vol.3, Issue 4, May 2014, pp-361-369

[6] Zhu, Wentao; Miao, Jun; Hu, Jiangbi; Qing, Laiyun (2014-03-27). "Vehicle detection in driving simulation using extreme learning machine". *Neurocomputing*. **128**: 160–165. Doi: 10.1016/j.neucom.2013.05.052.

[7] Justin Lahart (27 November 2009). "Taking an Open-Source Approach to Hardware". The Wall Street Journal. Retrieved 7 September 2014.