Mountain Climber Monitoring system

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***Abstract*— Mountaineering has always been a very adventurist & enthusiastic activity. But with adventure comes risk. Mountain climbers are always under risk of accidents. When any such accident occurs at high altitudes or remote locations, search and rescue operations are not always successful because:**

- **The news of accident takes hours or even days of reach search & rescue team**
- **Search and rescue team does not know the location of the accident.**
- **Search & rescue team does not know if the person is alive or not, and if alive what is his condition.**

The smart mountain climber allows for teams to track vitals of climbers in real time as well as monitor their location over IOT. This provides the following advantages:

- **Live Heartbeat Monitoring**
- **Upper & Lower Limit Settings**
- **IOT Live Vitals Display**
- **GPS Location Tracking**
- **Added SMS alert in case of limit crossings**
- **Automatic Operation**

The system makes use of a Heartbeat and temperature sensor with at mega controller, Wi-Fi module, LCD Display and GSM Module with Power supply to develop this system. The pulse sensor is use to sense the user heart rate and transmit it to the controller.

The controller displays this value on and LCD display as well as transmits this over the IOT for live monitoring. The controller also has 4 button inputs that lets user to configure the contact number on which to send the SMS as well as the upper and lower limits of heart rate to send alerts.

The controller now monitors the pulse rates constantly. If the pulse or temperature goes beyond set limits, the controller shows an alert over the IOT display using the wi-fi as well as it uses a GSM module to send an SMS alert with GPS coordinates that can be viewed as a link to send a search party instantly to send location for rescue attempt. Even if the climber goes out of network area, the team still has the last recorded location over IOT to narrow down the climbers search location.

***Index Terms*— Blynk app, Node MCU(ESP8266).**

I.INTRODUCTION

The heart rate and body temperature for the mountaineering user is very import to detect their life risk factor. Amidst the emergence of wearable and Internet of Things (IoT) devices, exercise- and leisure-related wearable devices have exhibited the most growth in popularity. While many exercise-related wearable devices are available, few have been designed for group interactions. This paper proposes an IoT-based mountaineering team management device to effectively assist mountaineering guides in leading mountaineering teams. The device can monitor the real-time physiological status and coordinate of each team member, and uploads the information to the cloud service platform via the fourth-generation (4G) mobile Internet. We used an unscented Kalman filter (UKF) to reduce the data influence of motion since the user's heartbeat and temperature are unstable during the motion of mountaineering. When an abnormal event occurs, the device allows the guide to immediately acquire the real time information of each member. If accidents occur or team members become lost, the device enables quickly locating the lost members. Additionally, the device can be used to make announcements to all team members. The proposed device can immediately and effectively assist mountaineering guides managing mountaineering teams, thereby improving mountaineering safety.

In the real time emergency rescue system, a heartbeat monitor is used to remind the user of altitude sickness and inertia sensor to detect falling, the monitoring is done using the Bluetooth available in a smart phone and the data is transmitted using cellular networks to the rescuers by using an application on the mobile device to facilitate the transfer of data. In case of emergencies the wearer can use the application to transmit the geographical data and request for rescue. The WE-Safe is device aimed at monitoring

dangerous and hazardous environments. Multiple low power environmental sensors nodes are used to transmit to a LoRa Gateway. By monitoring the carbon dioxide, ultraviolet level and other environmental parameters, individuals were warned of unsafe work environments. The LoRa Gateway is used to connect to the internet using a cloud server. A mobile application will provide with alerts when the environment reaches unsafe conditions. In the irrigation system, the LoRa is used to perform precision agriculture.

A system that consists of soil moisture, temperature and humidity sensors were used by the nodes. The data was then transmitted to a receiver called the Concentrator, which controls the irrigation process. Based on the soil's needs the irrigation was done instead of being set on a timer. The Concentrator allows the users to configure the irrigation system, monitor data and also manage crops remotely using a computer and also Web interface for ease of access. A bus tracking system was implemented in [11]. It was mainly implemented to eliminate user's concern about the unreliability of the bus timing. A LoRa based tacking system was implemented which reduced the number of repeaters need by 75% or more compared with Wi-SUN based systems used previously which decreases the installation cost by a very large portion. The tracking was transmitted to an information terminal bus stop that the users were able to use.

II. LITERATURE SURVEY

This paper proposes an IoT-based mountaineering team management device designed to effectively assist mountaineering guides in leading mountaineering teams. Our proposed system is characterized by an IoT architecture based on multiple people. It different from the IoT devices on the market and it can be managed by a team of multi-person. Through the network connection between the devices, one-to-many communication can be performed to achieve the purpose of multi-person team management based on the IoT. Figure 3 is a schematic diagram of the system communication in the team management mode. In the other hand, our proposed system is difference to the smartphone. The smart phone cannot provide the precise heart rate and also cannot provide the user's body temperature. Our proposed system is according to the life risk factor to detect the mountaineering physiology. The device enables guides to monitor the real-time physiological status and coordinates of team members. When team members are lost or in danger, the device can quickly locate their positions. Additionally, the device can be used to make announcements to all team members. We constructed the device using IoT concepts, linking it to cloud servers through fourth-generation (4G) mobile Internet. Data are processed by cloud servers, enabling monitoring of mountaineering team status. Our proposed system will store the map in our memory system when not accessing the map data through cloud. When the user is in disconnect situation, our proposed system can provide the correct location by GPS signal.

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 [4], Smart Diagnosis and Logistics [6], Smart homes and buildings [7] and even for monitoring a disable patient [8]. The Long Range provided by the LoRa is 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.

III. EXPERIMENTAL METHODOLOGY

The block diagram consists of Node MCU ESP 8266, lcd, LEDs, temperature sensor, pulse sensor, power supply, buzzer, Arduino Nano, MQ135 gas

sensor, GPS, BMP 180 sensor, panic button, blynk IOT server. Power supply apply to Arduino Nano. It is a one type of microcontroller board. This board has many functions and features like an Arduino Duemilanove board. However, this Nano board is different in packaging. It does not have any DC jack so that the power supply can be given using a small USB port otherwise straightly connected to the pins like VCC & GND. This board can be supplied with 6 to 20volts using a mini-USB port on the board.

Pulse sensor and temperature sensor are connected to Arduino nano, which will show the heart rate and temperature of the climber. The heart rate and temperature will be displayed on the LCD display which is also connected to the Arduino nano. In the second stage tracking of the climber will be takes place, using of GPS climber location can be detected. A device that is used to detect or measure or monitor the gases like ammonia, benzene, sulfur, carbon dioxide, smoke, and other harmful gases are called as an air quality gas sensor. The MQ135 air quality sensor, which belongs to the series of MQ gas sensors, is widely used to detect harmful gases, and smoke in the fresh air. Green LED will be on when we switch on the system.BMP 180 sensor measures both temperature and pressure, because temperature changes the density of gases like air. The panic button can be used by climber when he or she in the danger position, when the climber presses the panic button the higher authorities get the information the he is in danger he needs help, through the blynk IOT server the rescue team will reach the location. At finally in the first stage health monitoring of the climber can be performed. In the second stage tracking and detecting of harmful gases in the environment.

IV MODELING ANALYSIS

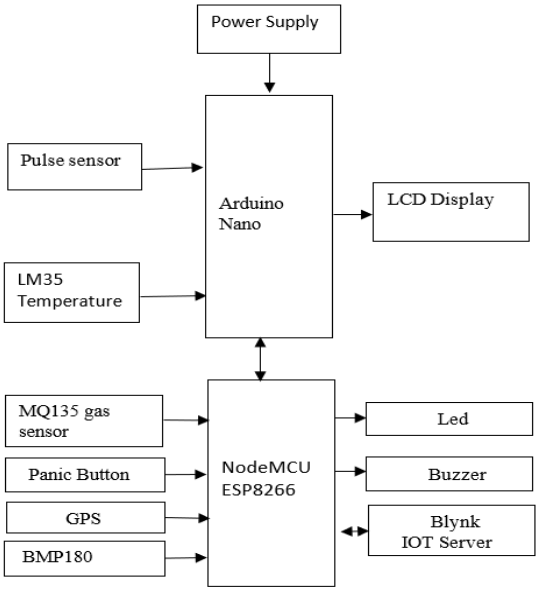
The main aim of our project is to monitoring the health of mountain climber and tracking of the climber location. The health monitoring can be done using the pulse sensor and temperature sensor.

Pulse sensor give the heart rate, when the heart rate crosses the limit given by the user it will alerts.

Temperature sensor will give the temperature of the climber on the LCD screen.

In stage two through GPS location of the climber can be detected, using of MQ135 gas sensor harmful gases in the environment can be detected it will alert if any harmful gas is present, panic will be activated when climber presses that button, when he or she in danger, when he presses that but automatically information is sent to the higher authorities or rescue team. through blynk app the temperature, pressure, altitude, longitude, latitude, Pulse rate can be seen.

Block diagram for this system can be shown below



V.RESULT & DISCUSSION

This project has proposed the idea of monitoring the health of the climber and tracking the location.

It also includes below points:

1.Health Status of the Climbers: The analysis could reveal insights into the health status of the mountain climbers, including their heart rate, blood pressure, oxygen saturation, respiratory rate, and temperature. The results could highlight any variations in these parameters based on the climbers' age, gender, fitness level, altitude, and other factors.

2. GPS Tracking: The analysis of GPS data could provide insights into the movement patterns of the mountain climbers, including their speed, distance, altitude, and route. The results could highlight any dangerous or challenging terrain that the climbers encountered, as well as their compliance with safety guidelines.

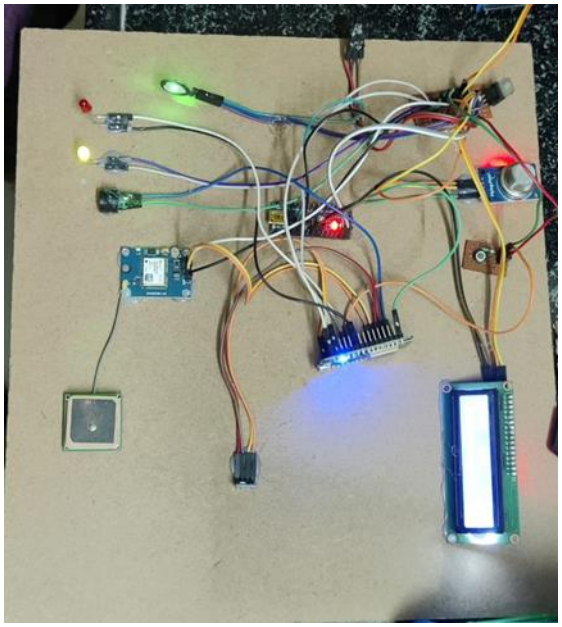
3. Predictive Models: The modelling analysis could result in the development of predictive models that can forecast potential health issues that mountain climbers may face based on their physiological data and GPS tracking. For instance, the models could predict the likelihood of altitude sickness, fatigue, or dehydration and suggest appropriate interventions.

4. Interventions: The analysis could provide insights into personalized interventions that can be

implemented to improve the health and safety of mountain climbers. For example, the analysis could suggest the use of hydration strategies, breathing exercises, and rest periods to mitigate the risk of altitude sickness.

5. Limitations: The discussion could also address the limitations of the study, including any data collection issues, assumptions made in the modelling analysis, and the generalizability of the findings.

Overall, a mountain climber monitoring system project could provide valuable insights into the health and safety of mountain climbers, potentially leading to interventions that could reduce the risk of adverse health outcomes.



VI. CONCLUSION

A mountain climber monitoring system project can provide valuable insights into the health and safety of mountain climbers. By collecting physiological data and GPS tracking, and performing modelling analysis, it is possible to identify potential health issues that climbers may face, predict their likelihood, and develop personalized interventions to mitigate the risks. The project can also improve compliance with safety guidelines, promote healthy behaviors, and ultimately contribute to better health outcomes for mountain climbers. However, the project also has limitations, such as data collection challenges and assumptions made in the modelling analysis. Overall, a mountain climber monitoring system project has the potential to enhance our understanding of the health challenges of mountain climbing and inform interventions to promote safe and healthy climbing practices.

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