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Solider Health Monitoring and Location Tracking System

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Abstract—Nowadays all countries preserve keep its protection at excessive priority.A country's arm forces encompass three expert uniformed services: the navy, the military, and the air force. Soldiers being the spin of any armed force generally lose their lives becauseof loss of clinicalassist when in emergency, also soldiers who are involved in missions or in special operations get straggled on war fields and lose contact with the authorities. To conquer these concerns, we had built this project, using temperature sensor, heartbeat sensor etc. Solider health monitoring location tracking system monitors the health status of the soldier whenever required. By using GPS, we can track the soldier's exact location whenever required. Using LM35 sensor, we can also monitor the environmental condition. The communication is setup between the soldiers and authorized based station via GSM. Any abnormalities in the readings of temperature sensor(LM35) considered as a trigger for GSM to establish the connection between the soldier and base unit and send current location and health status to the base station receiver. By usageof thisequipment, we had attempted to implement the basic safety monitoring system for the soldier in low price, wild weighted, transportable and specific devices, so authorities can provide essential aids.

Keywords:

1.INTRODUCTION

Theessential and cruel position of soldiers who sacrifice their life for his/her country. There are many issues regarding the protection of the soldier. Soldiers coming into the enemy traces often lose their lives because to lack of connectivity, it is important for the army base station to known the location as well as health condition of soldiers. India has lost so many soldiers in war-fields as there was no proper health backup and communication between the soldiers on the borders ofconflict-fields and the officials at the army base stations.

Indian soldiers are especially recognized for his/her courage, not with standingin spite of explosions and protection measures, they have many triumphs to their credits. It is our responsibility about the safety of the soldiers, so we have determined to construct a project which will efficiently keep a check on the health status of the soldier, and track the location to equip him with necessary medical treatment as quickly as possible. Soldier tracking is performed by using GPS and GSM is used to provide wireless communication system. For tracking the health status of solider we are using bio clinical sensors such as temperature sensor and heart beat sensor.

Proposed system:

Base station receives location of soldier from GPS. The base station can access the current status of the soldier which is displayed on the phone with the assist of GSM and therefore appropriate actions may be found.

flow Diagram:

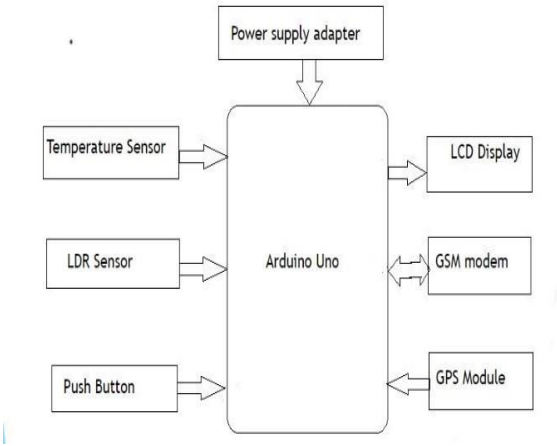

Fig1:Flow Diagram

2.HARDWARE DESCRIPTION

A. ARDUINO UNO

Arduino is a tool for making computer systems that mayexperience and control more of the physical world than your desktop computer. It's an open-source computing platform primarily based on a simple microcontroller board, and improvementsurrounding for writing software program for the board. The Arduino programming language is an implementation of Wiring, a comparable physical computing platform, that is primarily based totally at the Processing multimedia programming surroundings.

1. ATMEL ATMEGA328p:

The ATmega328P chip is used in this project as the microcontroller. The importance of the first two digits is to outline that the AVR core consists of variety of instruction set with 32 general purpose working registers which are linkedwithout delay to the Arithmetic Logical Unit (ALU), tolerating two independent registers to be retrieved in one single instruction executed in one clock cycle. The final digit is to indicate the 8 bit bi-directional port. The AVR is a modified Harvard architecture 8-bit RISC single chip microcontroller which was developed by Atmel in 1996. The AVR became one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM utilized by different microcontrollers on the time.

2. Arduino UNO:

To program the ATmega328P Microcontroller a Serial communicator is required. Serial. A Universal Asynchronous Receiver/Transmitter (UART) is a bit of computer hardware that interprets informationamong parallel and serial forms. Classically, most serial interface from microcontroller to computer is performed through serial port (DB9). TTL UART, a level shifter is needed between these interfaces. There are numerious level shifters available in the market, some of which supports USB plug and play.

The internal board of Arduino consists of all the necessary ICs for communication. It is also build compact into a PCB which has connectors for instant and easy prototyping.

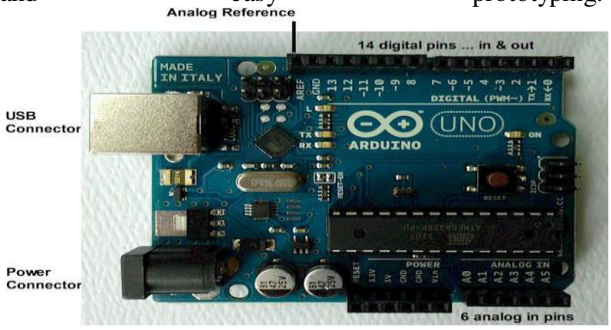

Fig 2: Arduino Development Board

B. LIQUIDCRYSTALDISPLAY**:**

LCD stands for liquid crystal display. Character and graphical LCDs are most common among hobbyist and DIY electronic circuit/project makers. Since their interface serial/parallel pins are described so it's easy to interface them with many microcontrollers. Many products we see in our daily life have LCDs with them. They are used to show status of the product or offer interface for selecting some process. Washing machine, microwave, air conditioners.Character LCDs come areavailable in many sizes 8x1, 8x2, 10x2, 16x1, 16x2, 16x4, 20x2, 20x4, 24x2, 30x2, 32x2, 40x2 etc. Individual character LCDs performs the same functions (display characters numbers special characters, asci characters etc.). LCDs programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to15). In an mxn LCD. M denotes number of columns and n represents number of rows. Like if the LCD is denoted by 16x2 it means it has 16 columns and pair rows. Few examples are given below. 16x2, 8x1 and 8x2 LCD are shown in the picture below. Note the difference in the rows and columns.

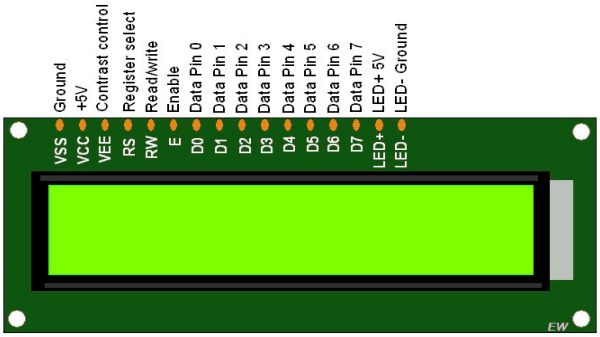

Fig3:Pin Configuration Of LCD

All individual LCDs have

- Eight (8) data pins D0-D7
- Vcc (Apply +5 volt here)
- Gnd (Ground this pin)
- Rc (Register select)
- Rw (read - write)
- En (Enable)
- V0 (Set LCD contrast)

The above figure indicates the pin out of the individual LCD. Almost all the individual LCDs are composed of the same pin out. LCDs with total pin count equal to 14 does not have back light control option. They might have back light always on or does not have a back light. 16 total pin count LCDs have 2 more A and K pins. A means anode and K cathode use those pins to govern the back light of LCD.

Character LCDs have a controller build in to them named HD44780.HD44780 has some registers which are initialized and manipulated for character displaying on the LCD.

1.Rs(Register select)
Register selects the HD44780 controller registers.

2.CommandRegisterWhen we send commands to LCD these commands go to Command register and are processed there. Commands with their full description are given in the picture below. When Rs=0 command register is selected.

3.DataRegisterWhen we send Data to LCD it goes to data register and is processed there. When Rs=1 data register is selected.

4.Rw(Read - Write)
Rw pin is used to read and write data to HD44780 data and command registers. When Rw=1 we can read data from LCD. When Rw=0 we can write to LCD.

5.En(Enable signal)

When we select the register Rs(Command and Data) and set Rw(read - write) and placed the raw value on 8-data lines, now it's time to execute the instruction.

6.V0 (Set LCD contrast)

To set LCD display sharpness use this pin. Best way is to use variable resistor such as potentiometer a variable current makes the character contrast sharp. Rotate the potentiometer knob forward and backward to adjust the LCD contrast.

C. TEMPERATURE SENSOR (LM35):

The LM35 sensor series are precision integrated-circuit temperature sensors, during fire occurrence we use temperature sensor.whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. To detect the heat produced

The Temperature Sensor LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

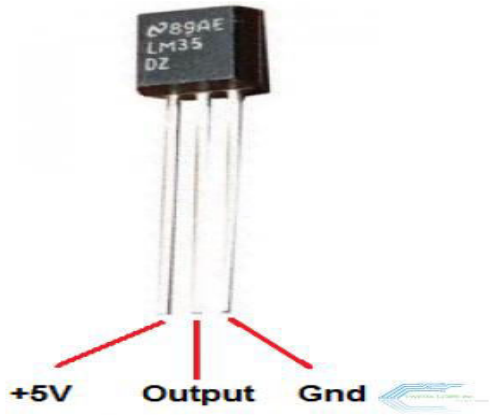

Fig 4: LM35 Sensor

1.LM35SensorSpecification**:**

The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 sensor thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 sensor does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package.

2.LM35 Sensor Sources:

There are several manufacturers of this popular part and each has LM35 sensor specs, datasheets and other free LM35 downloads. This amplifier is available from the following manufacturers.

- National Semiconductor
- On Semiconductor
- Texas Instruments
- Fairchild Semiconductor
- STMicroelectronics

D. PUSH-BUTTON:

A push-button orsimply button isa
simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal. The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Different people use different terms for the "pushing" of the button, such as press, depress, mash, hit, and punch.

push buttons can be connected together by a mechanical linkage so that the act of pushing one button causes the other button to be released. In this way, a stop button can "force" a start button to be released. This method of linkage is used in simple manual operations in which the machine or process has no electrical circuits for control.

Fig 5: Push Button

To avoid the operator from pushing the wrong button in error, pushbuttons are often color-coded to associate them with their function. Commonly used colors are red for stopping the machine or process and green for starting the machine or process.

E. LIGHT DEPENDENT RESISTOR SENSOR:

A photoresistor is a light-controlled variable resistor. The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light- and dark-activated switching circuits[2].

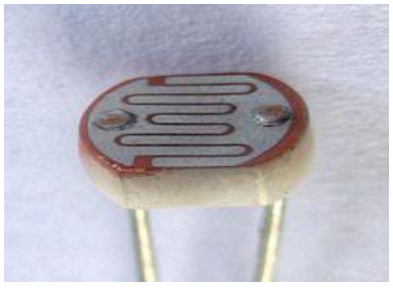

Fig 6: LDR Sensor

A photo resistor is made of a high resistance semiconductor. In the dark, a photo resistor can have a resistance as high as several megohms (MΩ), while in the light; a photo resistor can have a resistance as low as a few hundred ohms. Moreover, unique photo resistors may react substantially differently to photons within certain wavelength bands.

F.GSM MODEM

The modem consists of all the required external circuitry required to start experimenting with the SIM300 module like the power regulation, external antenna, SIM Holder, etc.

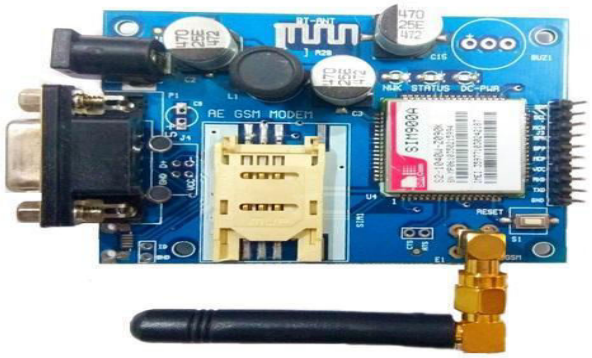

Fig 7: GSM (SIM 900) Module

AT commands are used to control MODEMs[1]. AT is the abbreviation for Attention.The Hayes commands started with AT to indicate the attention from the MODEM. The dial up and wireless MODEMs (devicesthat involve machine to machine communication) need AT commands to interact with a computer.

G. GPS MODULE

A GPS receiver calculates its position by precisely timing the signals sent by GPS satellite high above the Earth. Each satellite continually transmits messages that include[5].

- 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. Many GPS units show derived information such as direction and speed, calculated from position changes.

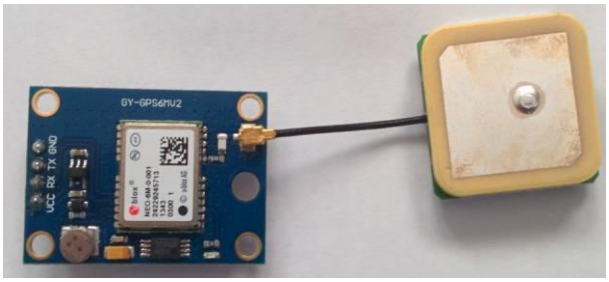

Fig 8: GPS Module

3. POWER SUPPLY

A. Regulator Power Supply

The regulated power supply will accept an AC input and give a constant DC output. Figure below shows the block diagram of a typical regulated DC power supply.

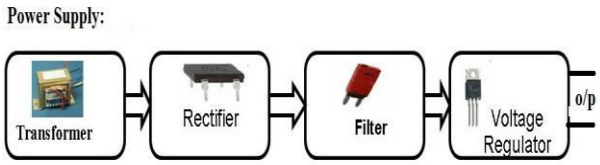

Fig 8: Regulated power supply

1. Step Down Transformer: A step down transformer will step down the voltage from the ac mains to the required voltage level. The turn's ratio of the transformer is so adjusted such as to obtain the required voltage value. The output of the transformer is given as an input to the rectifier circuit.

2. Rectification:Rectifier is an electronic circuit consisting of diodes which carries out the rectification process. Rectification is the process of converting an alternating voltage or current into corresponding direct (DC) quantity. The input to a rectifier is ac whereas its output is unidirectional pulsating DC. Figure below shows a full wave bridge rectifier.

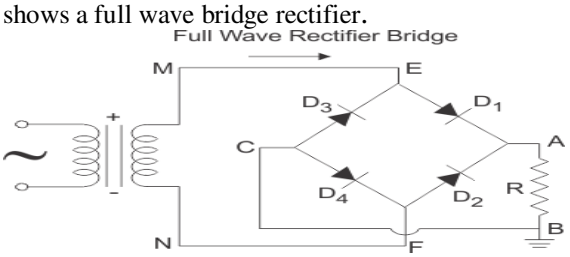

Fig9: Full Wave Bridge Rectifier

3.DCFiltration:The rectified voltage from the rectifier is a pulsating DC voltage having very high ripple content. waveform. Hence a filter is used. Different types of filters are used such as capacitorfilter, LC filter, Choke input filter, π type filter. Figure below shows a capacitor filter connected along the output of the rectifier and the resultant output waveform.

4.Regulation**:**Transistor series regulator, Fixed and variable IC regulators or a Zener diode operated in the zener region can be used depending on their applications. IC's like 78XX and 79XX are used to obtained fixed values of voltages at the output.

Schematic diagram:

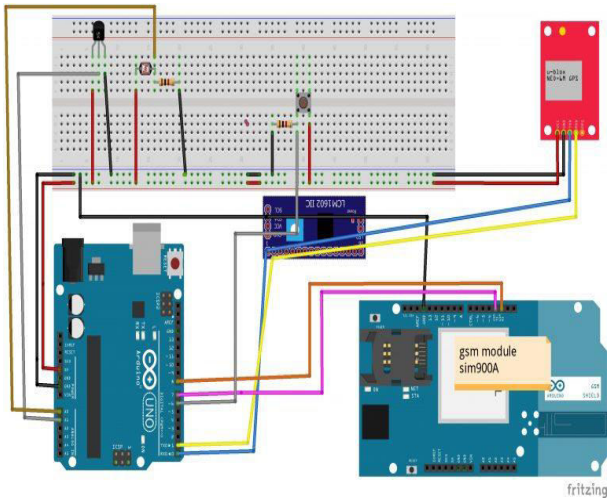

Fig 10: Interfacing LDR, LM35, GSM, And GPS

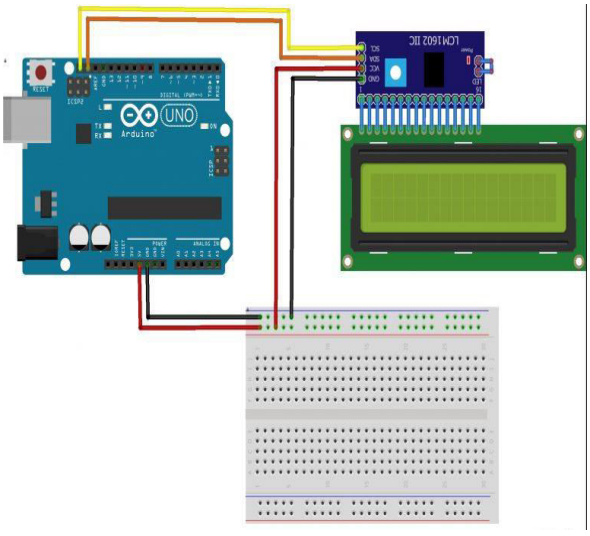

Fig 11: Interfacing I^2C LCD

4. SOFTWARE DESCRIPTION

1. Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE. It includes a code editor. A program or code written for Arduino is called a "sketch".
Following are the steps involved:
1. Open Arduino IDE.
2. Select the COM Port from tools.
3.Select the required Arduino board.
4. Write the sketch in Arduino IDE.
5.Compile and Upload the Sketch to Arduino Board.

5.RESULTS AND EVALUATION

The main intention of this project is to find out the exact location of the injured solider in the war field. This GSM based solider health and position tracking system retrieves the exact location of a soldier in terms of its longitude and latitude. This data is fed to the Arduino, which is interfaced to a GSM modem. The Arduino retrieves the exact location details from the GPS and sends an SMS to the concerned authority over GSM modem. An LCD display is connected to the Arduino for crossing the data received before being sent over GSM. This project will be very useful to army base station to keep track of their soldiers.

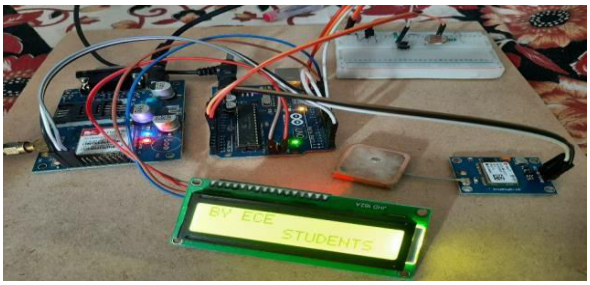

Fig 12: Prototype of Soldier Health and PositionTracking System

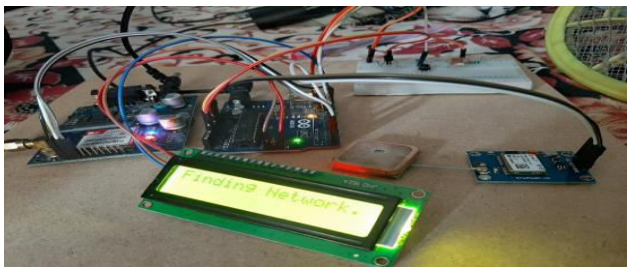

Fig 13: Status Updation of LCD screen

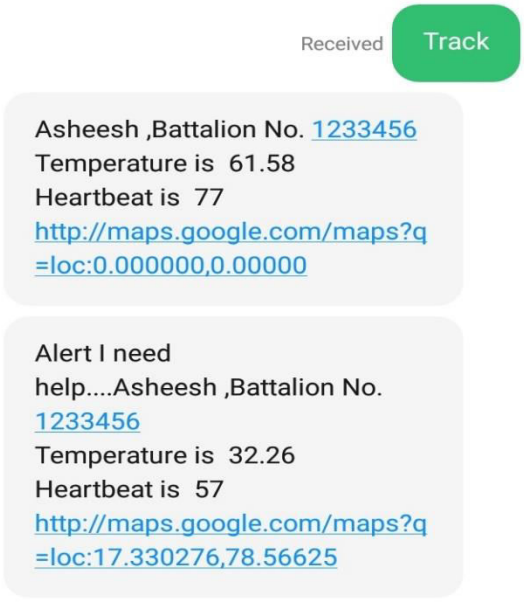

Fig 14: Message Delivered to the Authorized Mobile Number

6.CONCLUSION

The result is as shown above. A message is sent on the registered number confirming about GSM and GPS configuration. Later as the normal body parameters deviates an alert message is send to base station along.

7. FUTURE SCOPE

This can also be developed by inter connecting a camera to the controller module that takes the photograph of the accident spot that makes the tracking easier.

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