ISSN 2277-2685

IJESR/April. 2026/ Vol-16/Issue-2s /01-12

Mohammed Mateen *et. al.*, / International Journal of Engineering & Science Research

Full Length Article

Vehicle Over Speed Detection And Alerting System

Mohammed Mateen[1], Abdul Rahmaan Khan[2], Mohammed Uzair Ahmed[3]
Mrs Yasmeen Sultana[4], Dr Gauhar Fatima[5]
Ug Student[1, 2, 3], Associate Professor[4], Professor[5]
Department Of Electronics And Communication Engineering
Deccan College Of Engineering And Technology Hyderabad, India
Accepted 23-04-2026

Abstract: *Nowadays over speeding is one of the most common traffic violations. Generally, over speeding is the result of restless and bad behavior of drivers. As the accident rates are increasing it is important to develop and implement a system which can automatically detect and report over speeding to the traffic control authorities and drivers as early as possible. This will help reduce the risk of accidents and promote road safety. Nearly all the roads are marked with speed limits depending upon the size of moving vehicles and heaviness of traffic, but some drivers habitually ignore this speed limit. The advancement in technology has replaced most of the manual or semi-automatic systems with an automated system. To add on to various systems in place, this research is making the use of Internet of Things to detect and report over speeding of the vehicle on which the device has been preinstalled. IoT is a technique to integrate various devices to exchange data among themselves. This research proposes the design, development and functioning of a smart device that helps in automatically detect and report to competitive authority, when so ever the subject vehicle exceeds the speed limit. The device has been developed based on the Global Positioning System (GPS) Technology using Arduino hardware and Android OS and has been practically tested on real time basis by installing it in a car.*

I. Introduction

In developing nations such as India, the vehicular growth rate is increasing exponentially which is worsening the traffic operations. Most of the urban cities in India are facing traffic related problems such as congestion, accidents, pollution, etc. during peak hours. The main cause for traffic congestion in such cities is mainly due to uncontrolled urbanization and extensive usage of private vehicles. The traffic congestion leads to many problems like increase in travelling time, health disorders and accidents. Road accidents in India claimed over 1.5 lakh lives in the country in the year 2018, with over-speeding of vehicles being the major cause. Ministry of Road Transport and Highways report on Road accidents in India stated that road accidents increased by a rate of 0.46 % in the year 2018 when compared to 2017 .Overspeeding accounted for 66 % in total road accidents due to traffic rules violation In spite of well-equipped traffic personnel with night vision speed guns it is a tedious task to identify over speeding vehicles. Indian Government increased the over speed fine by amending of the Motor Vehicles Act. Although over speeding is the main cause for accidents in India. In order to mitigate over speeding, continuous monitoring of highways is essential. But in densely populated nations such as India, the vehicular growth is at a faster rate and monitoring speeds of all the vehicles is a complex task for traffic authorities. The manual method of monitoring speeds (such as speed guns) requires lot of man power and continuous patrolling by traffic personnel. In many parts of the city or highway road, accidents are found to be a major social problem. There are several reasons to why vehicle accidents occur. Most of accidents on the highway road are caused by high speed driving. Some highway roads has signboards signifying maximum speed limit permitted while driving such as 100 km/h for the driver's safety, but some people do not follow the speed limit. The traffic has increased in many folds but the system of monitoring the speed has been compromised. Rash driving causes severe risk not only to the driver & passenger but also to general public.

In this paper, automatic speed detection system for vehicles is proposed. This system proves very effective in detection of over speed driving. This circuit is mainly consisting of an Arduino UNO, two IR sensors, 1602A LCD and buzzer. It first takes the required time for the car to move from one point to another. This method is carried out through the use of an IoT receiver and transmitter pair. A microcontroller is used to process the data and determine the required travel time for a vehicle from one point to another. It displays this information on an LCD display. If a vehicle is detected traveling over the speed limit, a

buzzer will sound to alert the user. When a vehicle is passing between the first and second sensors, the two sensors sense the object and then, the microcontroller program will start counting. When it passes across the second sensor, the microcontroller will stop counting and calculate the speed as kilometer per hour. If the car's speed is over speed of (100 km/h), the buzzer will be alarmed and the LED will start blinking. Then, LCD displays the speed of vehicle. This paper intends to design a system of detection on highway road for vehicles and to improve the device that detects over speeding of vehicle, gives warning using alarm and display vehicle's speed in LCD.

II. Literature Survey

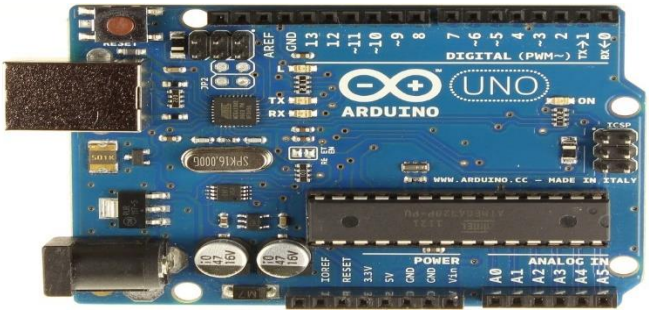
Name Of The Paper	Year	Component Used	Contributions	Limitations
Computer Vision Based Smart Over speeding Vehicle Surveillance System- Budhaditya Bhattacharjee	2025	• OCR Module (Software) • Speed Detection Algorithm	• Computer Vision-Based Over speed Detection • Integration Of OCR For Vehicle Identification	• Dependence On Environmental Conditions • OCR Accuracy Issues
Design and Implementation of Iot-Based Vehicle Over Speed Detection and Alert System on Highways-M. Muthukumaran	2024	• Power Supply • Cloud/Server Platform	• Practical Iot-Based Implementation • Instant Alert Mechanism	• Limited Deployment Scale • Network Dependency
Enhancing Vehicle Safety: A Comprehensive Accident Detection And Alert System-Jamil Abedalrahim Jamil Alsayaydeh	2023	• Mobile Application/ Notification System • GSM	• Comprehensive Accident Detection Framework • Multi-Sensor Based Detection • IoT Integration	• Prototype-Level Implementation • Possibility Of False Positives
Systematic Literature Survey On Accident Alert & Detection System-Sharmila Gaikwad	2021	• Microcontroller (Arduino-Based) • GPS Module • Vibration Sensor	• Comprehensive Review Of Existing Techniques • Identification Of Accident Causes & Need	• No Practical Implementation • Lack Of Experimental Validation
Iot Based Framework for Vehicle Over-Speed Detection-Mohammad Ahmar Khan	2018	• IoT Communication Module • Speed Sensor	• IoT-Based Architecture For Over-Speed Detection • Real-Time Speed Monitoring	• Dependence On Network Connectivity • Scalability Issues
Vehicle Tracking, Monitoring And Alerting System: A Review-Sumit S. Dukare	2015	• GSM/GPRS Module • Sensors • Microcontroller	• Classification Of Systems • Comparative Analysis	• Lack Of Experimental Results • Security Aspects Not Covered

III. Hardware Specifications

1. Arduino board

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. The project's products are distributed as open-source

hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.



The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

2. LCD Interfacing

This section describes the operation modes of LCDs, then describes how to program and interface an LCD to art .8051 using Assembly and C.

LCD operation

In recent years the LCD is finding widespread use replacing LEDs (seven-segment LEDs or other multisegmented LEDs). This is due to the following reasons:

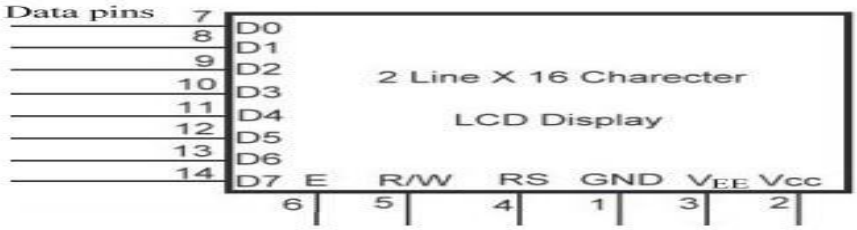
1. The declining prices of LCDs.
2. The ability of display numbers, characters, and graphics. This is a contrast to LEDs, which are limited to numbers and a few characters.
3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU (or in some other way) to keep displaying the data.
4. Ease of programming for characters and graphics.

Interfacing an LCD to the 8951 Microcontroller

LCD pin descriptions:

The LCD discussed in this section has 14 pins. The function of each pin is given in table.

Pin	Symbol	I/O	Description
1	GND	-	Ground
2	Vcc	-	+5V power supply
3	VEE	-	Contrast control
4	RS	I	command/data register selection
5	R/W	I	write/read selection
6	E	I/O	Enable
7	DB0	I/O	The 8-bit data bus
8	DB1	I/O	The 8-bit data bus
9	DB2	I/O	The 8-bit data bus
10	DB3	I/O	The 8-bit data bus
11	DB4	I/O	The 8-bit data bus
12	DB5	I/O	The 8-bit data bus
13	DB6	I/O	The 8-bit data bus
14	DB7	I/O	The 8-bit data bus

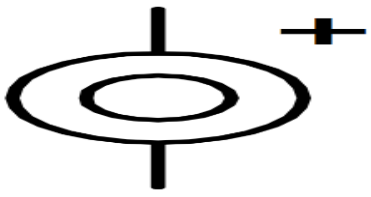


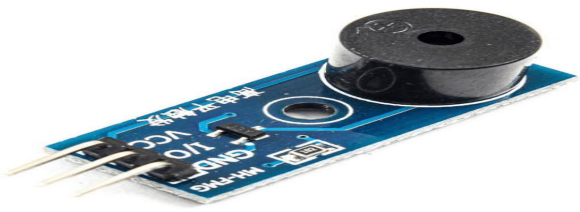
LCD Commands table

We also use RS = 0 to check the busy flag bit to see if the LCD is ready to receive information. The busy flag is D7 and can be read when R/W =1 and RS = 0, as follows: if R/W =1, RS =0. When D7 = 1(busy flag = 1), the LCD busy taking care of internal operations and will not accept any new information. When D7 = 0, the LCD is ready to receive new information. Note: It is recommended to check the busy flag before writing any data to the LCD.

3. Buzzer:

Buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally available or manmade. Piezoceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer. When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal thereby producing sound.



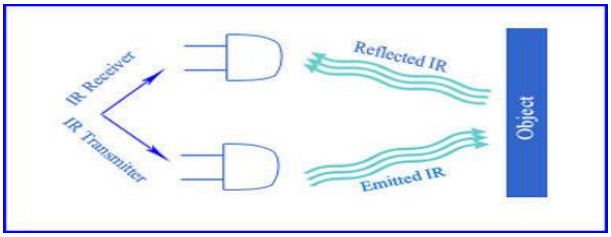


4. IR Sensor:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation rather than emitting it, which is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

An infrared sensor circuit is one of the basic and popular sensor modules in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time. This circuit comprises of the following components

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.
- LED (Light Emitting Diode).



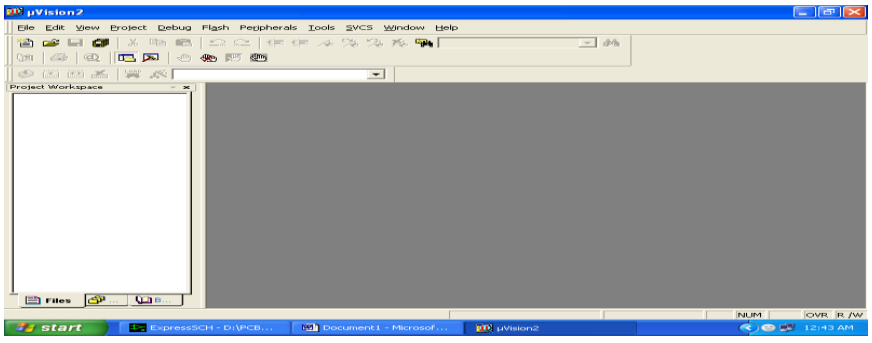
In this project, the transmitter section includes an IR sensor, which transmits continuous IR rays to be received by an IR receiver module. An IR output terminal of the receiver varies depending upon its receiving of IR rays. Since this variation cannot be analyzed as such, therefore this output can be fed to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is used as comparator circuit.

When the IR receiver does not receive a signal, the potential at the inverting input goes higher than that non-inverting input of the comparator IC (LM339). Thus the output of the comparator goes low, but the LED does not glow. When the IR receiver module receives signal to the potential at the inverting input goes low. Thus, the output of the comparator (LM 339) goes high and the LED starts glowing. Resistor R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively. Resistor VR2 (preset=5k) is used to adjust the output terminals.

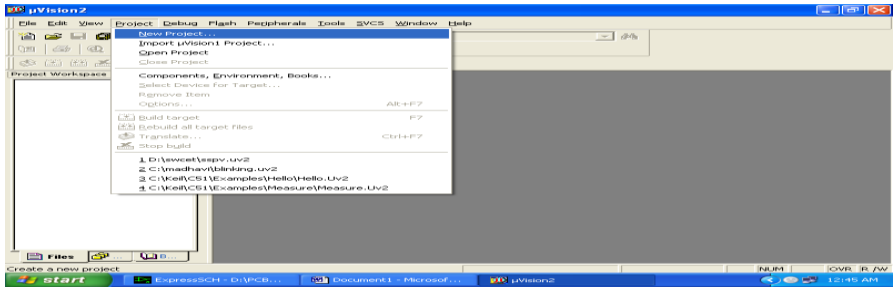
IV. SOFTWARE IMPLEMENTATION

Keil uVision tool

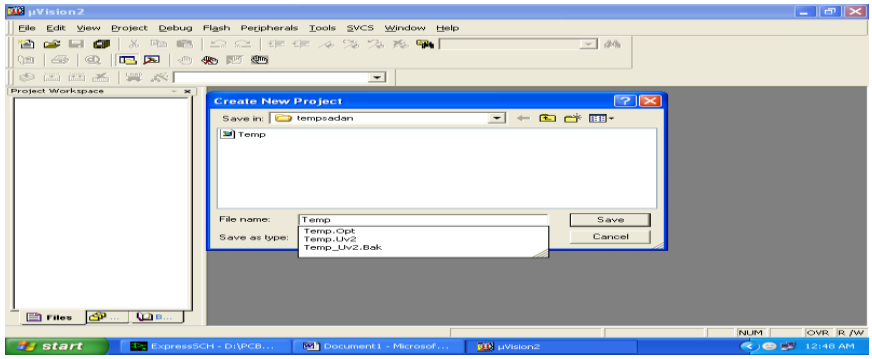
1. Click on the Keil uVision Icon on Desktop
2. The following fig will appear



3. Click on the Project menu from the title bar
4. Then Click on New Project



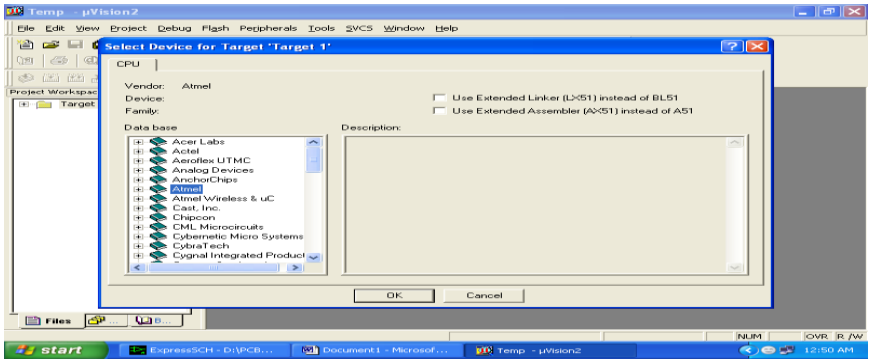
5. Save the Project by typing suitable project name with no extension in u r own folder sited in either C:\ or D:\



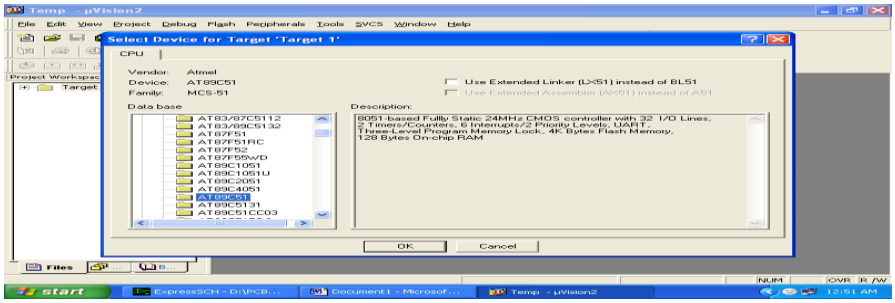
6. Then Click on save button above.

7. Select the component for u r project. I.e. Philips……

8. Click on the + Symbol beside of Philips

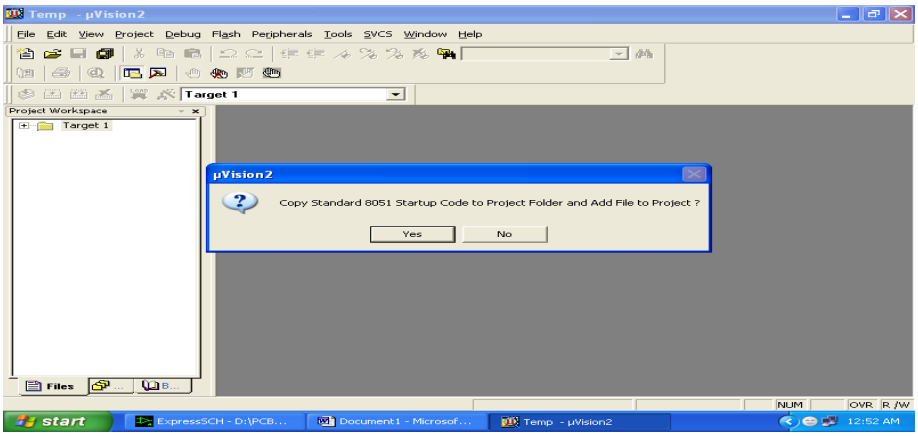


9. Select AT89C51 as shown below



10. Then Click on "OK"

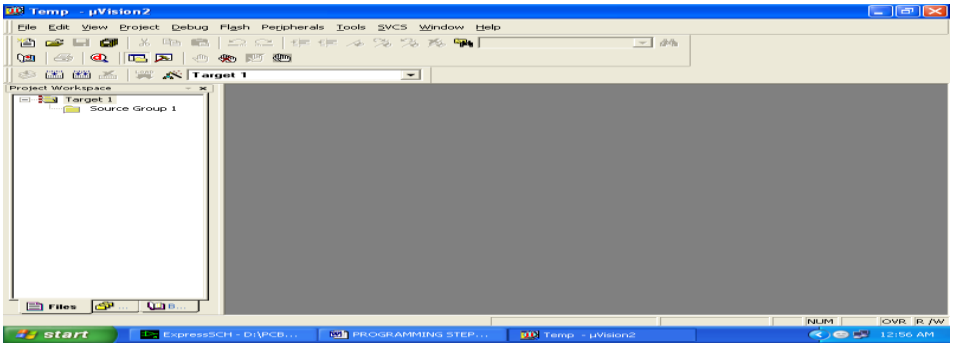
11. The Following fig will appear



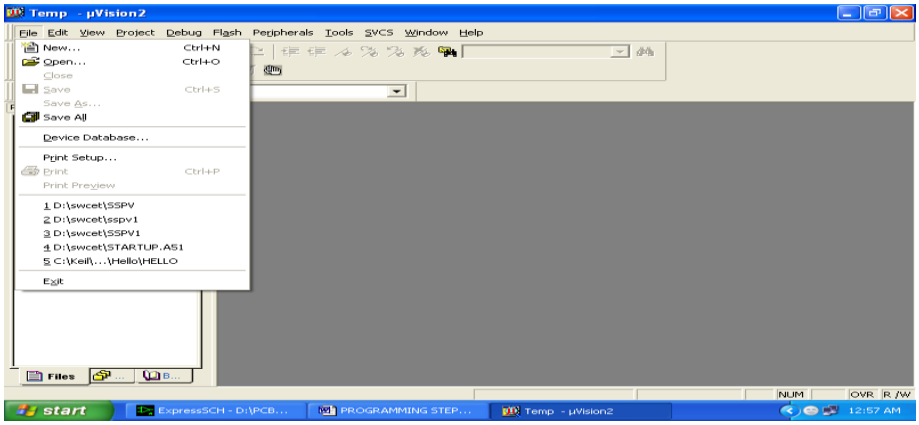
12. Then Click either YES or NO……mostly "NO"

13. Now your project is ready to USE

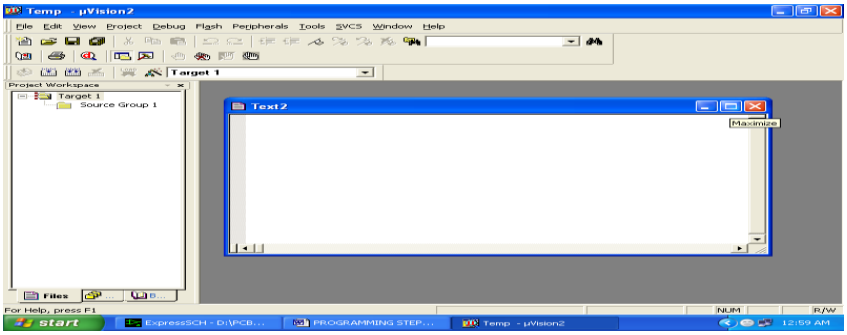
14. Now double click on the Target1, you would get another option "Source group 1" as shown in next page.



15. Click on the file option from menu bar and select "new"

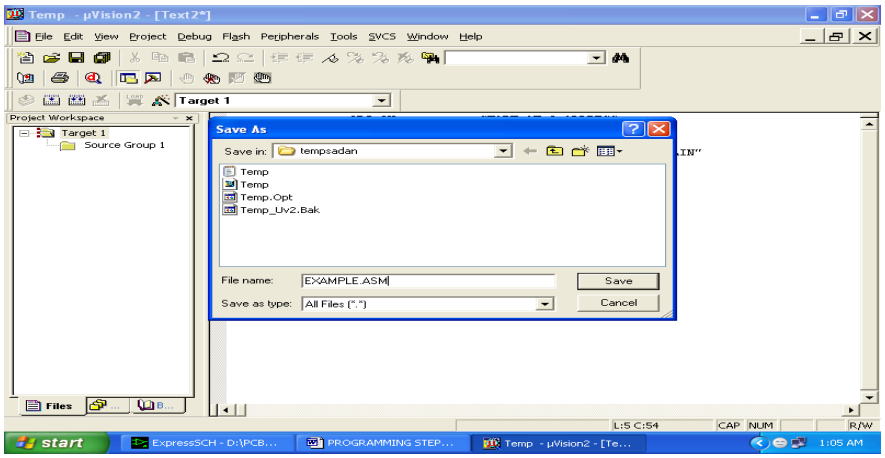


16. The next screen will be as shown in next page, and just maximize it by double clicking on its blue boarder.

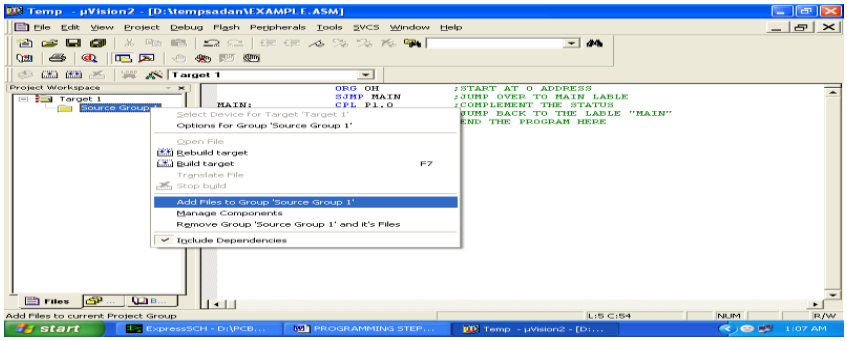


17. Now start writing program in either in “C” or “ASM”

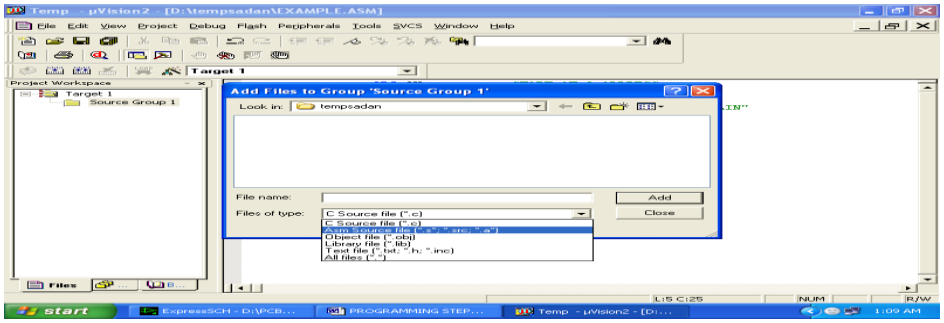
18. For a program written in Assembly, then save it with extension “. asm” and for “C” based program save it with extension “ .C”



19. Now right click on Source group 1 and click on “Add files to Group Source”



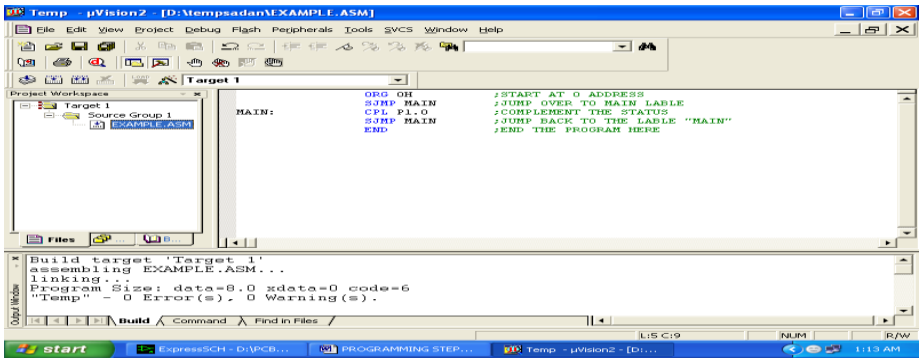
20. Now you will get another window, on which by default “C” files will appear.



21. Now select as per your file extension given while saving the file

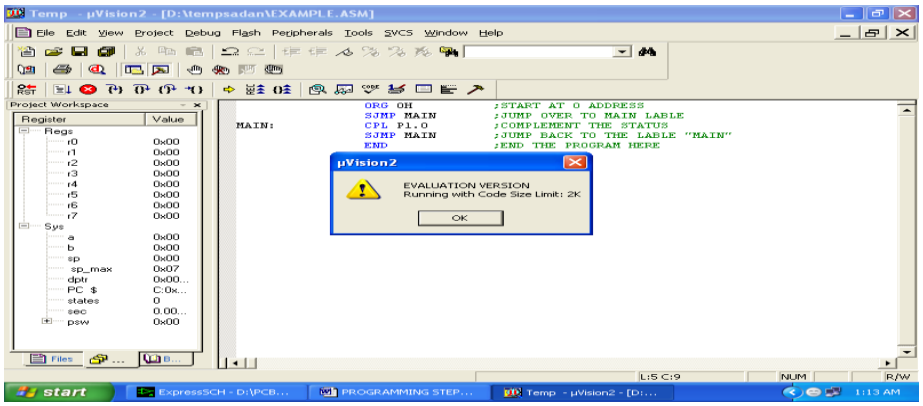
22. Click only one time on option “ADD”

23. Now Press function key F7 to compile. Any error will appear if so happen.



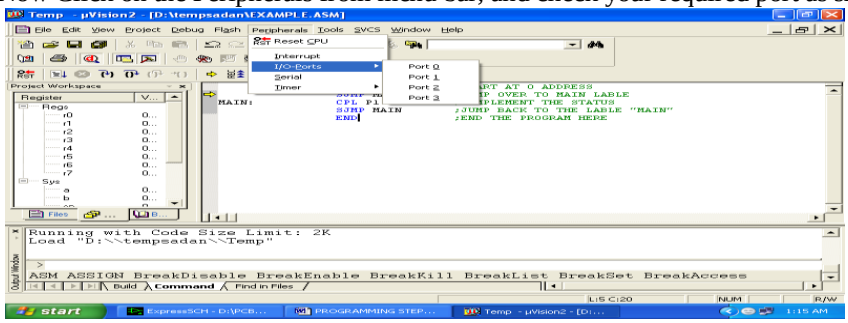
24. If the file contains no error, then press Control+F5 simultaneously.

25. The new window is as follows

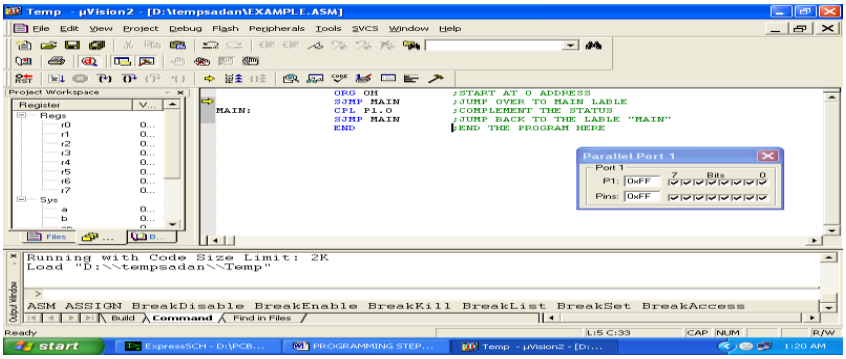


26. Then Click “OK”

27. Now Click on the Peripherals from menu bar, and check your required port as shown in fig below



28. Drag the port a side and click in the program file.



29. Now keep Pressing function key "F11" slowly and observe.

30. You are running your program successfully

CIRCUIT DESIGN OF SPEED DETECTION SYSTEM

When a vehicle passes through the first sensor, the infrared ray touches the vehicle that the sensor has detected the object. The output of IR sensor 1 is connected to the pin 8 of the Arduino and LED 1 for sensor 1 is connected to the pin 13 of the Arduino. The second sensor's infrared ray touches the object and reflects to the sensor and the sensor has sensed the object. The output of IR Sensor 2 is connected to the pin 9 of the Arduino and LED 2 for sensor 2 is connected to the pin 12 of the Arduino. 1602A LCD is used to display the vehicle's speed. DB 7 to DB 4 of the LCD Pin is connected to the I/O pin 2 to 5 of the Arduino. The RS and E pins of LCD are connected to pins 7 and 6 of Arduino. And then the LCD shows the speed. LCD displays "no vehicle" before the car passes and after the car passes. If the speed is over 100 km/hour, the buzzer will be alarmed and LED 3 will be blink. LCD displays "Reduced Speed Now!!!". The vehicle speed is calculated in microcontroller as km/h. The speed of the vehicle is calculated by this equation.

$$speed = \frac{distance}{time\ taken}\ (km/h)$$

The time taken between the two sensors is calculated by this equation.

$$Time = (t_2 - t_1)\ ms$$

Necessity Of Vehicle Over Speed Detection And Alerting System

Prevention of Accidents:

- By actively monitoring and controlling vehicle speeds, the system helps prevent accidents caused by over speeding. Immediate intervention ensures that drivers adhere to speed limits, reducing the likelihood of collisions.

Lives Saved:

- The system's ability to enforce speed limits promptly contributes to saving lives. Accidents at high speeds are more likely to result in severe injuries or fatalities, and the system acts as a proactive measure to mitigate these outcomes.

Reduced Severity of Injuries:

- In the event of an accident, the reduced speeds facilitated by the system can significantly decrease the severity of injuries. Lower speeds result in less force upon impact, reducing the risk of life-threatening injuries.

Economic Savings:

- Road accidents, especially those involving over speeding, result in substantial economic costs related to medical expenses, vehicle repairs, and loss of productivity. The system helps minimize these costs by preventing accidents and their associated damages.

V. System Overview

System Breakdown

This system is design to detect an over speeding vehicle by computing the speed of the passing vehicle using the time taken to travel between two sensors at a fixed distance. In this system, IR Sensors are the main part of circuit design that detects the speed of the vehicles. The system keeps the time taken by the speed of the vehicle in crossing the fixed distance from two sensors. When the vehicle passes through the first IR sensor, this sensor gets activated. From this instant forward, a timer is initiated and will continue to keep time until the vehicle reaches the second IR Sensor. Then the microcontroller starts to count the time and calculate the speed of the vehicle as km/h and this speed is displayed on a 16X2 LCD Module. If the vehicle's speed is greater than the limited speed, the

buzzer will be alarmed and LED will be blinked. Then LCD will be displayed "Reduced Speed Now!!!". Figure 1 shows block diagram of this system.

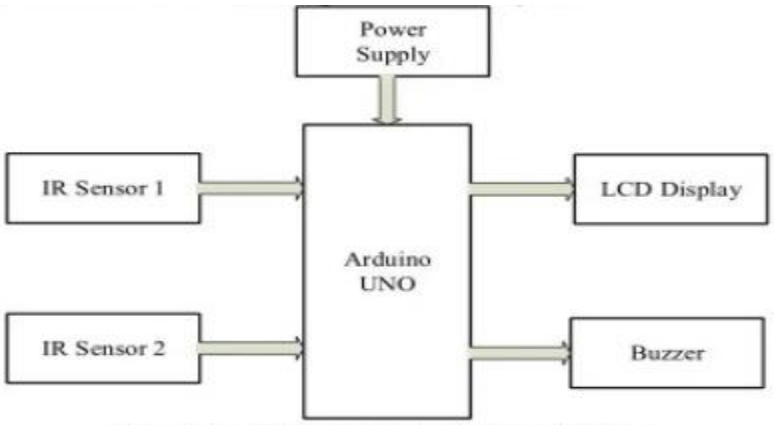


Figure1. Block Diagram of the System

It consists of Arduino Uno, two IR sensors, LCD display, and buzzer. Arduino Uno is used to acquire the input data from sensors and buzzer is used for alarm system and then show warning message on LCD. In this system limited speed is 100 km/h. The experimental output results can be proved in this section.

VI. Conclusion

Design and construction of speed detection system for vehicles was designed in this paper. This design is based on Arduino microcontroller. The timing condition for the vehicle detection system must be set base on distance between the sensor and speed which can be easily changed and modified using microcontroller

The project "VEHICLE OVER SPEED DETECTION AND ALERTING SYSTEM" has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit.

Secondly, using highly advanced IC's and with the help of growing technology the project has been successfully implemented.

References

[1]. Kumar, N., et al. (2019). IoT-Based Vehicle Accident Detection and Notification System. IEEE Xplore.
Link: https://ieeexplore.ieee.org/document/8869993

[2]. Al-Sultan, S., Al-Doori, M., Al-Bayatti, A., & Zedan, H. (2014). A Comprehensive Survey on Vehicular Ad Hoc Network. IEEE Access, 2, 1066–1083.
Link: https://ieeexplore.ieee.org/document/6917054

[3]. International Journal of Engineering Research & Technology (IJERT)
Patil, S., et al. (2017). Accident Alert and Vehicle Tracking System. IJERT, 6(4).
Link: https://www.ijert.org/accident-alert-and-vehicle-tracking-system

[4]. Singh, K., Amrutha Varshini, G., Karthikeya, M., Manideep, G., Sarvanan, M., & Dharnasi, P. (2026). Automatic brand logo detection using deep learning. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 126–130.

[5]. Neela Madheswari, A., Vijayakumar, R., Kannan, M., Umamaheswari, A., & Menaka, R. (2022). Text-to-speech synthesis of Indian languages with prosody generation for blind persons. In IOT with Smart Systems: Proceedings of ICTIS 2022, Volume 2 (pp. 375–380). Springer Nature Singapore.

[6]. Gogada, S., Gopichand, K., Reddy, K. C., Keerthana, G., Nithish Kumar, M., Shivalingam, N., & Dharnasi, P. (2026). Cloud computing/deep learning customer churn prediction for SaaS platforms. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 74–78.

[7]. Sugumar, R. (2024). AI-driven cloud framework for real-time financial threat detection in digital banking and SAP environments. International Journal of Technology, Management and Humanities, 10(04), 165–175.

[8]. Akula, A., Budhai, G., Bingi, G., Chanda, U., Borra, A. R., Yadav, D. B., & Saravanan, M. (2026). Emotion recognition from facial expressions using CNNs. International Journal of Engineering & Extended Technologies Research (IJEETR), 8(1), 120–125.

[9]. Poornima, G., & Anand, L. (2024, May). Novel AI multimodal approach for combating against pulmonary carcinoma. In 2024 5th International Conference for Emerging Technology (INCET) (pp. 1–6). IEEE.

[10]. Tirupalli, S. R., Munduri, S. K., Sangaraju, V., Yeruva, S. D., Saravanan, M., & Dharnasi, P. (2026). Blockchain integration with cloud storage for secure and transparent file management. International Journal of Computer Technology and Electronics Communication (IJCTEC), 9(1), 79–86.

[11]. Vani, S., Malathi, P., Ramya, V. J., Sriman, B., Saravanan, M., & Srivel, R. (2024). An efficient black widow optimization-based faster R-CNN for classification of COVID-19 from CT images. Multimedia Systems, 30(2), 108.

[12]. Vishwarup, S., et al. (2020). Automatic person count indication system using IoT in a hotel infrastructure. In 2020 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1–4).

[13]. Inbavalli, M., & Arasu, T. (2015). Efficient analysis of frequent item set association rule mining methods. International Journal of Scientific & Engineering Research, 6(4).

[14]. Dadigari, M., Appikatla, S., Gandhala, Y., Bollu, S., Macha, K., & Saravanan, M. (2026). Bitcoin price prediction with ML through blockchain technology. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 130–136.

[15]. Fazilath, M., & Umasankar, P. (2025, February). Comprehensive analysis of artificial intelligence applications for early detection of ovarian tumours: Current trends and future directions. In 2025 3rd International Conference on Integrated Circuits and Communication Systems (ICICACS) (pp. 1–9). IEEE.

[16]. Varshini, M., Chandrapathi, M., Manirekha, G., Balaraju, M., Afraz, M., Sarvanan, M., & Dharnasi, P. (2026). ATM access using card scanner and face recognition with AIML. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 9(1), 113–118.

[17]. Saravanan, M., & Sivakumaran, T. S. (2016). Three phase dual input direct matrix converter for integration of two AC sources from wind turbines. Circuits and Systems, 7, 3807–3817.

[18] Ravi Kishore Kodali and Sairam, M Department of Electronics and Communication Engineering National Institute of Technology, Warangal, INDIA. "Over Speed Monitoring System".

[19] P.R. Kambadkone, G.P. Hancke and T.D. Ramotsoela Department of Electrical, Electronic and Computer Engineering University of Pretoria Tshwane. "Real Time Speed Detection and Ticketing System".

[20] Zakaria Khan Department of Aeronautics & Astronautics Institute of Space Technology Islamabad, Pakistan Zakisss@hotmail.com. Ayesha Department of Aeronautics & Astronautics Institute Technology Islamabad, Pakistan Ayeshashafiqueaz@gmail.com. "Wireless Speed Monitoring System using GNSS Technology".

[21] Iszaidy1, A.Alias2, R.Ngadiran3, R.B.Ahmad4, M.I.Jais5,D.Shuhaiza6 1,2,3,4,5,6affiliations Embedded, Network and Advance Computing (ENAC) School of Computer and Communication Engineering University Malaysia Perlis Pauh Putra, Perlis, Malaysia. "Video Size Comparison for Embedded Vehicle Speed Detection & Travel Time Estimation System by Using Raspberry Pi".

[22] Butare Jimmy Damascene and Ryosuke Okuda Department of Information Systems Graduate School of Information Technology, Kobe Institute of Computing, Kobe, Japan. "Low-cost Speed Limit Monitoring System for Developing Countries Using a Series of Active Infrared Sensors ".

[23] M. Ahsan*, J. McManis** and M. S. J. Hashmi* *School of Mechanical and Manufacturing Engineering, Dublin City University, Dublin, Ireland **School of Electronic Engineering, Dublin City University, Dublin, Ireland. "Prototype System Development for Wireless Vehicle Speed Monitoring".

[24] L. Baghli 1,2, K. Benmansour 3, M. Djemai 4 1 LAT, Laboratoire d'Automatique de Tlemcen, Universitéi de Tlemcen 13000, Tlemcen, Algeria 2 Université de Lorraine, GREEN, EA 4366 F-54500, Vandoeuvre-lès-Nancy, France Lotfi.Baghli@univ-lorraine 3 Laboratoire de Recherche en Electrotechnique et en Automatique, Université de Médéa, Algeria 4 Univ. Lille Nord de France F59000 Lille, France.

[24] UVHC, LAMIH, CNRS, UMR 8201 F-59313 Valenciennes, France. "Development of a Data Acquisition and Tracking System for Vehicles".