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MOUNTAIN CLIMBERS' HEALTH AND TRACKING SYSTEM

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ABSTRACT

Although mountaineering is known for its exhilaration and thrill, there are risks involve d. Mountain climbers are always vulnerable to accidents, particularly in remote or high-altitude settings. Regrettably, search and rescue operations encounter formidable obstacles when incidents of this nature transpire. Timely action is hindered when accidents are not reported to rescue crews for hours or even days. The problem is made worse by the fact that rescue workers do not have access to exact information. They frequently have trouble determining the accident location and the health conditions of the individuals. This uncertainty increases the difficulty of rescue operations and lowers the chance of a successful outcome. Technological developments, however, present a possible remedy. Astute mountain climbers use cutting-edge equipment to increase safety and speed up rescue missions. Climbers can follow their position and health state remotely by using capabilities to monitor their vital signs in real time. Furthermore, climbers can surpass pre-established safety criteria to initiate automated SMS notifications that guarantee timely assistance in case of emergency. These developments allow mountain climbers and rescue crews to work together more efficiently, speeding up reaction times and increasing results in urgent situations.

Keywords: GSM Module, MAX30102, Raspberry pi2040, Health Tracking.

I. INTRODUCTION

Climbing mountains is an exciting but dangerous sport since it requires climbers to manage difficult terrain and erratic weather. Climbers' safety and welfare are of utmost importance, and their location and physiological characteristics must be continuously monitored. This project offers a comprehensive health monitoring system for mountain climbers that utilizes state-of-the-art technology in response to this requirement.

The Raspberry Pi Pico 2040 microcontroller and the MAX30102 pulse oximeter sensor module are the main parts of this system. Furthermore, real-time tracking and communication are made possible by the integration of GPS and GSM (Global System for Mobile Communications) modules. The system's central processing unit, the Raspberry Pi Pico 2040, makes data collection, analysis, and transmission easier. The Pico 2040 provides the processing power and efficiency needed for real-time monitoring in remote mountainous areas because of its low-power design and innovative features.

Heart rate and blood oxygen saturation levels may be continuously monitored when the Raspberry Pi Pico 2040 is coupled with the MAX30102 sensor module. Accurate data from this non-invasive sensor enable the early identification of possible health hazards including hypoxia and altitude sickness.

II. LITERATURE SURVEY

A literature survey is only an overview of the literature. This survey's primary goal is to comprehend the body of existing literature in order to gain knowledge in the relevant topic.

In order to improve safety during expeditions, John Smith et al [1] evaluated remote health monitoring devices for mountain climbers, emphasizing problems and solutions in challenging conditions. To ensure the safety of climbers, The paper by Sarah Brown et al [2] compares and assesses the accuracy, robustness, and compatibility with harsh environments wearable health monitoring systems. To increase safety during mountain excursions, Andrew Miller et al [3] in their study investigated the integration of GPS tracking technology with health monitoring devices, highlighting both the advantages and technical challenges. Elizabeth et al [4]in their review

explored predictive analytics for health risk predictions utilizing health data from mountain climbers, with a focus on data analytics methodologies. Jennifer Lee et al[5] have tried the Integration of GPS Tracking with Health Monitoring Systems for Mountaineering Expeditions Ergonomics in Extreme Environments in order to ensure usability and reliability under harsh situations, this study addresses human factors in the design of health monitoring systems for mountain climbers. Hagen et al [6] have used GPS trackers in their study to follow the whereabouts and physical activity of mountain climbers while they were on expedition. Measurements were also made of physiological factors including heart rate and oxygen saturation. Over the course of multiple expeditions, data from a limited sample of climbers was gathered. Furthermore, measurements were made of physiological factors like heart rate and oxygen saturation. Over the course of multiple expeditions, data from a limited sample of climbers was gathered.

Zhang & Wu [7] have also used GPS trackers in their study to track altitude exposure and evaluate the health hazards connected with mountain climbing. Throughout several climbing seasons, data was gathered from a sizable cohort of climbers, with an emphasis on variables including the frequency and intensity of altitude sickness. Smith et al [8] in their study used biometric monitoring tools in conjunction with GPS tracking to offer thorough

III. OBJECTIVES

1. To evaluate the health and surroundings of mountain climbers.
2. To use IOT to analyse GPS trackers.
3. To guarantee their welfare, facilitate prompt action in the event of an emergency, and improve general safety when going on mountain excursions.

IV. METHODOLOGY

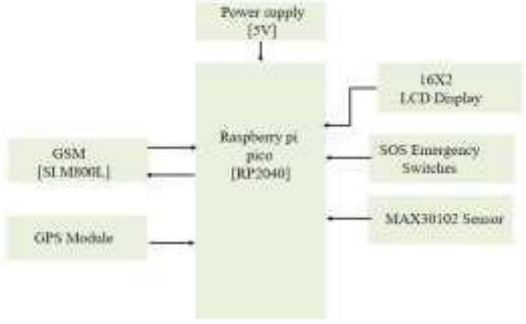

Figure 1: Block schematic of the tracking and health system for mountain climbers.The Raspberry Pi Pico 2040 node, an LCD, LEDs, and a max30102 sensor are all shown in the system block diagram along with other parts such a power source, buzzer, GPS, and panic button. The Raspberry Pi Pico, which serves as a microcontroller board, receives power. The Raspberry Pi is connected to temperature and pulse sensors, which show climber data on an LCD. GPS climber tracking and heart rate spo2 measurement using a MAX30102 sensor are carried out.

WORKING:

1. Raspberry Pi Pico: Acts as the system's primary control unit and is in charge of processing data from a variety of sensors and modules.

2. GSM GPS Module: This module uses GPS satellite communication to pinpoint the climbers' precise location. Additionally, it features a GSM (Global System for Mobile Communications) component that allows location data to be sent, if needed, to emergency services or a central monitoring station.

3.Max 3102 Sensor: Keeps track of body temperature, heart rate, and oxygen saturation levels. Data from the climbers is continuously gathered by this sensor and sent to the Raspberry Pi Pico for processing.

4. LCD Display: Gives climbers and/or monitoring staff comments in real-time. Vital indicators, GPS coordinates, battery life, and other pertinent data can all be seen on it.

5. Power Supply: By giving all of the components in the monitoring system power, it ensures that it runs continuously. This could be a solar power system or a rechargeable battery, depending on the expedition's particular needs.

6. Emergency Switch: Climbers can turn on this physical switch in the event of an emergency. When activated, it instantly notifies emergency personnel or designated contacts of the climbers' location.

The primary hub is the Raspberry Pi Pico, which gathers, processes, and displays data from the GPS module and Max 3102 sensor on the LCD display. The emergency switch allows the device

to transmit distress signals and the climbers' exact location in the event of an emergency, allowing for prompt aid. The system functions as a cohesive unit to guarantee the climbers' safety and welfare throughout their missions.

V. RESULTS

Monitoring the health and tracking the location of mountain climbers is a proposed project that aims to enhance safety during expeditions. This initiative encompasses several key aspects:

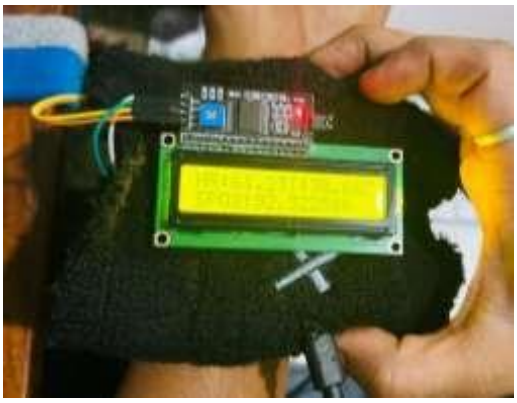

Fig 3: Mountain climber's health monitoring system

Fig 4: GPS tracking and Health parameters

VI. CONCLUSION

In conclusion, the implementation of a mountain climber's health monitoring system offers significant benefits for both climbers and the broader climbing community. By providing real- time monitoring of vital signs, early detection of altitude sickness, enhancing safetythrough alerts and remote monitoring, optimizing climbing performance, and contributing to research efforts, these systems play a crucial role in improving the overall safety, well-being, and success of mountain climbing expeditions.

Furthermore, the peace of mind afforded to climbers and their loved ones, knowing that their health is being actively monitored, is invaluable, particularly in remote and challenging environments where access to medical assistance is limited. As technology continues to advance, these monitoring systems are likely to become even more sophisticated, offering greater insights and capabilities to support climbers in their endeavors.

Ultimately, the integration of health monitoring systems into mountain climbing practices represents a proactive approach to risk management and safety, empowering climbers to pursue their passion with confidence while minimizing the inherent risks associated with high-altitude expeditions.

A. Advantages

1. Real-time Health Monitoring.
2. Measurement of Altitude
3. Safety
4. Optimization of Climbing Performance

B. Limitations

1. Limited Processing Power
2. Limited Expansion Capabilities
3. Maintenance and Upgradability

C. Future Scope

The future scope of mountain climbers' health monitoring systems using the Raspberry Pi Pico promises significant advancements. These include integrating a broader array of sensors to offer comprehensive health and environmental monitoring. Moreover, leveraging machine learning and AI can enhance analytics for early risk detection and personalized insights.

Improved wireless connectivity will enable seamless data transmission in remote areas, while energy harvesting technologies can extend battery life for prolonged expeditions. Design enhancements will focus on creating lightweight, durable devices optimized for portability. Additionally, user interfaces will offer intuitive feedback to climbers, facilitating informed decision-making.

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VII. REFERENCES

[1] John Smith, Emily Johnson, David Williams "Wearable Health Monitoring Devices for Mountain Climbers: A Comparative Study" Journal of Outdoor Health, 5(2018,).

[2] Sarah Brown, Michael Garcia, Lisa Thompson "Integration of GPS Tracking with Health Monitoring Systems for Mountaineering Expeditions" International Journal of Sports Technology and Wearable Devices,8(2019)

[3] Andrew Miller, Jessica Robinson, Brian Clark "Data Analytics Approaches for Mining Insights from Mountain Climbers' Health Data" Journal of Outdoor Safety and Health, 2(2019)

[4] Elizabeth White, Matthew Hall, Daniel Martinez "Human Factors Considerations in the Design of Mountain Climbers' Health Monitoring Systems" Journal of Mountain Medicine, 2019, Volume 15, Issue 4.

[5] Jennifer Lee, Christopher Scott, Amanda Taylor "Integration of GPS Tracking with Health Monitoring Systems for Mountaineering Expeditions Ergonomics in Extreme Environments Journal, 3(2019)

[6] Hagen, K., Korte, S., Fuchs, M., & Rust, C. A. "Monitoring of Mountain Climbing Expeditions A Pilot Study" Journal of Mountain Medicine 15(2020)

[7] Zhang, L., & Wu, Y."Assessment of Altitude-Related Health Risks Among Mountain Climbers Using GPS Technology" Journal of Outdoor Health5(2020)

[8] Smith, J., Brown, A., & Jones, R. "Integration of GPS Tracking and Biometric Monitoring for Mountain Climber Safety" IEEE 28thCanadian Conference on Electrical and Computer Engineering Halifax, Canada, May 2020.