International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 39 (KCCEMSR) (March 2016), PP. 87-90

DRIVERLESS CAR

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Abstract-**This paper introduces an innovative solution to develop smart and efficient vehicle without human interference using wireless camera and an Infrared sensor. The project provides an important introduction to the vast field of otherwise unknown driverless car analysis using the concept of image and video processing and communication via wireless ZigBee module.**

***Keywords*- centroid, image processing, obstacle avoider sensor, relay driver, wireless camera, WPAN, ZigBee, etc.**

I. INTRODUCTION

This is a different and a very potential subject which specializes in automated vehicular movement without human interference. The project topic strongly suggests a very vast and a very familiar in context and theory but difficult in application based area of development. Also it should be noted that as this being a very notable but a very huge area for commendable research, it is only justifiable that we, with this topic as our project would try to solve or improve only a very small part of the whole autonomous car system research. The main purpose of developing this type of vehicle is to reduce human errors which cause loss to property and for the most important loss of human life [4]. Thus, by using such important concepts to provide better assistance to the daily lives of every human, we can make a contribution to saving people's lives and also provide safety on our roads. The main motive of our project is for the vehicle to be able to navigate its own path on our city roads. For such an application we would require image processing using wireless camera which would help us in providing with the input to our system feed. We have regarded this project as a vision based navigation system with obstacle avoidance using image processing with wireless camera and IR sensor. We have divided this project mainly into two contexts. The first would be the vehicle itself and the other would be the system module to control and help in maneuvering the system. The car would consist of a set of 4 wheels controlled by dc motors along with a circuit to send information to the outside module. The car would consist of a wireless camera and an IR sensor which would help in navigation. The signal from the vehicle would be sent to the outside module to check for credibility and thus would be directed and sent back as the control signal would then either allow or disallow the vehicle to move forward. This project stands as a basic navigation system based vehicle movement and we, with it, would try to contribute a small but notable maneuvering system to the driverless car research community. [1]

II. COMPONENT DESIGN

A. Base.

It is the main frame of the robot which holds the micro controller, a 12 reduction gear dc motor and the other components to be transported. It is made of low density materials so that they have low weight and high strength to suit the required needs. It is made of aluminum, in order that overall weight of the robot is reduced.

B. Microcontroller

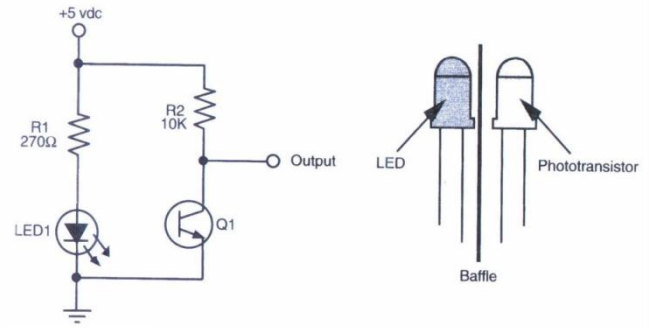
It is the main component of the robot. It plays an intermediate role between the image processor and the motor. Each of the motor receives separate signal from the micro controller depending on the signal received from the image processor. Now the obtained image is processed using the programmed algorithm. It converts the obtained image into its binary color and its complement. Centroid and centre of the image is obtained and compared and depending on the result generated the robot is tracked. The ATmega16 is a low-power CMOS 8-bit micro controller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz allowing us, the system designers to optimize power consumption versus processing speed.

C. Wireless Camera

The camera is the basic requirement in this method because the movement of the path follower robot depends on the output of the camera the wireless camera is so mounted on the vehicle so as to provide a full and wide view of the terrain in front of the vehicle. Here only one camera is used

which is placed in front of the robot at a tilt down position so as to capture the track.

D.IR Sensor

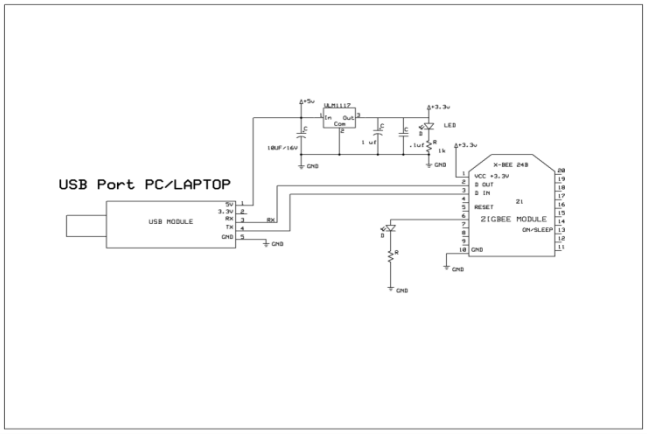


The basic design of the infrared proximity sensor.

A Photodiode is a p-n junction or p-i-n structure. When an infrared photon of sufficient energy strikes the diode, it excites an electron thereby creating a mobile electron and a positively charged electron hole. If the absorption occurs in the junction's depletion region, or one diffusion length away from it, these carriers are swept from the junction by the built-in field of the depletion region, producing a photocurrent. Photodiodes can be used under either zero bias (*photovoltaic mode*) or reverse bias (*photoconductive mode*). Reverse bias induces only little current (known as saturation or back current) along its direction. But a more important effect of reverse bias is widening of the depletion layer (therefore expanding the reaction volume) and strengthening the photocurrent when infrared falls on it.

E. ZigBee Module

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios. The technology defined by the ZigBee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or Wi-Fi. Applications include wireless light switches, electrical meters with in-home-displays, traffic management systems, and other consumer and industrial equipment that require short-range low-rate wireless data transfer. [8]



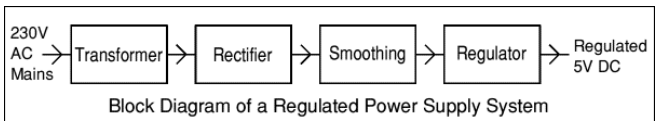
Its low power consumption limits transmission distances to 10–100 meters line-of-sight, depending on power output and environmental characteristics. ZigBee devices can transmit data over long distances by passing data through a mesh network of intermediate devices to reach more distant ones. ZigBee is typically used in low data rate applications that require long battery life and secure networking. ZigBee has a defined rate of 250 Kbits/sec, best suited for intermittent data transmissions from a sensor or input device.

F. Relay Driver

The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. All devices feature open–collector outputs and freewheeling clamp diodes for transient suppression. The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS.

G. Power Supply

Power supply is the first and the most important part of our project. For our project we require +5V regulated power supply with maximum current rating 500Ma.
Following basic building blocks are required to generate regulated power supply.



Block Diagram of a Regulated Power Supply System

III. WORKING

The path follower robot proposed in this paper is guided with the help of machine vision. The camera that is placed in front of the robot captures the track to be followed by the path follower robot. Now the obtained image is processed in the image processing software using the programmed algorithm. The RGB image obtained from the camera is first converted into a gray scale image. Then the gray scale image is converted into its binary image and the complement of the binary image is taken. The complementary of the binary output is in such a way that the background is black in color and the track is white in color. Then the Centroid of each image is calculated and is compared with the centre of the image. If the Centroid of the image coincides with the centre of the image the line follower robot is programmed to go straight. If Centroid of the image is shifted to the right of left from the centre of the image the robot is programmed to take a right or left turn. Thus the path follower robot is guided along its track. It is clear that the Centroid for straight path coincides with the centre of the image. The Centroid for the left curve is less than the centre of the image and the Centroid of the right curve is greater. Thus depending on the position of the Centroid with respect to the centre of the image the robot is made to move. [2]

Similarly, for obstacle avoidance, an IR sensor is mounted on the bot to sense the road in front of it. If came across any obstacles, the bot will automatically stop. As the obstacle is removed from its path, the bot automatically accelerates forward and continues its course. All this is possible with the help of the ZigBee module and Visual Basic 6. Hence, all this is done wirelessly without the need of mounting the laptop or handheld device on the bot. [3] [6]

IV. ADVANTAGES & LIMITATIONS

A. Advantages

An increase in the use of autonomous cars would make possible such benefits:

[1] Fewer traffic collisions, since unlike a human driver with limited situational awareness, an autonomous car can continuously monitor a broad range of sensors (e.g. visible and infrared light, acoustic including ultrasound) both passive and active (LIDAR, RADAR) with a 360° field of view and thus more quickly determine a safe reaction to a potential hazard, and initiate the reaction faster than a human driver.

[2] Increased roadway capacity and reduced traffic congestion due to reduced need for safety gaps and the ability to better manage traffic flow.

[3] Relief of vehicle occupants from driving and navigation chores.

[4] Removal of constraints on occupants' state – in an autonomous car, it would not matter if the occupants were under age, over age, unlicensed, blind, distracted, intoxicated, or otherwise impaired.

[5] Elimination of redundant passengers – the robotic car could drive unoccupied to wherever it is required, such as to pick up passengers or to go in for maintenance. This would be especially relevant to trucks, taxis and car-sharing services. [7]

B. Limitations

In spite of the various benefits to increased vehicle automation, some foreseeable challenges persist:

[1] Liability for damage.

[2] Resistance by individuals to forfeit control of their cars.

[3] Software reliability i.e. the software can be easily hacked.

[4] Implementation of legal framework and establishment of government regulations for self-driving cars.

[5] Loss of driving-related jobs.

[6] Self-driving cars could potentially be loaded with explosives and used as bombs. [5]

CONCLUSION

In this new era, where we are rapidly moving towards a smarter globe, it is also important to focus on smart and efficient human transportation with increasing population. Especially in Asian countries like India where we are facing transportation and traffic crisis, this unmanned automotive driverless car will be an important breakthrough in providing us with apt solutions in traffic congestion and pollution free driving experience. We, with this project, have tried to create a small but advantageous role in improving transportation without human interference.

V. REFERENCES

[1]Vision based Navigation system on Mobile Robot using obstacle Avoidance by single camera vision and Ultrasonic sensing by Akihisa oya (Intelligent Robot Laboratory-University of Tsukuba) and Akio Kosaka(Purdue university).

[2] Murat Tekalp, "*Digital Video Processing*", Pearson, 2010.

[3] Gonzales and Woods, "*Digital Image Processing*", Pearson Education, India, Third Edition.

[4] Speeding into the future: Self-Driving cars are the future of smart transportation. Time Magazine Inc.

[5]"Visual slam for driverless cars: A brief survey", AM Lopez, Dr. Cynthia Barnhart.

[6]"Autonomous ground vehicles-concepts and path to the future"-Dr. Marissa Mayer.

[7] Harvard University Gazette.

[8] Vijay K Garg, "*Wireless Communication and Networking*", Morgan -Kaufmann Series in Networking—Elsevier.