



COLLISION AVOIDANCE SCHEME USING EMBEDDED SYSTEM

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Abstract: Collision Avoidance Systems, this is an alternative step to avoid collision, are one of the great challenges in the area of active safety for road vehicles. In India the total annual deaths due to road accidents has crossed 1.18 lakhs, according to the latest report of National Crime Records Bureau (NCRB). If these deficiencies are not controlled at early stages they might cause huge economical problems affecting the road side networks. The main part of the work was to carry out a feasibility study on vehicle collision avoidance system using wireless sensor networks. The collision avoidance can be done by Ultrasonic ping sensor. Vehicle collision avoidance system can be identified by using Ultrasonic sensor which will be connected to the car at four sides with the LCD and to an Android mobile (via Bluetooth) to show the top view of the car.

I. PROBLEM STATEMENT

According to a recent World Health Organization report, India has the highest number of road deaths in the world: 105,725 died last year on its roads, followed by China (96,611), the US (42,642) and Russia (35,972). The United Kingdom had 3,298 recorded road deaths. Worldwide, 1.3 million lives were lost.

In India, an accident happens every 60 seconds and every 3.7 minutes, to be precise; a road mishap snuffs out a life.

Driver's fault accounted for a whopping 77.5% of the total road accidents while pedestrian and cyclist's fault accounted for a mere 3.7%.

As Collision Avoidance System is already been developed but in high cost vehicles, In India most of the people can afford the low cost vehicles.

So, we have designed this system which can be installed in any vehicle with an affordable cost and we can have accident free roads as well as lives can be saved.

II. INTRODUCTION

Although there have been a number of technological innovations in vehicle safety, the number of accidents continues to rise. This is especially true for intersection accidents. It has been reported that nearly 30% of the reported accidents in the India are due to intersection collision. Intersection areas are equipped with traffic signals or stop signs. As a result, it is recommended that an intersection collision warning system be implemented as a part of vehicle safety systems, thus reducing the number of accidents. To be most effective, such a system should have the capability of supporting real time systems that can warn potential drivers of an impending collision. It also should be adaptable to different types of intersections. Vehicle collision avoidance system can be identified by using Ultrasonic sensor. Ultrasonic sensor will be connected to the AVR board which will be connected to it. Ultrasonic sensor is connected to the all sides of the car and sends the information via Bluetooth to the Android mobile and transmits the message to the LCD output on the driver side. Actually, in this project we consider the distance by using an Ultrasonic Sensor and an Android Application in the system to avoid an accident. The system was designed to prevent the driver and passenger inside the vehicle gets an accident by detecting the object in front of vehicle in the safe distance. The system operates by using ultrasonic sensor which detects the object or vehicle in distance that we set in front our vehicle where the vehicle is at high speed.

III. OVERVIEW OF EMBEDDED SYSTEMS

An embedded system is one that has computer-hardware with software embedded in it as one of its most important component. It is a dedicated computer-based system for an application(s) or product. It may be either an independent system or a part of a larger system. As its software usually embeds in ROM (Read Only Memory) it does not need secondary memories (Secondary memory (magnetic memory located in hard disks, diskettes and cartridge tapes and optical memory in CD-ROM) as in a computer. An embedded system has three main components:

1. It has hardware.

2. It has main application software. The application software may perform concurrently the series of tasks or multiple tasks.

3. It has a real time operating system (RTOS) that supervises the application software and provides a mechanism to let the processor run a process as per scheduling and do the context-switch between the various processes (tasks). RTOS defines the way the system works. It organizes access to a resource in sequence of the series of tasks of the system. It schedules their working and execution by following a plan to control the latencies and to meet the deadlines. [Latency refers to the waiting period between running the codes of a task and the instance at which the need for the task arises.] It sets the rules during the execution of the application software. A small-scale embedded system may not need an RTOS.

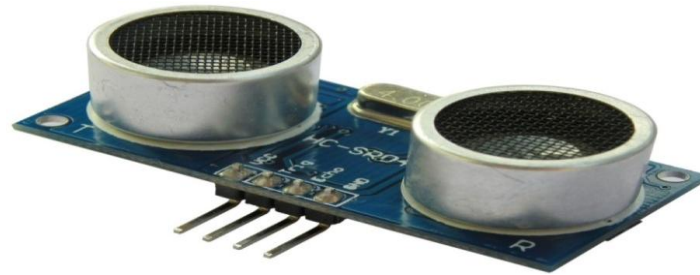
An embedded system has software designed to keep in view three constraints:

- Available system memory.
- Available processor speed.
- The need to limit power dissipation when running the system continuously in cycles of wait for events, run, stop and wake-up.

IV. OVERVIEW OF ULTRA SONIC SENSOR

Ultrasonic sensors (also known as transceivers when they both send and receive, but generally called transducers) work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensor calculates the time interval between sending the signal and receiving the echo to determine the distance to an object.

ULTRASONIC SENSOR

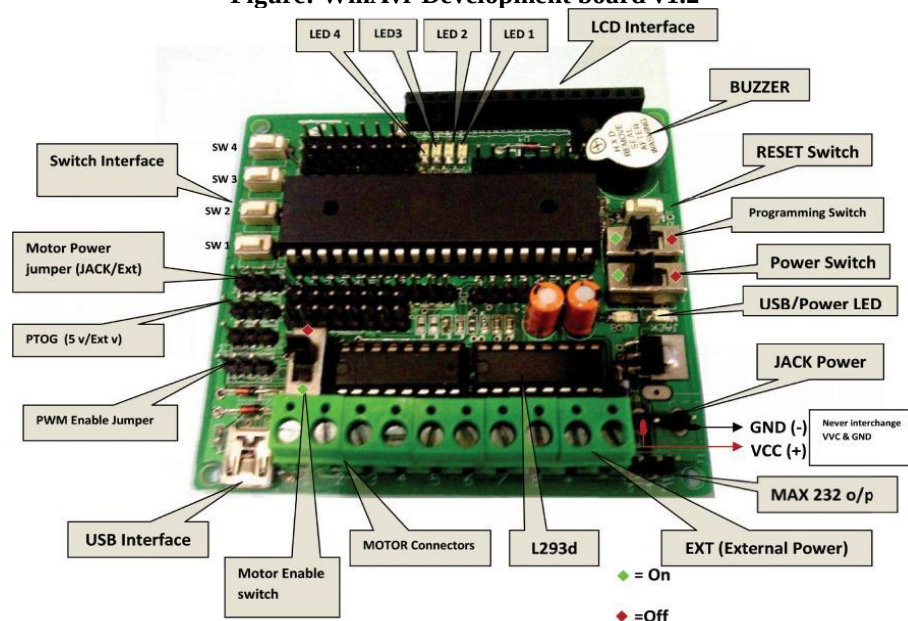


V. FEATURES OF ULTRASONIC SENSOR

- Compact and light-weight
- High sensitivity and high sound pressure
- High reliability

VI. REQUIREMENTS

Figure: WinAvr Development board v1.2



1. About the Dvp Board

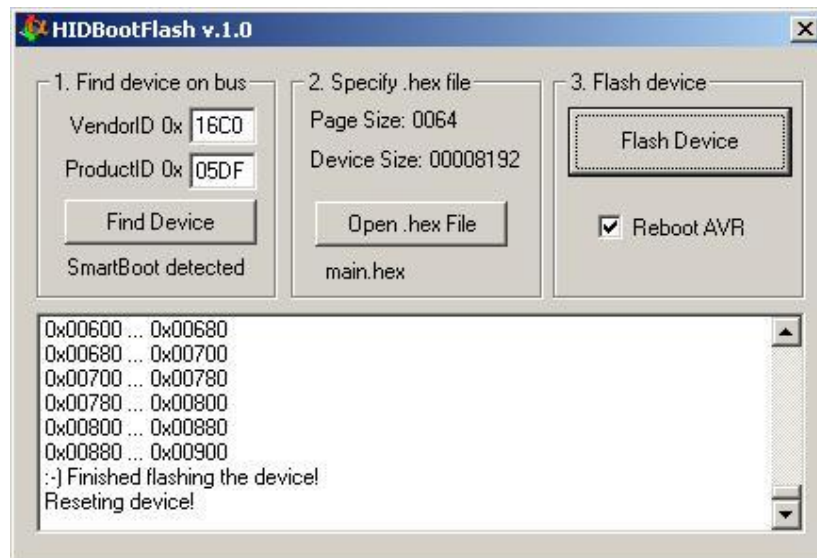
AVR Dvp Board v1.2 is especially designed for the students having interest in electronics, embedded system, robotics and industrial-automation. This board is made in such a way that it becomes easier for anybody to learn about AVR micro controllers. This board can also be used in various applications and hobby projects.

2. ULTRA SONIC SENSOR

Ultrasonic sensors (also known as transceivers when they both send and receive, but generally called transducers) work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor.

3. HIDBootFlash

HIDBootFlash is a GUI and tool used to download firmware to a controller with BootloadHID or AVRUSBBoot equivalent boot loader. It is quite similar to the FW Uploader but not taking advantage of the FischlBootloadHID.exe. In addition it will enable connecting to devices and flashing the firmware in a step approach.



VII. CAS IMPLEMENTATION

WinAVR is a suite of executable, open source software development tools for the Atmel's AVR series of RISC microcontrollers hosted on the Windows platform. It includes the GNU GCC compiler for C and C++. Steps for writing a code using WinAVR

1. Open the Programmer's Notepad and write your code.

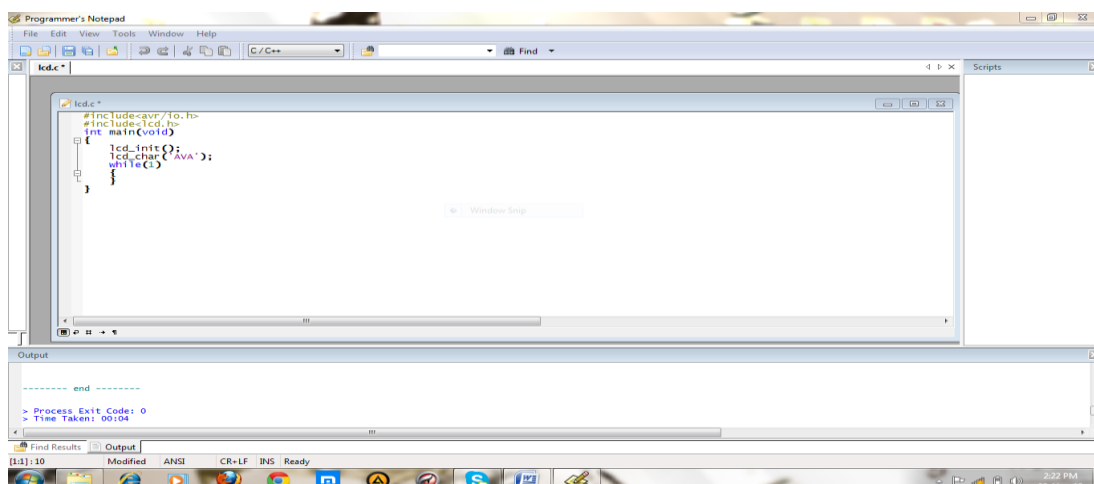


Figure 1

2. Create a new folder and save your code in that folder with extension name ".c"

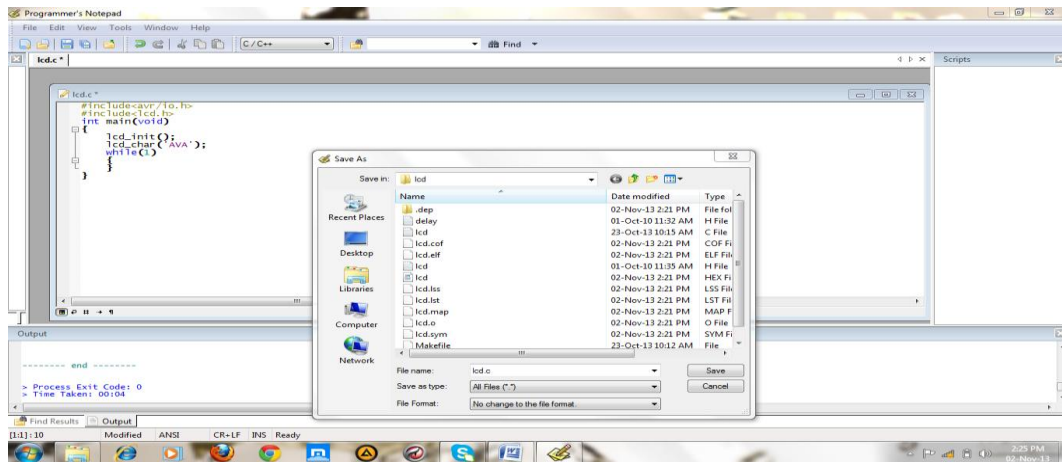


Figure 2

3. Now open the make file and edit it as mentioned below:

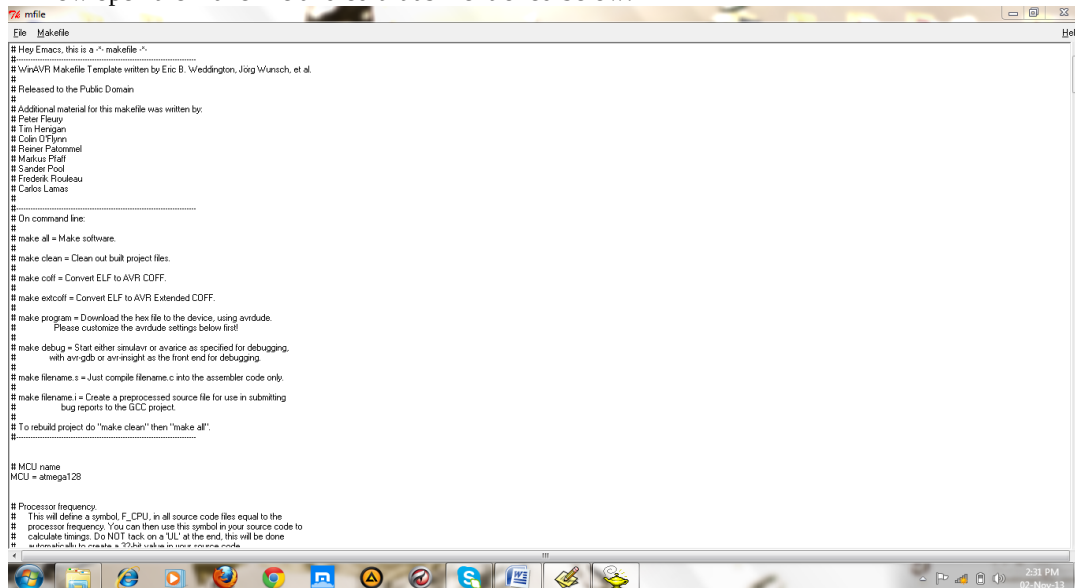


Figure 3

4. Make file→ main filename (give your file name here without extension)

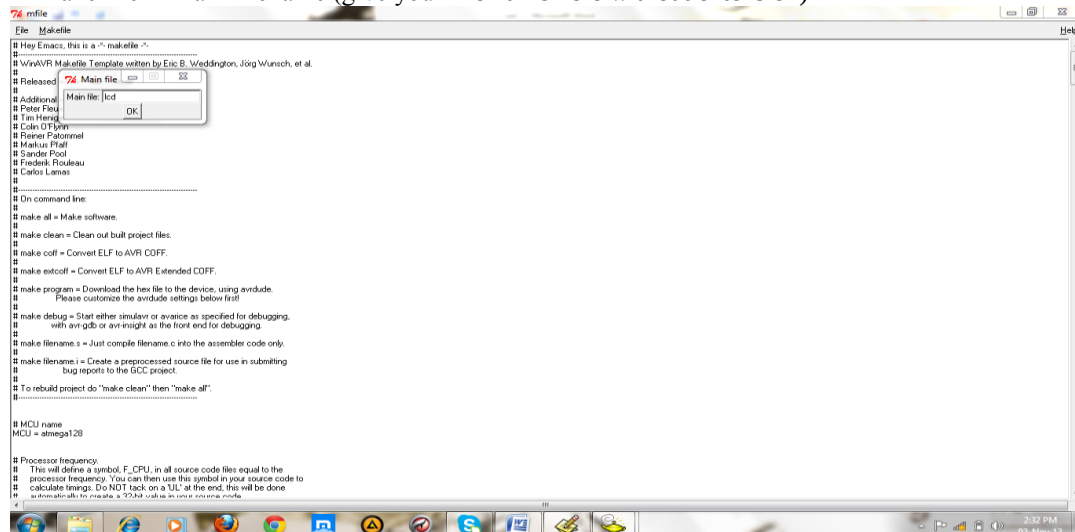


Figure 4

5. Make file→ MCU type→ AT mega→ (choose your UC)

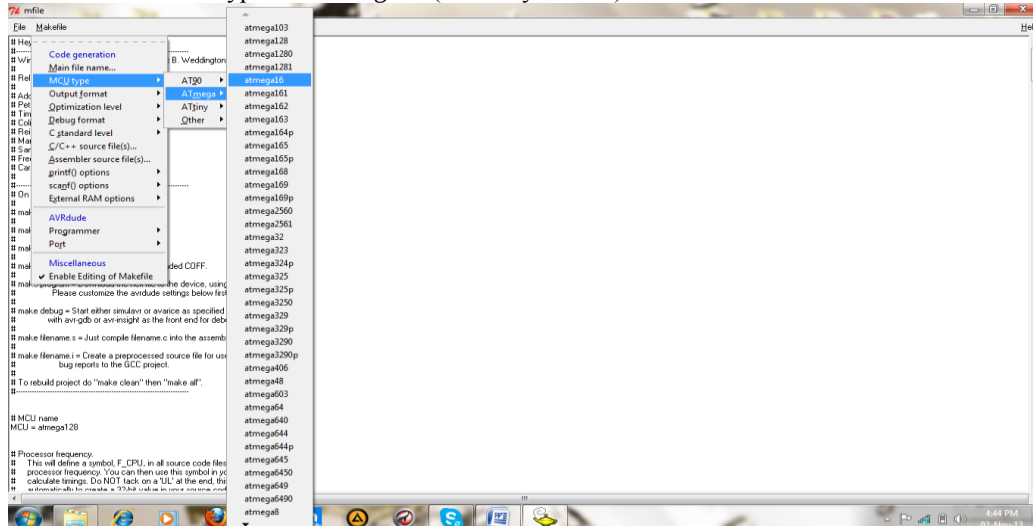


Figure 5

6. Make file→ Debug format→ AVR-ext-COFF

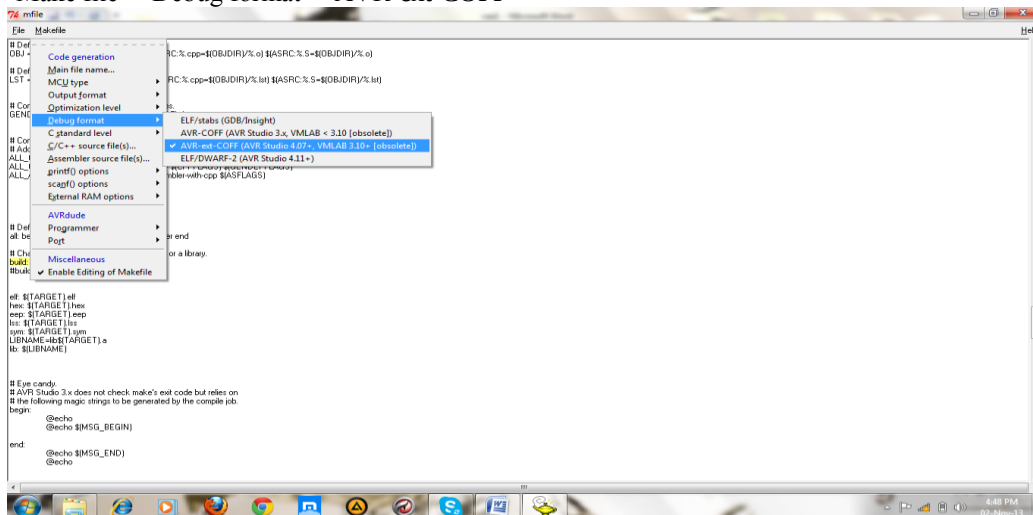
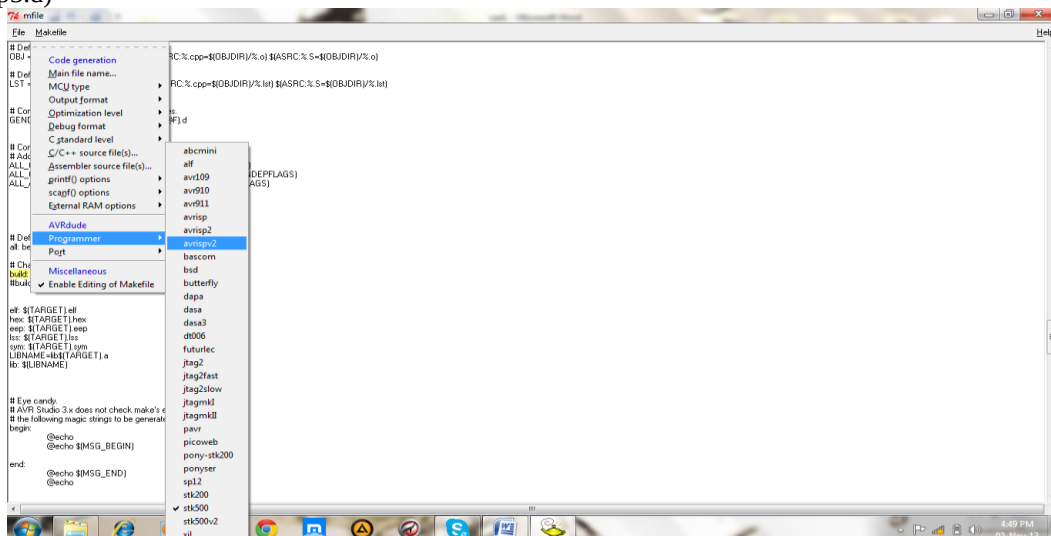


Figure 6

7. Make file→ Programmer→ select your programmer (if your programmer is not in the list then follow the step3.d)



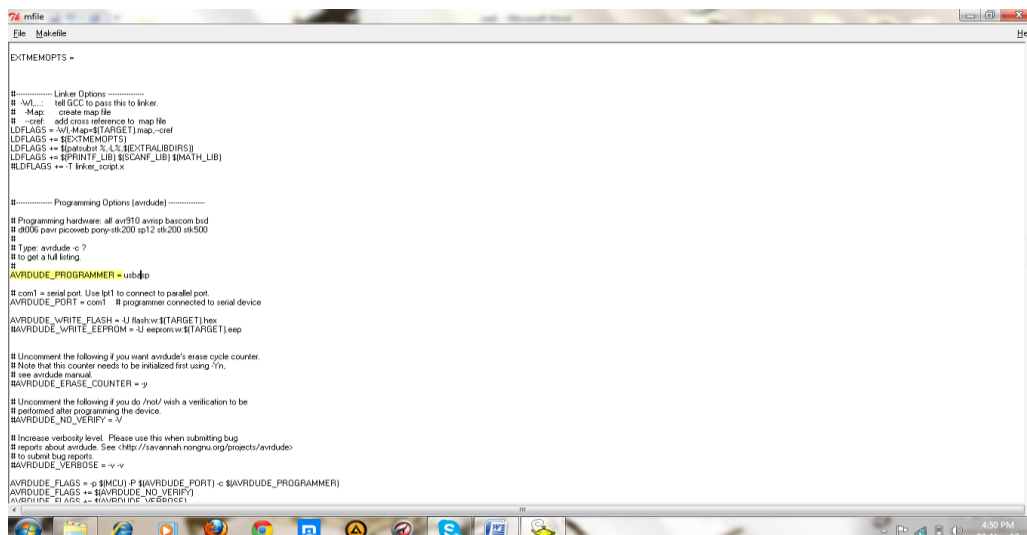


Figure 7(a) and 7(b)

8. Make file→ port→ (select the port where you have connected your programmer)

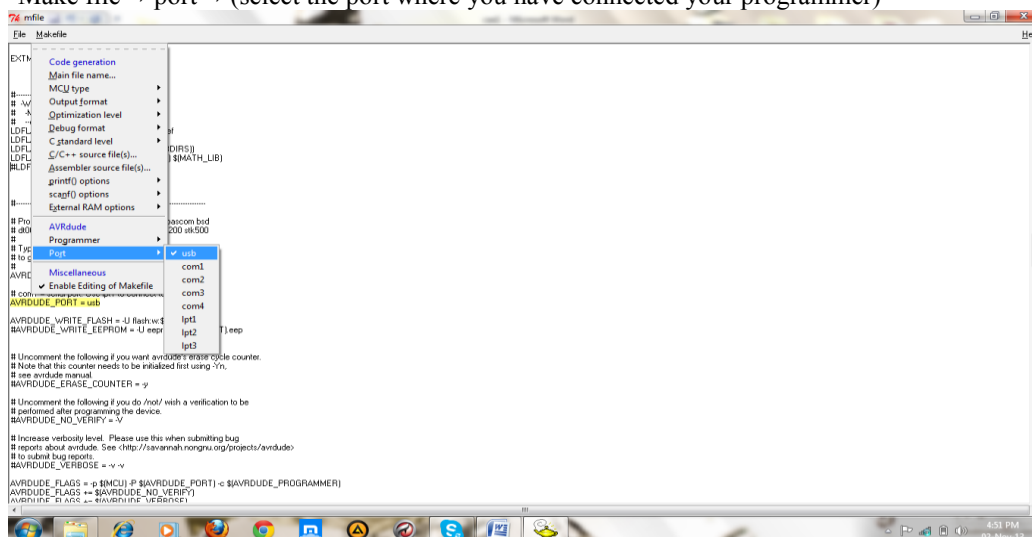


Figure 8

9. Make file→ enable editing make file→ then in your make file edit the following things

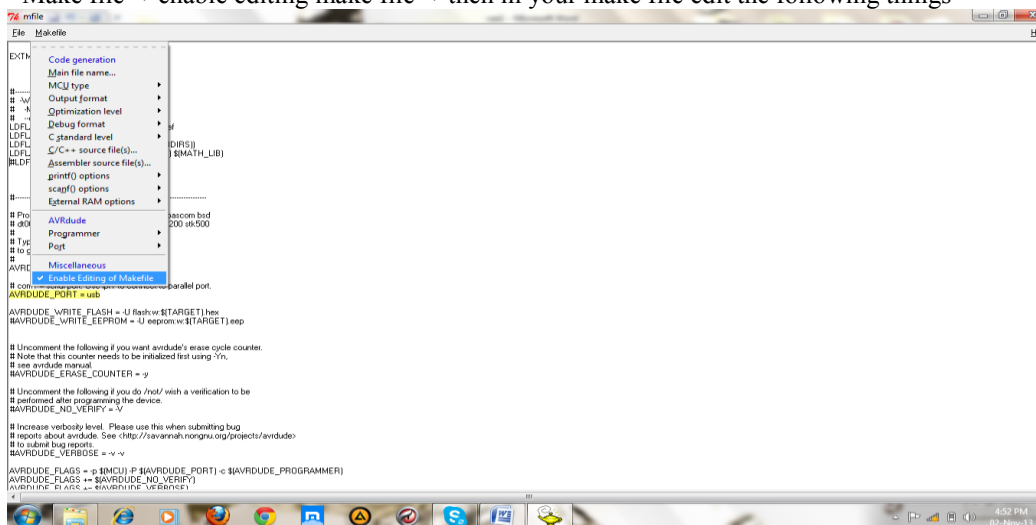


Figure 9

10. F_CPU = 16000000 (change it as for your crystal frequency) AVRDUDE_PROGRAMMER = stk500 (here write down you programmers name)

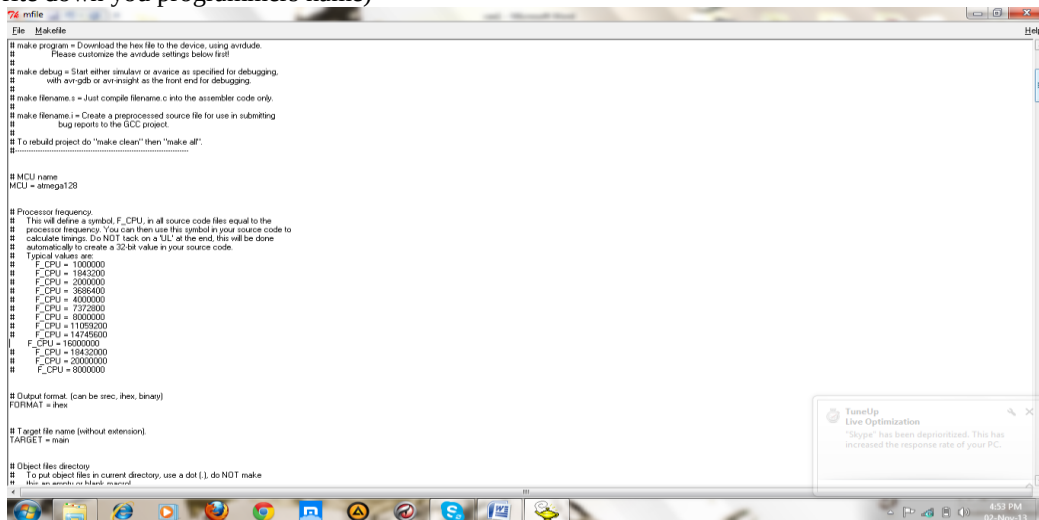


Figure 10

11. Save the make file in your folder without changing its name.

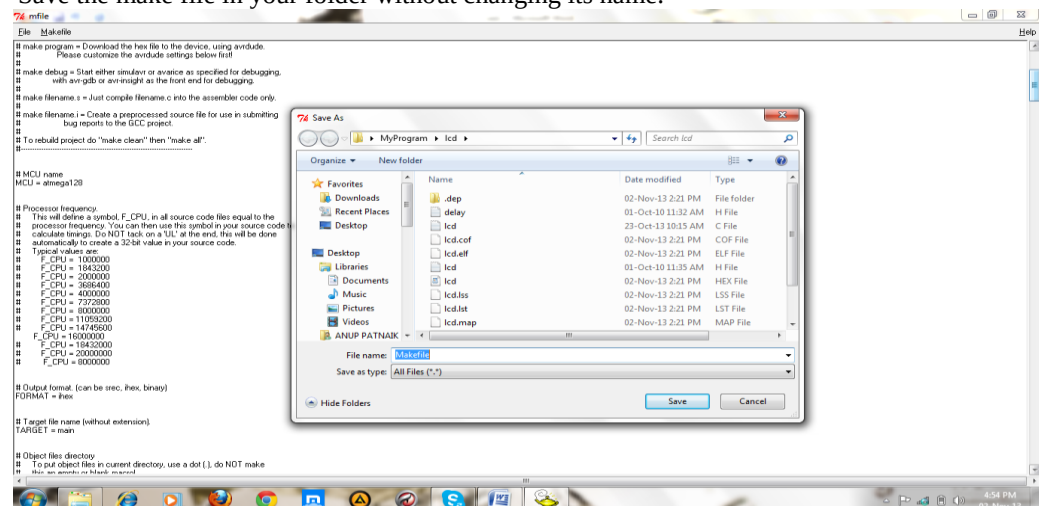


Figure 11

12. Now open the programmer's notepad.

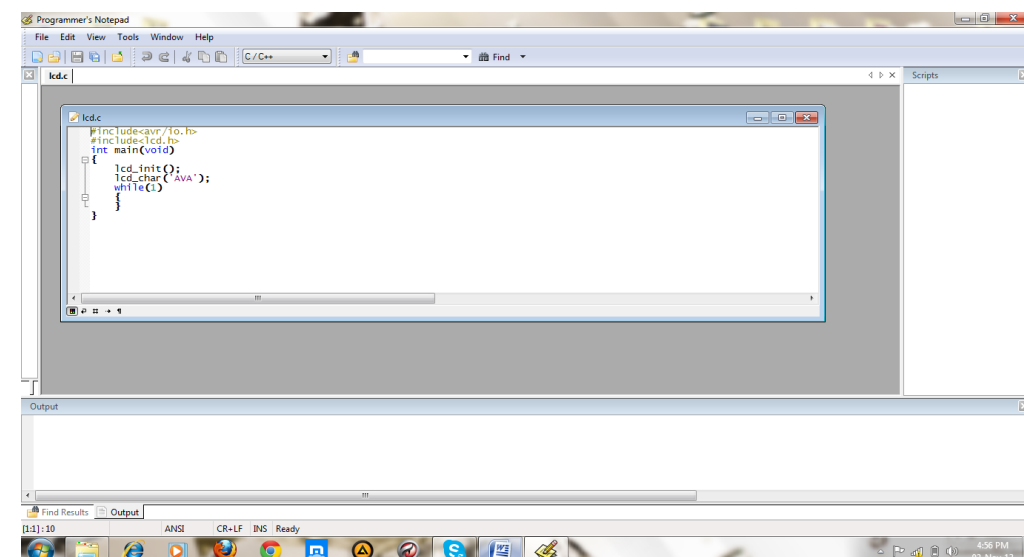


Figure 12



To upload your code into your UC (Tools → program).

-
- Flash Software will detect the AVR.
- HIDBootFlash v1.0
1. Find device on bus
VendorID 0x [16DC]
ProductID 0x [050F]
Find Device
Enter VID & PID
2. Specify .hex file
3. Flash device
- CMD Usage
- Welcome to the AVR-USB Bootloader Flash Tool
This tool is designed to load firmware to AVR-USB with HID bootloader.
1. Enter VID & PID to connect to.
2. Specify the .hex file to download.
3. Flash and enjoy.
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100. Flash and enjoy.

Figure 18(a)



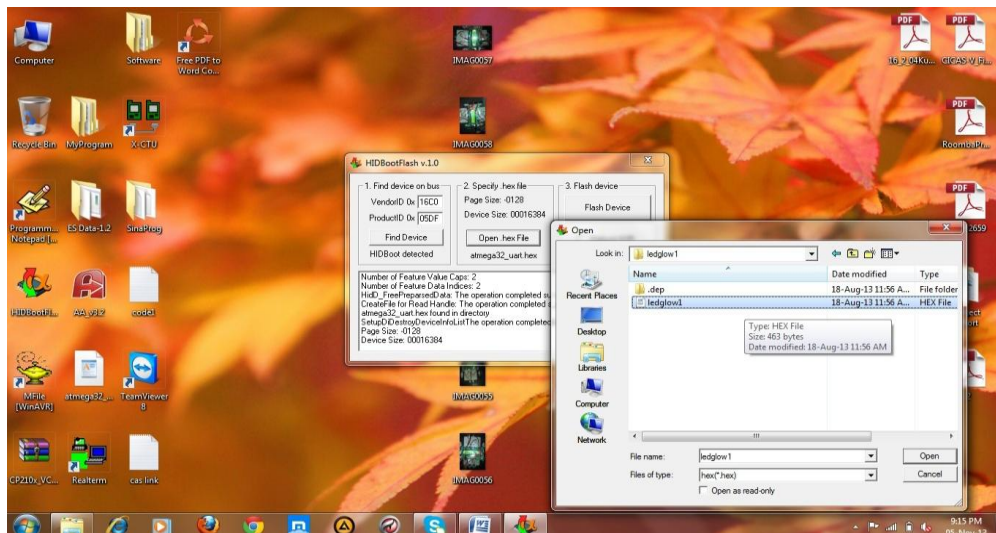


Figure 18 (c)

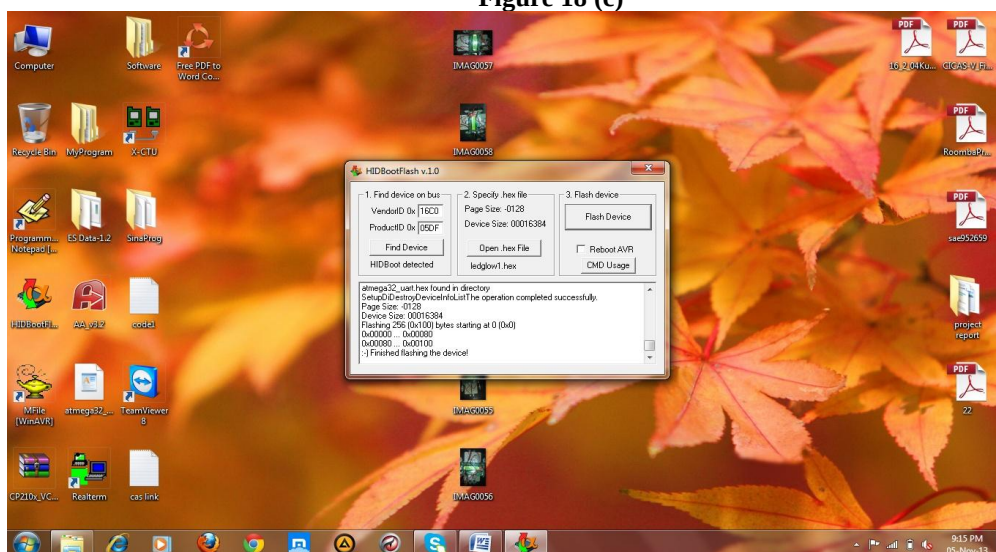


Figure 18(d)

IX. TESTING OF THE PROJECT

1. View of our CAS.

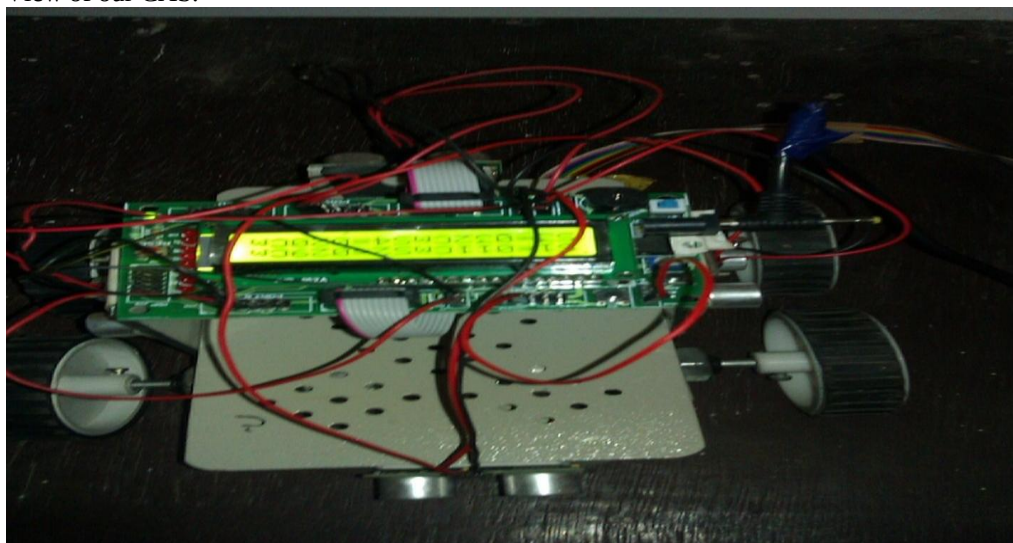


Figure 19

2. Always detecting the distance of the object coming around the car.

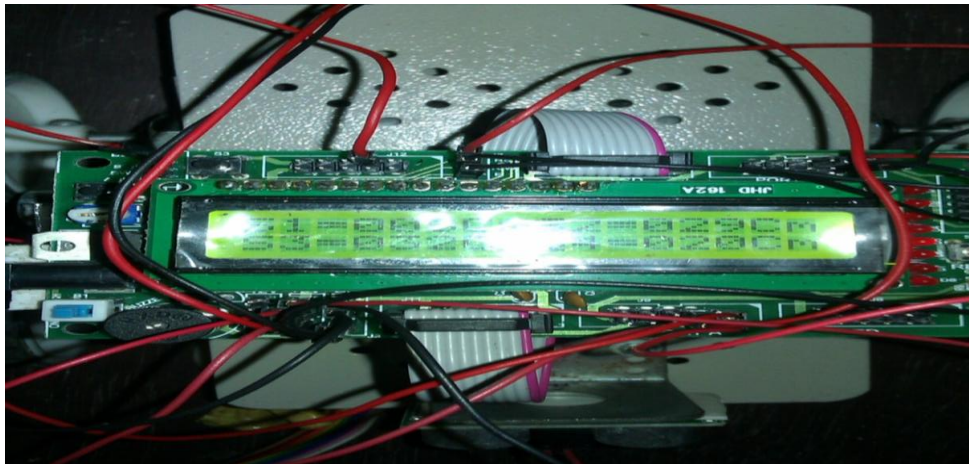


Figure 20

3. Alerting the user when it comes closer to any object (i.e. glowing LED or Ring of Buzzer).

1st view

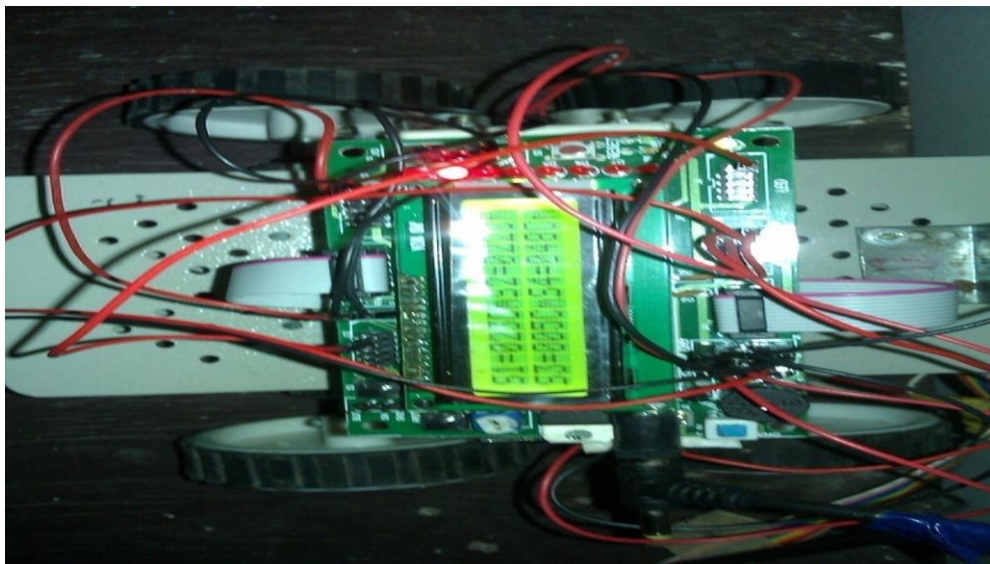


Figure 21

2nd view

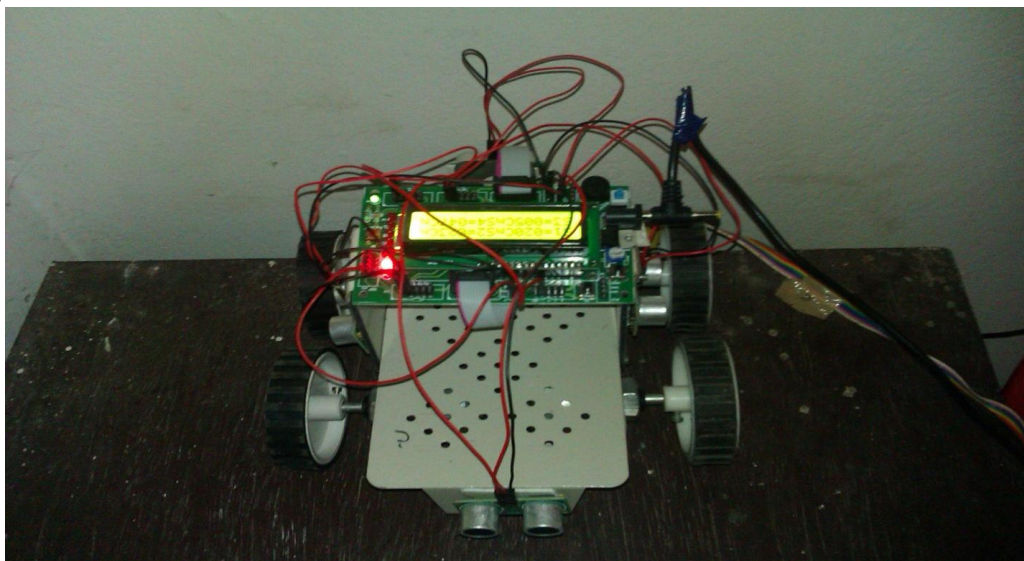


Figure 22

X. FUTURE SCOPE

We will continue this project as it will include the software part (i.e. Android application) which will be connected to the hardware .

- The Android application will give the user a top view of the car indicating colors of Green, Orange and Red which will be surrounding all sides of the car.
- As we all know color code is easily being identified by a human eye so we are using it.

XI. CONCLUSION

The vehicle collision avoidance system is very useful in today's society. It makes drivers more aware of their surroundings; therefore it will be easier for them to avoid collisions. With parking lots becoming more and more crowded and with more people driving larger vehicles that are hard to maneuver, a device like this becomes almost essential. The implementation for our product was very successful, with no real problems found. We were able to implement each of the four major subprojects without too much difficulty. Changing the offset a little more might allow us to get perfect distance readings, but being off only a couple of centimeters is not of much concern. If we were to produce this product commercially, we would use a more sophisticated microcontroller that would allow us to eliminate the rounding problems and would therefore make for near perfect distance readings. Also, we would have to find and use lower cost parts in order to make something like this feasible for a company to produce and to sell to a car manufacturer.

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