Digital Speedometer with Password and Accident Alert, Vehicle Tracking System

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Abstract: The main objective of this project is to design a digital speedometer with enable password with speed limit controlling and Accident alert, vehicle tracking system. The simple system shows the ability to apply speed limit controlling techniques to the vehicle and also gives the acknowledgement when accident occurs.

Our digital speedometer takes input from the vehicle speed meter cable and executes the speed limit controlling action and also it takes input data from the satellite and stores the latitude and longitude values in Atmega328 microcontroller's buffer. Once GSM gets activated it takes the last received latitude and longitude positions values from the buffer and sends a message to a central emergency dispatch server which is predefined in the program.

The system comprises of keypad, LCD display, GSM, GPS, Pressure sensor and micro controller unit. The user interface includes keypad through which the password will be accepted by the microcontroller. Microcontroller controls the over speed of vehicle.

IndexTerms - Digital Meter, GPS system, Speedo Meter, Vehicle Tracking.

I. INTRODUCTION

Digital speedometer with password enable speed limit controlling and accident alert vehicle tracking system is different think and technology for automobiles. This instrument is normally used in maintaining the speed in that your vehicle is operating and is extremely useful in roadways and highways that have a fixed speed limit and it also takes the input data from the satellite and stores the latitude and longitude values in micro controller 's buffer. The system generally consists of Hex-keypad, LCD, Ardunio, DC motor, Motor-driver, GSM, GPS, vibration sensor, power supply.

The speed sensor system is easy to build. Keypad allows us to enter the password to access the vehicle, instead of the numerical password we can also use finger print scanner as a password. This speedometer system can be used in any vehicle like bikes, cars, trucks, buses and any kind vehicle. This system is very useful for the beginner drivers and who drives speed in city and highways. The proposed system which can detect accident in significantly less time and sense the basic information to first aid center within a few seconds covering geographical coordinates, the time and angle in which a vehicle accident had occurred. This alert message is sent to the central emergency dispatch server in a short time so that the emergency dispatch server will inform to the ambulances which are near to that location, which will help in saving the valuable life's. A switch also provided in order terminates sending of a message in rare case where there is no casualty, this can save the precious time of victim.

When accident occurs, message sent through GSM and the location of the accident is detected with the help of GPS. This application provides the optimum solution to the poor emergency facilities provided to the road accidents in most feasible way. This research details the construction and building of a digital speedometer and accident alert, vehicle tracking circuit that may be interfaced to control the speed limit of the vehicle. The circuit is trained to calculate the speed and check that is under speed limit or not. If it is over speedy than the circuits control the speed automatically. This system increases the vehicle fuel efficiency and Human life. Currently most vehicle provided with analog speedometer which is less accurate than the digital speedometer. Also, May vehicles are provided digital speedometer. The limitations of this speedometer are that they don 't have speed controlling facility. The limitation is overcome in our project.

II. PROPOSED SYSTEM

The system takes password input and checks it is correct or not, if it is true then allows driving over speed but if it is false then activating the speed limit function. The speed is senses in form of pulse by op-amp comparator and given to microcontroller which calculates the pulses per sec and display the speed.

It also comparers the speed with stored speed limit data and if it is over the speed limit than turn off the relay which is connected with the ignition power supply. So, speed will decrease and when it comes below speed limit than turn on supply and continues.

Working: A digital speedometer is an instrument in a vehicle that is used for indicating the speed in which it is actually travelling. It is at the same time useful for knowing the range that was travelled by the vehicle. First when the key is turn on a message ENTER PASSWORD ‖ is displayed on the EL1602 16*2 LCD. The password is entered using 3*4 numeric keypad. Pre-defined password is

stored in the memory of microcontroller AT80S52. Entered password is compared with stored password. If it's true than display the second menu display Drive, Setting ‖ . The setting menu includes the facility to change the speed limit and password.

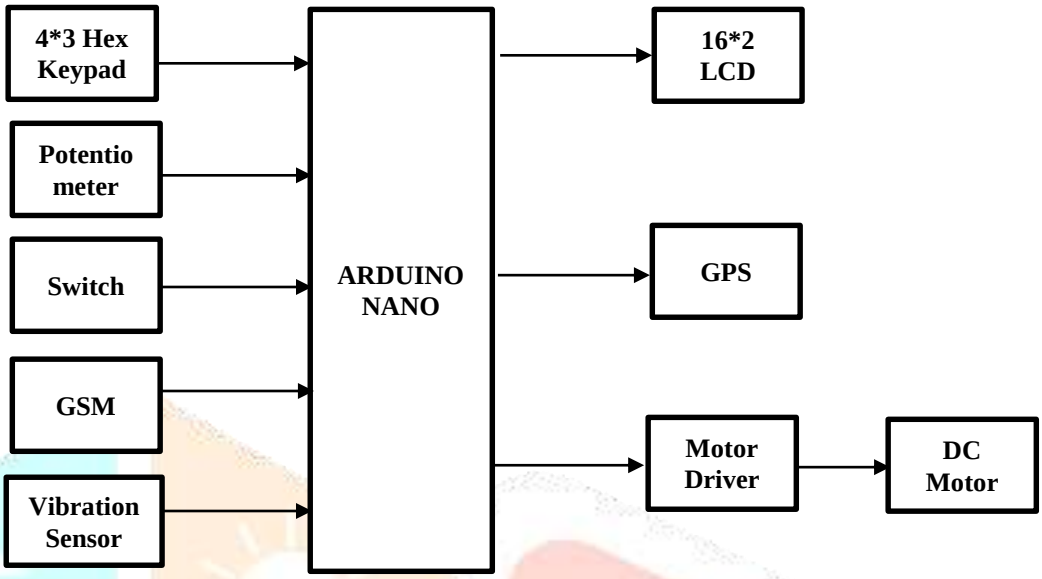

Figure 1: Block diagram of the proposed system

By entering in the Drive menu user can drive above the speed limit. If the password is false than system turn on the speed limit function, in which speed is continuously compared with the stored speed limit and displayed on LCD. If speed is above the limit than system turn off the relay which is connected with the ignition power supply, so power is disconnected and speed decreases. Now, when speed comes below the speed limit, system turn on the relay and 3 continuously follows this process.

At speed sensor pulses are generated using infrared LED and receiver. It can be also generated by using magnetic reed relay sensor. These pulses are given at the OPAMP LM324 comparator which produces pulse train. These pulses given to pin no.14, 15 of port 3.4 & 3.5 of microcontroller 8052. With the help of pulse input we can calculate the speed by calculating the frequency at input. This frequency is multiplied by the distance travel by wheel in one rotation. The calculations are as follow: Circumference of the wheel= $2\pi r$ (where r is in cm) = 2×3.14×30 = 188.4 cm or 1.884 meters Let 's assume that in 1 second the wheel completes one revolution. In other words, in one second, the bike has covered 1.88 meters. Therefore, the speed in km/hour: =N×1.88×3600/1000 = N×6.784 or N×6.8 Where N is the number of revolutions per second. 6.8 is a constant and only N varies.

The Accident Alert and Tracking System is the system which track vehicle current location using global positioning system (GPS). This product gives the live updates of accidental vehicle with their location details. It ensures the vehicle which has got accident to send location details to web server located at emergency ambulance center further that location details of accidental vehicle send to nearby ambulance as well as display it on map.

III. HARDWARE DESCRIPTION

The Proposed system consists of Arduino, 16x2 LCD, Hex-keypad, Relay, DC Motor, Motor Driver, GPS, GSM modules.

Arduino NANO: The Arduino Nano has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328P provide UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An FTDI FT232RL on the board channels this serial communication over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Nano's digital pins. The ATmega328P also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

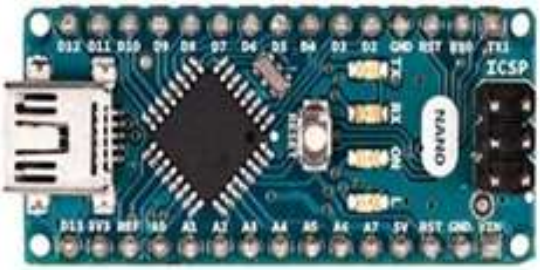

Figure 2: Arduino NANO

PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write () function. SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language. LED: There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Nano has 8 analog inputs, each of which provides 10 bits of resolution (i.e. 1024 different values). By default, they measure from ground to 5 volts, though is it possible to change the upper end of their range using the analog Reference () function. Additionally, some pins have specialized functionality.

The Arduino Nano can be powered via the mini-B USB connection, 6-20V unregulated external power supply (pin 30), or 5V regulated external power supply (pin 27). The power source is automatically selected to the highest voltage source.

16 * 2 Alphanumeric LCD: Liquid crystal display is very important device in embedded system. It offers high flexibility to user as he can display the required data on it. A liquid crystal display (LCD) is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals (LCs). LCs do not emit light directly. LCDs therefore need a light source and are classified as "passive" displays. Here the LCD has different memories to display data, those are discussed below.

Figure 3: 16*2 LCD

Display data RAM (DDRAM) stores display data represented in 8-bit character codes. Its extended capacity is 80 X 8 bits, or 80 characters. The area in display data RAM (DDRAM) that is not used for display can be used as general data RAM. So whatever you send on the DDRAM is actually displayed on the LCD. For LCDs like 1x16, only 16 characters are visible, so whatever you write after 16 chars is written in DDRAM but is not visible to the user.

Hex-keypad: The hex keypad is a peripheral that connects to the DE2 through JP1 or JP2 via a 40-pin ribbon cable. It has 16 buttons in a 4 by 4 grid, labelled with the hexadecimal digits 0 to F. An example of this can been seen in Figure 1, below. Internally, the structure of the hex keypad is very simple. Wires run in vertical columns them C0 to C3 and in horizontal rows (called R0 to R3). These 8 wires are available externally, and will be connected to the lower 8 bits of the port. Each key on the keypad is essential switch that connects a row wire to a column wire. When a key is pressed, it makes an electrical connection between the row and column. The internal structure of the hex keypad is shown in Figure 2. The specific mapping of hex keypad wires (C0 to C3 and R0 to R3) to pins is given in as inputs. The pins connected to column wires C0 to C3 should be set as outputs. (That is, pins 0–3 are inputs, and 4–7 are outputs.)

Computers transfer data in two ways: parallel and serial. In parallel data transfers, often 8 or more lines (wire conductors) are used to transfer data to a device that is only a few feet away. Examples of parallel transfers are printers and hard disks; each uses cables with many wire strips. Although in such cases a lot of data can be transferred in a short amount of time by using many wires in parallel, the distance cannot be great. To transfer to a device located many meters away, the serial method is used. In serial communication, the data is sent one bit at a time, in contrast to parallel communication, in which the data is sent a byte or more at a time. The 8051 has serial communication capability built into it, thereby making possible fast data transfer using only a few wires.

When a microprocessor communicates with the outside world, it provides the data in byte-sized chunks. In some cases, such as printers, the information is simply grabbed from the 8-bit data bus of the printer. This can work only if the cable is not too long, since

long cables diminish and even distort signals. Furthermore, an 8-bit data path is expensive. For these reasons, serial communication is used for transferring data between two systems located at distances of hundreds of feet to millions of miles apart. The Figures shows serial versus parallel data transfers.

RELAY: A relay is used to isolate one electrical circuit from another. It allows a low current control circuit to make or break an electrically isolated high current circuit path. The basic relay consists of a coil and a set of contacts. The most common relay coil is a length of magnet wire wrapped around a metal core. When voltage is applied to the coil, current passes through the wire and creates a magnetic field. This magnetic field pulls the contacts together and holds them there until the current flow in the coil has stopped. The diagram below shows the parts of a simple relay.

Terms associated with relays • Normally Open (NO): contacts connect the circuit when the relay is activated; the circuit is disconnected when the relay is inactive. • Normally Closed(NC): contacts disconnect the circuit when the relay is activated; the circuit is connected when the relay is inactive. • Change Over (CO): Its the common contact. • COIL: It's the electromagnet coil inside relay.

Relay Operation: When a current flow through the coil, the resulting magnetic field attracts an armature that is mechanically linked to a moving contact. The movement either makes or breaks a connection with a fixed contact. When the current is switched off, the armature is usually returned by a spring to its resting position shown in figure 6.6(b). Latching relays exist that require operation of a second coil to reset the contact position.

Potentiometer: A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat.

Figure 4: Relay Module

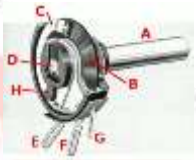

Figure 5: Potentiometer

The measuring instrument called a potentiometer is essentially a voltage divider used for measuring electric potential (voltage); the component is an implementation of the same principle, hence its name. Potentiometers are commonly used to control electrical devices such as volume controls on audio equipment. Potentiometers operated by a mechanism can be used as position transducers. Potentiometers consist of a resistive element a sliding contact (wiper) that moves along the element, making good electrical contact with one part of it, electrical terminals at each end of the element, a mechanism that moves the wiper from one end to the other, and a housing containing the element and wiper.

Global System for Mobile Communication (GSM)

Definition of GSM: GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services.

GSM (Global System for Mobile communication) is a digital mobile telephone system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple Access (TDMA) and is the most widely used of the three digital wireless telephone technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service). GSM Frequencies

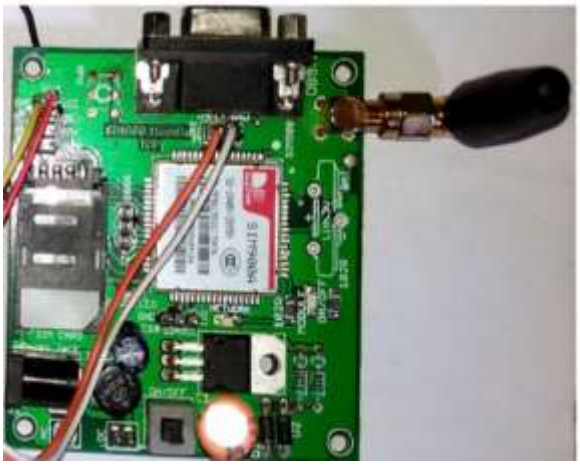

Figure 6: GSM Module

GSM networks operate in a number of different frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G). Most 2G GSM networks operate in the 900 MHz or 1800 MHz bands. Some countries in the Americas (including Canada and the United States) use the 850 MHz and 1900 MHz bands because the 900 and 1800 MHz frequency bands were already allocated. Most 3G GSM networks in Europe operate in the 2100 MHz frequency band. The rarer 400 and 450 MHz frequency bands are assigned in some countries where these frequencies were previously used for first-generation systems.

GPS Module: A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include

- The time the message was transmitted
- Precise orbital information (the ephemeris)
- The general system health and rough orbits of all GPS satellites (the almanac).

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite. These distances along with the satellites' locations are used with the possible aid of trilateration, depending on which algorithm is used, to compute the position of the receiver. This position is then displayed, perhaps with a moving map display or latitude and longitude; elevation information may be included. Many GPS units show derived information such as direction and speed, calculated from position changes

DC Motor: DC motors are fairly simple to understand. They are also simple to make and only require a battery or dc supply to make them run. A simple motor has six parts Armature or rotor, Commutator, Brushes, Axle, Field magnet, DC power supply as shown in the diagram below:

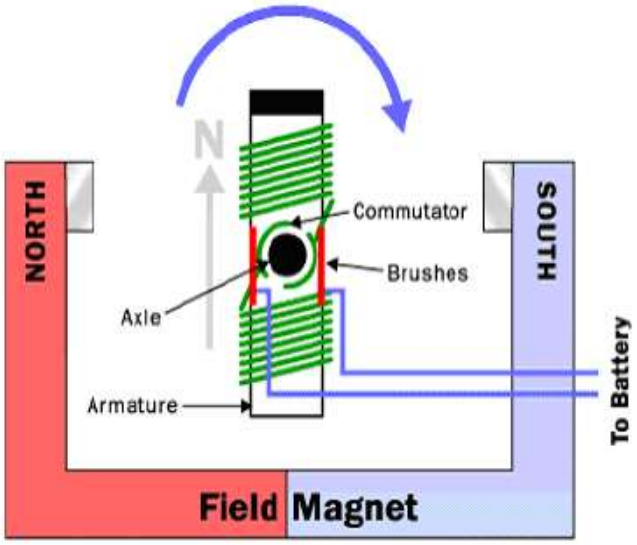

Figure 7: Inner parts of DC Motor

An electric motor is all about magnets and magnetism: A motor uses magnets to create motion. If you have ever played with magnets you know about the fundamental law of all magnets: Opposites attract and likes repel. So if you have two bar magnets with their ends marked "north" and "south," then the north end of one magnet will attract the south end of the other. On the other hand, the north end of one magnet will repel the north end of the other. Inside an electric motor, these attracting and repelling forces create rotational motion. The armature (or rotor) is an electromagnet, while the field magnet is a permanent magnet In the figure 3.2, the armature winding has been left out so that it is easier to see the Commutator in action.

Power Supply: The input to the circuit is applied from the regulated power supply. The ac. input i.e., 230V from the mains supply is step down by the transformer to 12V and is fed to a rectifier. The output obtained from the rectifier is a pulsating dc voltage. So in order to get a pure dc voltage, the output voltage from the rectifier is fed to a filter to remove any ac components present even after rectification. Now, this voltage is given to a voltage regulator to obtain a pure constant dc voltage.

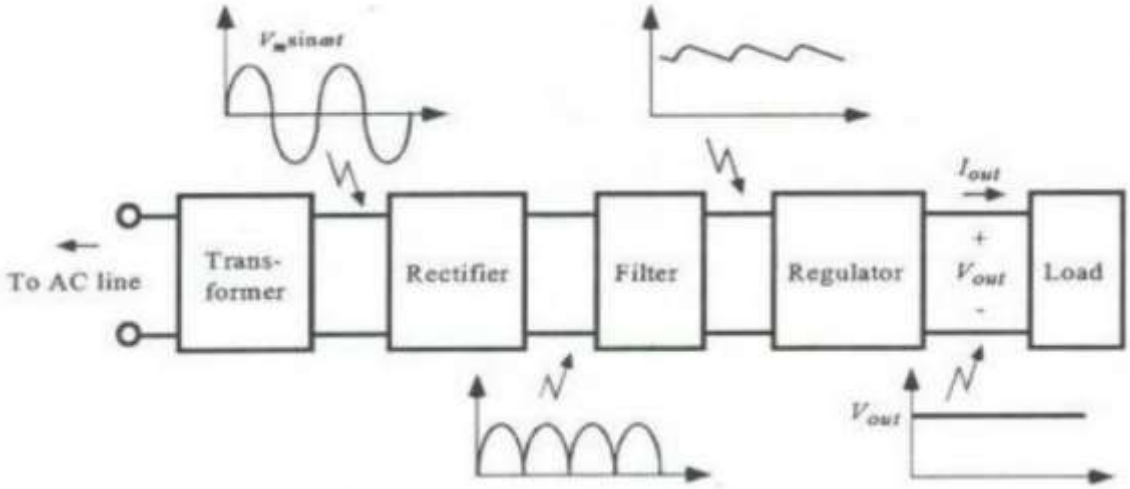

Figure 8: Block Diagram of Power Supply

Above figure 8 shows Block diagram of Power Supply Transformer Usually, DC voltages are required to operate various electronic equipment and these voltages are 5V, 9V or 12V. But these voltages cannot be obtained directly. Thus the a.c input available at the mains supply i.e., 230V is to be brought down to the required voltage level. This is done by a transformer. Thus, a step-down transformer is employed to decrease the voltage to a required level. Rectifier The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification.

Filter Capacitive filter is used in this project. It removes the ripples from the output of rectifier and smoothens the D.C. Output received from this filter is constant until the mains voltage and load is maintained constant. However, if either of the two is varied, D.C. voltage received at this point changes. Therefore, a regulator is applied at the output stage.

IV. APPLICATIONS AND MERITS/DEMERITS OF THE PROPOSED SYSTEM

APPLICATIONS:

- In vehicles to display speed.
- In vehicles to as over speed protector.
- It can be used to control the speed of heavy motor and drive speed.
- It can reduce the time taken to the accident location.

MERITS:

- Easy user interface Speed is easy to read due to back lighted LCD.
- Prevent accidents at high speed.
- Consumption of fuel is less. Password protection.
- Saves the life's.

DEMERITS:

- Speed limit depends on the dc motor capacity.
- Vibration sensor vibrates easily

V. RESULTS

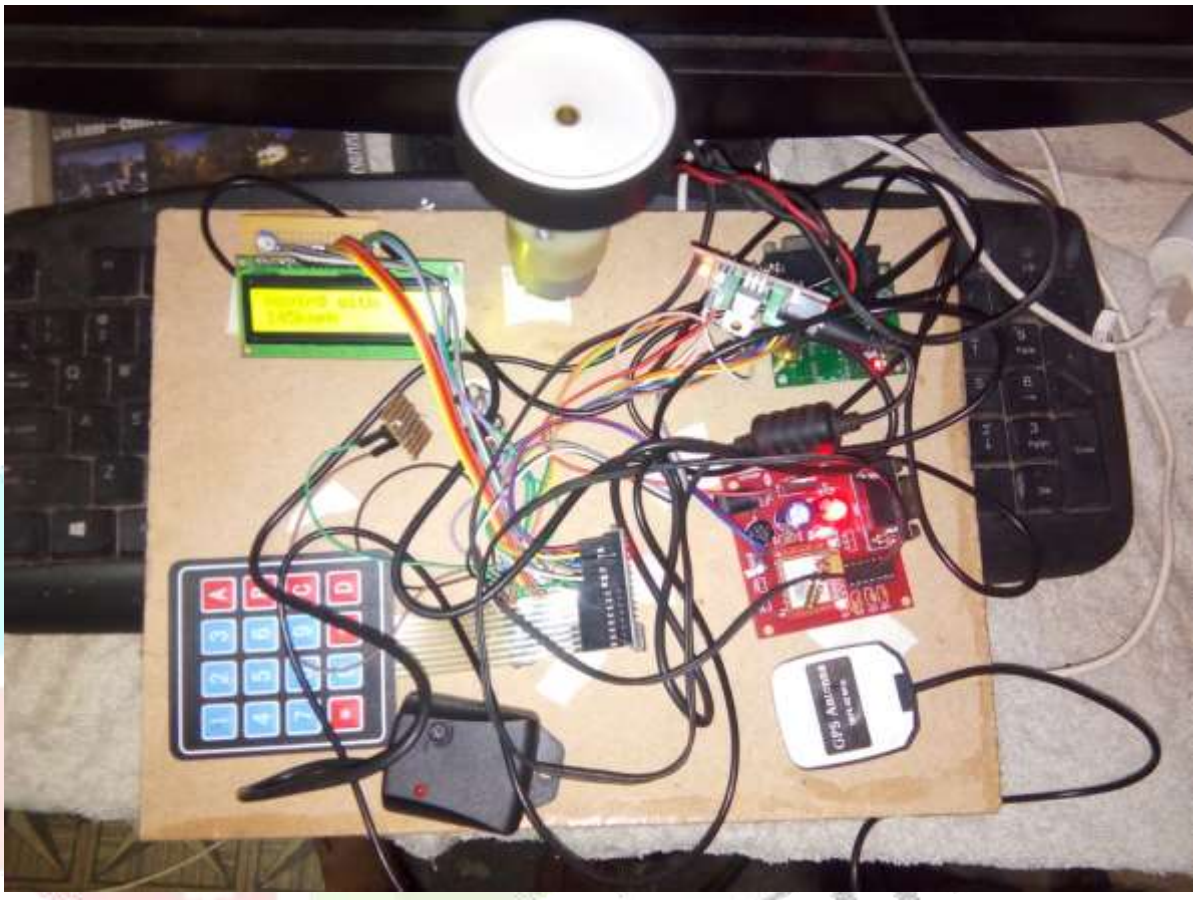

Figure 9: Experimental Setup

Figure 10: Result of Proposed System

VI. CONCLUSION

By this digital speedometer we can control the over speed of vehicle and also protect it from theft. By it we observe that consumption of fuel will decreases. This is cost effective product, life is higher than analog speedometer. Vehicle accident detection system can track geographical information automatically and sends an alert SMS regarding accident. Experimental work has been carried out carefully. The result shows that higher sensitivity and accuracy. This system is verified to be highly beneficial for the automotive industry. This product is very useful for vehicles.

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