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# Smart Mountain Climbers Health Monitoring and Position Tracking

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**ABSTRACT:** The well-being checking and efficient monitoring for mountain climber is gaining its importance nowadays. Several precautions must be taken regarding the safety of climbers. In order to track the wellness of the climbers they must carry pulse rate sensors suitable communication devices to connect with the control rooms. At worst health conditions, it turns out to be incompetent for the mountain climbers to utilize it and communication issues increases inefficiency after a particular altitude. The health and position tracking system with Global Positioning System (GPS) to detect the live location and furthermore measuring the temperature and heartbeat of the climber is proposed in the work which overcomes the shortcomings of the techniques used by the mountain climbers. providing them instant help. Mountaineering includes activities such as skiing, hiking, hill climbing and more. But, it becomes dangerous and involves high risks. Common accidents include altitude sickness, missing persons and accidental falling. Due to mountaineering activities lots of cases with heavy injuries and deaths are reported. There is a need for monitoring the mountaineer accidents and providing a rescue system. This issue is addressed and Wireless Sensor Networks along with Telehealth is seen as a promising solution. It can cut cost in power and wiring. Devices which is low power is needed to transmit the data over very long distances where there are no network coverages. So Wireless technologies like Long Range (LoRa) which is a network being able to transmit over long distances without high power consumptions can be used under these conditions. A monitoring device is implemented which is used for monitoring the person for safety via LoRa technology. A cloud server is set up by using LoRa gateway combined with Internet of Things (IoT). This system provides an architecture system for monitoring, tracking and early rescue

**KEYWORDS:** GPS Module, LoRa, Petlier, Temperature, Mountain

## I. INTRODUCTION

- Mountain climbing or trekking count is increasing currently owing to their interest in improving their health, balancing mental and physical health. It is also viewed in the point of body weight exercise, better flexibility and blood circulation. Both mountain climbing and trekking are comprehensive sports. This mountain climbing is fast growing recreation sport. Encouragement and sponsors from the various agencies motivates more persons to involve in mountaineering and as sport people aim to create new records by beating up the previous records. Especially these passionate climbers undergo several risks during their climbing activity. So, it is necessary to beware of the risks of accidents in climbing process. High altitude mountain climbing exposed to low oxygen levels, low temperatures, wind, physical and mental stress, and dietary deficiencies. This sudden variation causes abnormal variation blood pressure and heart rates. The major risk includes shortness of breath due to insufficient oxygen at high altitudes and climbing in extreme warm and cold environment involves in getting the risk of injuries, hypothermia and heat stroke.
- In addition to the climatic conditions, getting contact with the insects and poisonous plants cause allergies and variation in blood pressure needs medical attention. The leaders who lack in mountain medicine is failed to handle the situation when person get ill. Many trekkers do not know how to access the medical equipment and this leads to several issues. At this situation, immediate contact of rescue team by the person affected is difficult and this time lagging in identifying the affected climbers leads to severe illness.
- The tracing of mountain climber's location with suitable communication technologies is required for the team. The automatic tracking of mountain climber's location and reaching the spot by the rescue is needed. Mountain climbers can communicate with their team or if emergency they contact the rescue team or medical team with the communication medium, but the range of signal availability after a particular altitude is difficult. Mountain climbers often face unexpected situation with power and signal issues. LoRa (Long Range) is a wireless radio frequency technology that has been gaining high popularity for integration with Internet of things (IoT) networks worldwide.

- LoRa along with IoT has been used to solve some of the biggest challenges facing us such as the reduction in the natural resources used, infrastructure efficiency, pollution control and even energy management. Some applications where LoRa is used are Smart agriculture, Smart Diagnosis and Logistics, Smart homes and buildings and even for monitoring a disabled patient. The Long Range provided by the LoRa is a key feature as it can reach up to 10Km in rural areas by using proper directional antennas. It also penetrates to a higher extent in urban conditions compared with other wireless technologies. LoRa is a low cost and low power replacement since it reduces the infrastructure costs to a large portion and provides negligible operating costs. The high battery life ensures that replacement is done after very long time. Thus, the LoRa is a combination of both Wi-Fi and Cellular networks making it an efficient, inexpensive and flexible alternative for other wireless technologies. Telehealth is a way of transmitting medical information and data over long distances using telecommunication systems which provide with the adequate medical care or diagnosis. It is needed to overcome the challenge of distance when there is no access to the medical services nearby. The Telehealth can be used to monitor the people remotely for the mountaineers, diagnose the issues and provide rescue.

## II. LITERATURE REVIEW

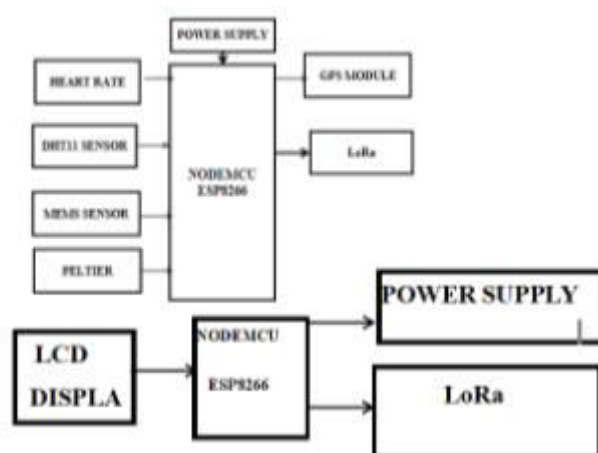
**Asarla Anusha, Kotha Ravi Teja, Suragani Srikanth, Muthyala.V. V Satya Chowdary**

Mountains have attracted many enthusiasts and trekkers for a long time to conquer high peaks or explore picturesque terrain. A team of mountaineers carries the necessary equipment for climbing steep slopes and steering through rugged terrain. The movements are monitored through the main control centres. The reporting mechanism is periodic on a need basis or at the end of the day's summary reporting. The team members are travelling under the threat of avalanches and victims get buried inside the snow-mass in the event of accidents. In such accidents, 65% of fatalities happen due to asphyxia, 29% due to trauma, and balance due to hypothermia, drowning and primary cardiac arrest. Commercially available gadgets and previously developed electronic systems are designed for normal habitation. They use WiFi services to transmit health parameters on IoT platforms. Users should be conscious and self-aware to monitor and communicate health parameters, whereas the buried victims suffer from trauma and remain immobile/unconscious. The present paper aims at addressing the healthcare issues of mountaineers while trekking in normal conditions as well as in a buried scenario without the need for WiFi connectivity. The proposed electronic system uses low power consuming chips that sustain low temperatures up to -40 °C. The system monitors oxygen level, heart rate, body temperature, etc., and disseminates the compiled data to a central control station by employing technological advancements in Wireless Sensor Networks, LoRa, and satellite modems. In the event of accidental burial of victims, the electronic system is equipped with a special feature to automatically activate Op-Mode-5 and transmit data at optimum power to the master node. The system helps in the regular assessment of the health conditions of mountaineers so that search and rescue operations can be carried out in time for saving precious lives.

## III. METHODOLOGY

The methodology for the proposed mountain climber monitoring system involves a systematic approach to address the challenges and requirements of ensuring the safety and well-being of climbers in hazardous environments. Beginning with a comprehensive analysis of the requirements, the researchers identify the essential components necessary for effective monitoring, including pulse rate sensors, communication devices, and GPS modules. Furthermore, they scrutinize the shortcomings of existing techniques used by climbers, particularly regarding communication inefficiencies and limitations at higher altitudes. Leveraging this understanding, the researchers propose the development of a health and position tracking system that integrates pulse rate sensors, GPS modules, and temperature sensors. To facilitate communication in remote areas, Wireless Sensor Networks (WSNs) and Long Range (LoRa) technology are selected for their ability to transmit data over long distances with minimal power consumption. Subsequently, a monitoring device is designed and implemented, incorporating the identified components and LoRa transceivers for data transmission.

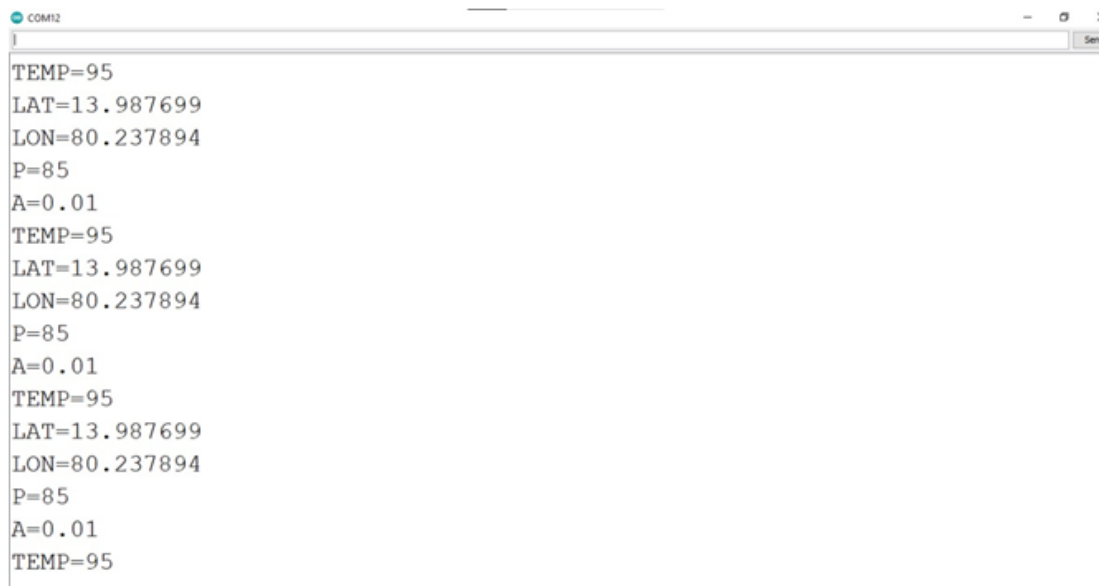




Concurrently, a cloud server infrastructure is established using LoRa gateways and IoT technology to store and process the collected data. Finally, the developed system undergoes rigorous testing and validation in real-world mountain climbing scenarios to assess its accuracy, reliability, and effectiveness in monitoring and facilitating early rescue operations. Through this methodology, the researchers aim to provide a robust solution for monitoring climbers' health and safety, mitigating risks associated with mountaineering activities.

#### IV. RESULTS AND DISCUSSION





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TEMP=95

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## V. CONCLUSION

The V2I has been proposed in this paper to allow ambulance-to-traffic light controller communications, namely A2T. Based on the application of A2T in a use case of Thailand, ambulances benefit in terms of faster and safer casualty transfers by getting rid of stops at the intersections. Our performance evaluation shows that A2T accomplishes 100 percent stop removal for the ambulances at the intersection. Other vehicles on the rescue road also benefit from A2T by experiencing a 13.10 percent improvement in terms of AAWT. Other vehicles on the crossing road, in contrast, experience only a 2.48 percent increase of AAWT. Therefore, A2T is positioned as a promising approach to enhance rescue operations in the near future.

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