

# GPS based Soldier Tracking and Health Indication System

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**ABSTRACT:** The project aim is to track the soldier's location in the battlefield and information about the soldier's health so that we can save soldiers from war zone and hence to protect our nation from the rivals. During war and Search operations our protectors are injured and many of them are lost from their battalion, at that time this project gives an ability to track and analyse health of the soldiers in real time who become lost and get injured in the battlefield. It helps to save the time, search and rescue operation efforts of soldier control unit. This system enables army base station to track the location and monitor health of soldiers using GPS module and body sensor, such as temperature sensor, heartbeat sensor etc. The GPS modem sends the latitude and longitude position with the help of that military can track the current position of the soldier. The system is helpful for getting health status information of soldier and providing them instant help.

**KEYWORDS:** Nations Security; M-Health GPS Tracking; GSM Module; (Lpc2148) microcontroller

## I. INTRODUCTION

**“The soldier fights not because he hates what is in front of him, but because he loves what is behind him.”**Soldiers are the real protector of the country. Soldier is the one who serves the nation. The role of soldier in safeguarding the frontiers of his modest land is unique. He lives and dies for the NATION. It is our responsibility to help our soldier.

In our system we are basically focusing on Soldier's health. That's why we are introducing this project which will be very useful for providing health status of the soldiers and provide medical help to them at critical situation in battlefield. Concerning the soldier's safety there are many instruments to view their health status as well as ammunitions on the soldiers. In soldier security, bio-sensors systems give different types of small physiological sensors, Biomedical sensor, transmission modules and processing capabilities, and can thus facilitate low-cost wearable unobtrusive solutions for health monitoring. GPS used to log the longitude and latitude so that direction can be known easily. GSM module can be used for effective range of high-speed transmission, short-range and soldier-to-soldier wireless communications that will be required to relay information on situational awareness, tactical instructions, and covert surveillance related data during special operations reconnaissance and other missions. In our project, we are trying to provide an embedded wireless system by which the Army base stations can monitor the heart beat count, Atmospheric pressure and gas level, body as well as atmospheric temperature by using sensor networks. Base stations can also know the location of soldiers by tracking them through Global positioning system (GPS) and can guide them to any safe area. In this project, all the processes are in real time because of the use of ARM7 microcontroller (LPC2148). In this project, our main aim to improve the communication between soldiers and army control room by using advance and highly efficient, powerful systems.

This project helps in to solve above mentioned problems as follows:

- i. By using GPS device, it is possible to provide proper information about the location of soldiers when it is needed.
- ii. It will become easy to provide medical assistance to soldiers when they get injured.

## II. RELATED WORK

In [1] authors used soldier's health parameters such as heart rate and body temperature are continuously measured and transmitted wirelessly to the control room using GSM. In case of death of the soldier, the processor detects the change in pulse rate and location of the dead soldier; tracked by the GPS module is then communicated to the military base station. In [2] this paper aim is to track the soldiers real time positions and the health indication parameters so that we can protect our nation from the rivals. During war and Search operations our protectors are injured and many of them are lost from their battalion, that time this project gives an ability to track the location and analyse health of the soldiers in

real time who become lost and get injured in the battlefield. In[3] this paper presents an embedded wireless sensor network(WSN)prototypesystemfortemperature monitoring in a building. The ultimate goal is to help saving the energy cost and reducing energy consumption. The system provides a web user interface for any user to access the current and past temperature readings in different rooms. The network consists of a data gateway or coordinator which wirelessly polls each WSN temperature-monitoring node.In[4]design and implement wireless biomedical parameters monitoring system based on different biomedical sensors and microcontroller unit Arduino UNO with Zigbee.The system can be used to measure physiological parameters, such as Blood pressure (Systolic and Diastolic), Pulse rate, ECG monitoring.In[5] the proposed system enables a communication with the army base station to track the location and health status of soldiers. This is done through embedding GPS (Global positioning system) module with low power wireless body sensors in the system. Communication is set up two way: using antenna and using a GSM module. This improves reliability of the communication and makes it more fault tolerant. Hence the risk of non-functioning of the system is reduced. In [6] this paper gives an ability to track the location and monitor health of the soldiers in real time who become lost and get injured in the battlefield. It helps to minimize the time, search and rescue operation efforts of army control unit. This system enables to army control unit to track the location and monitor health of soldiers using GPS module and wireless body area sensor networks (WBASNs), such as temperature sensor, heart beat sensor, etc. In[7]a new Iot-based health monitoring approach in which collected medical sensor data is sent to an analysis module via low-cost, low-power and secure communication links provided by a LoRaWAN network infrastructure. Mainly focus on monitoring blood pressure, glucose and temperature in rural areas where cellular network coverage is either absent or does not allow data transmission. The main objective is to reduce the burden of long trips for people living in these areas to visit healthcare facilities, while minimizing the communication cost. The results indicate that the average area covered is around 33 km<sup>2</sup> when the LoRa Gateway is placed outdoor on a 12-meter altitude.

III. PROPOSED ALGORITHM

A. Design Considerations:

- Locomotion, the vehicle must have a flexible drive system
- Communication, Control and Power
- GSM technology would be used in the prototype
- GPS to show the position and orientation of the robot
- Additional features to assist in search and rescue applications, including cameras, audio systems and sensors

B. Description of the Proposed Algorithm:

Aim of the proposed algorithm is a large number of these robots are sent in the forest and these mini robots scan the whole area on the ground level and search for the missing person. Hence it completely eliminates the danger of human life during the rescue operation and one of the best features of UGVs is it don't require any human to control it i.e.it is self-controls itself and reduces man force.

Here the Over view of the systems is shown and explained briefly.

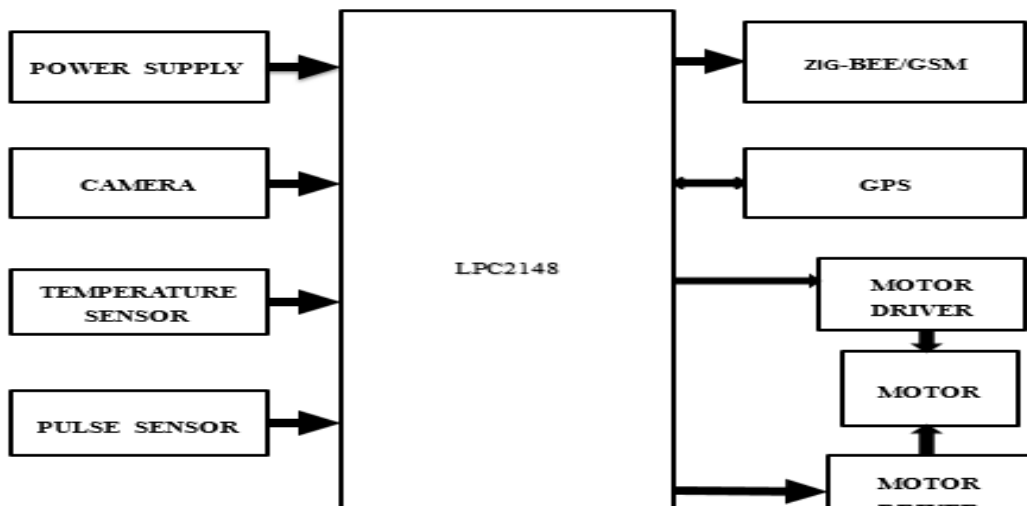


Figure 1: Block diagram of overview of the system

- i. The main goal is to integrate a medium-size, robot type unmanned ground vehicle (UGV), for searching lost people in the natural disasters. UGV is built with camera for detecting the person using image processing and video processing techniques for rescue purpose must know about the person's alive or not.
- ii. Temperature sensor and pulse sensor or heartbeat sensor is used for detecting the condition of the person. Once the person is detected as alive the rescue team will get the person location through GPS Navigation system via GSM/Zig-Bee.
- iii. All these sensors and protocols are interfaced in the LPC2148 microcontroller which has 32 bit and have 64 pins high performance ARM-7 in which only 48 pins are used by the user which are multi-function pins operating at 3.3V power supply and has an oscillation frequency of 60Mhz.
- iv. Two motor drivers are used which are connected to a motor, these motor drivers are nothing but just like a relay which act as a switch used to turn on the motor which indirectly help the vehicle to move.

#### IV. PSEUDO CODE

##### Algorithm for temperature sensor

Step 1: The sensor sends the analog signal to the microcontroller.

Step 2: ADC 0,1 converts the analog signal into digital.

Step 3: The digital value will be converted into degrees using the formulae

$$\text{Temperature} = (\text{ADC\_value}) / 19.37$$

Step 4: Depending on the temperature w.r.t. the threshold.

Step 5: Send a message to the number provided with the exact location of site of accident.

##### Algorithm for pulse sensor

Step 1: Activate the pulse sensor.

Step 2: Start the timer for one minute.

Step 3: Simultaneously sensor transmit and receive the wave at micro seconds.

Step 4: After one minute stop the timer.

Step 5: Convert the count into pulse rate.

Step 6: Depending on the measured pulse rate w.r.t. the threshold level.

Step 7: A message is sent accordingly (alive or dead)

##### Algorithm for image processing

Step 1: Clear all

Step 2: Activate the camera and start a video.

Step 3: Take the images from the video and store the image in x.

Step 4: Subplot the image in rows and columns and display it on the screen.

Step 5: Crop this image into 40\*40 pixel and check for a human face.

Step 6: Face is detected using the protocol Cascadeobject detection and displayed it on screen.

Step 7: Once the face is detected control is send to the controller.

Step 8: End.

#### V. SIMULATION RESULTS

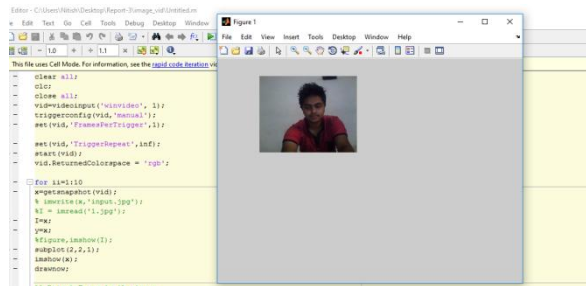
The simulations studies involve the steps involved in executions are as follows. A third improvement for the cameras would be to position them so that they could be panned and tilted. To this end, the lights on the front of the robot would also have to pan and tilt to provide light wherever the user looked. This would require both better cameras and additions to the control logic. Cameras could also be added to the sides, top and bottom of the vehicle (bearing in mind that the top and bottom of the robot are interchangeable) to convey more information regarding the robot's surroundings to the user. The feeds from these cameras would not always be shown but instead would be toggled by the user, to avoid disorientation from the different views.

Further improvements would involve adding more sensors. The primary candidate for addition would be a thermal imaging camera, allowing the robot to see surface heat on obstacles to precisely locate a survivor. To allow more utility in hazardous materials situations, the robot would have additional sensors for air purity, temperature, pH, radiation, etc. It would be fully water-sealed to further resist contamination, as well.

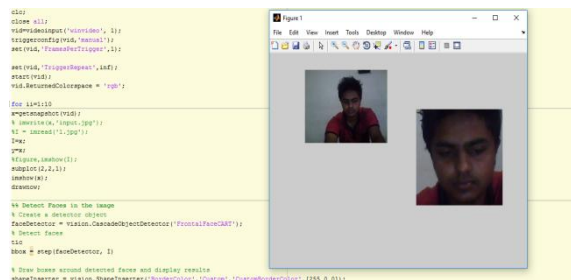
- Step1: Motor is switched on and the search operation starts, with the message displayed on the LCD.



- Step 2: The camera starts searching for people and displays objects around it as seen below.



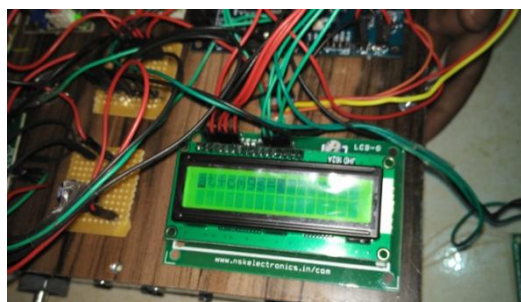
- Step 3: The captured image is cropped and the face is detected and displayed on the screen.



- Step 4: Following that a message is sent to the number provided with the message of "human detected".

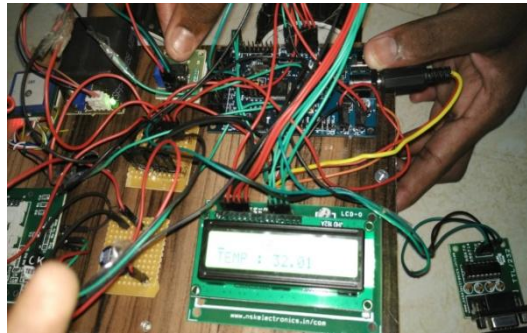


- Step 5: The location of the site is also sent to the number.

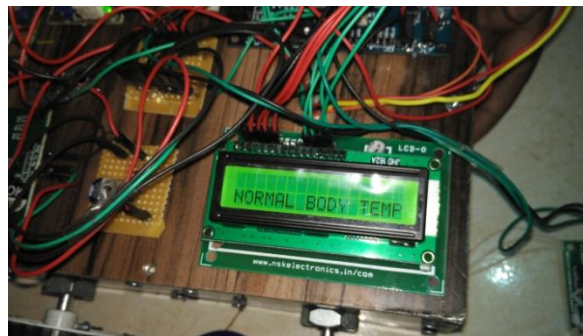




- Step 6: After detecting the human temperature of the body is measured and displayed on LCD.



- Step 7: If the temperature is found to be normal then a “normal body temperature” message is sent.



- Step 8: Finally, the pulse rate of the body is calculated and message of alive or dead person is sent accordingly.



## VI. CONCLUSION AND FUTURE WORK

A prototype of the project has been developed and tested which works according to the designed algorithm with satisfactory results. The sensors work efficiently as coded and provide accurate outputs. The base station can easily monitor and track each soldier as the front-end of the webpage is designed such a way so that it makes everything clear. Further improvements the microcontroller could also be modified to monitor the voltage across each arm rotation motor to determine when the motor has stalled (and by extension, when the arm has made contact with the ground or an obstacle). These contacts would be communicated to the laptop via the Wi-Fi router on the robot. The arms would flash a different color when they confirm contact with an obstacle. In addition, the two processors used by the team would be replaced by a single, more powerful processor with more input and output pins, which would eliminate the communication delays experienced by the prototype.

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#### BIOGRAPHY

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