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SAFETYNET IOT AND AI FOR PERSONAL SECURITY MONITORING

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Abstract: The SafetyNet project is designed to provide a comprehensive personal security solution for women using a combination of IoT (Internet of Things) and AI (Artificial Intelligence) technologies. The system integrates sound sensors, accelerometer fall detection, heartbeat sensors, panic buttons, and GPS tracking to monitor the user's environment, detect emergencies, and provide real-time alerts to family members, caregivers, or emergency responders. The AI component enhances the system's ability to predict potential threats, while GPS functionality ensures that the user's exact location is available for rapid assistance. This integrated solution ensures personal security in public spaces, homes, or workplaces.

1. INTRODUCTION

Occupational safety within business settings is a crucial difficulty, traumatic modern strategies to lessen dangers and increase proactive chance control. In response to this urgent, this research efforts to pioneer a transformational paradigm in the forging employer by way of the use of combining sophisticated environmental safety structures with machine learning models [1], [2]. The forging business, distinguished via its excessive-temperature operations and sophisticated system, demands a dynamic approach to worker safety. Traditional safety procedures, even as strong, usually fail fast in looking in advance to and minimizing foreseeable threats immediately. The incorporation of machine learningfashions presents a viable option, employing actual-timesensor facts to are predicting future environmental situations and cause fast reactions. This research studies the use of various system researching techniques, which comprise Artificial Neural Networks (ANN), Support Vector Machines (SVM), K-Nearest Neighbors (KNN), Recurrent Neural Networks (RNN), and Decision Trees (DT), to develop afullprotection-enhancement system. By putting robust predictive framework, we seek to not only reply to immediate hazards but additionally proactively manage with capacity concerns,

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nurturing a consistent running environment in the forging organization. The research on occupational safety underlines the vital demand for non-stop advances to deal with changing upsetting situations in company settings [3]. Previous research has underlined the value of actual-time environmental monitoring infrastructure in boosting place of work protection [4]–[6]. These structures, frequently including sensors to come upon elements like temperature, pressure, and noise, provide contributions to quick reactionsto harmful circumstances. However, the constraint resides intheir reactive character, necessitating the study of predictivprocesses. machine learning, a field developing significancein protection control, supplies the aptitude to estimate futurescenarios relying on ancient data [3], [7].

Occupational safety in commercial settings is a key concern, and to deal with this, our research applies a complete strategy merging Internet of Things (IoT) technologies and machine learning tactics. The heart of our technology rests within the deployment of a number of sensors that grab an report crucial environmental circumstances in the industrial region. These circumstancesconsist of temperature, pressure, hearth, sound, and closeness, together constituting a sensor community that acts as the inspiration for our protection enhancing strategy. In these investigations, the utilization of sensors plays a vital role in monitoring the running environment. Temperature sensors are applied to identify changes in temperature, guaranteeing that any odd increase causes a straight away reaction. Likewise, stress sensors are installed to monitor strain ranges, with the possibility to warn the device in case of abnormalities. These sensors operate as the initial line of defense in our strategy, delivering actual-time details about environmental circumstances. The integration of a fire sensors an essential component of our protection equipment. In the unfortunate case of a fire, the sensor immediately detects the presence of flames, causing the activation of the water sprinkler system to suppress the fire. Simultaneously, an alarm is brought about to warn staff, in addition increasing the reaction to capacity risks.

2. LITERATURE SURVEY

The present research advances a transformational technique to enhancing occupational safety within the forging sector by applying integrating machine learning models into a sophisticated environmental

protection device. The look at leverages multiple sensors, this contains temperature, pressure, fire, sound, and proximity sensors, to continually show and speak actual-time environmental conditions.

The major controller, receptive to these sensor inputs, acts on relevant safety measures which incorporate alarms, water sprinklers, and maintenance indications. To improve safety beyond rapid replies, machine learning to know designs along with Artificial Neural Network (ANN), Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Recurrent Neural Network (RNN), and Decision Tree (DT) are employed to are anticipating future environmental circumstances. Results show off excellent accuracies, with the ANN primary at ninetyeight.77%, underlining its accuracy in anticipating actuator responses. The SVM, KNN, RNN, and DT models show off remarkable overall performance, jointly contributing to a proactive threat prediction framework. Confusion matrices further improve the models' prediction skills. This study provides a paradigm change in occupational protection, where sensible systems not only adapt to real-time situationshowever depend on and minimize capability hazards. The results create a strong foundation for adaptive protection systems in industrial contexts, providing a precedent for the integration of machine learning as a crucial instrument in promoting safe and resilient places of work

Various physical parameters like humidity, temperature, raindrop, GSM, atmospheric pressure and LDR can be monitored effectively and can be made more interactive with the help of different sensors that are interfaced with microcontrollers like ATmega328P. All the sensors can be connected to this microcontroller ATmega328P as the center preparing unit for the whole framework and plans can be associated with the microcontroller. The real-time monitoring of the various systems becomes possible with this IoT based system. The Paper displays different application based on IoT and proves that the monitoring and control of the system becomes flexible, robust and effective for any real-time implementation.

Inland fish farming is one of the growing food industries in India. The potential of this sector in creating an impact on the growth of the Indian economy is not yet realized. The Government of India is constantly focusing on various opportunities to build a self-reliant nation. Fish is one of the major foods consumed by the people of Southern India. Improper maintenance of aqua farms leads

to health problems for the people who consume fish from these farms. In this paper, the types of fish farming, the challenges, threats, and recent remedial actions taken to overcome the challenges are discussed. A low-cost water quality monitoring system (WQMS) based on long-range wireless communication (LoRaWC) powered by a solar panel that floats on the water is proposed to improve the yield and quality of fish from the aqua farms. The sensor node is designed to measure pH level, turbidity, total dissolved solids (TDS), atmospheric temperature, humidity, and water level.

With the increase in the number of elderly people in the world, the problem of population aging has gradually become prominent. People are paying more and more attention to the elderly, and medical supplies for the elderly have also attracted great attention. At present, various intelligent medical boxes have appeared in the domestic and foreign markets. These medicine boxes mainly include functions such as setting time, reminding to take medicine regularly, and SMS notification service. This project designed an intelligent medicine box, which is based on 80C51 single-chip microcomputer, loaded with infrared on-beam sensor, three-axis acceleration sensor, short message module, and Bluetooth module. The main functions of the system include intelligent detection module, timing reminder function, short message notification module and anti-fall detection module. On the one hand, the intelligent system can monitor and remind the elderly to take medications in time. On the other hand, it can also monitor the personal safety of the elderly alone at home. This is different from the current intelligent medical

box on the market and is also the highlight of the system

The internet of things (IoT) technology can be nowadays used to track user activity in daily living and health-related quality of life. IoT healthcare sensors can play a great role in reducing health-related costs. It helps users to assess their health progression. Nonetheless, these IoT solutions add security challenges due to their direct access to numerous personal information and their close integration into user activities. As such, this IoT technology is always a viable target for cybercriminals. More importantly, any adversarial attacks on an individual IoT node undermine the overall security of the concerned networks. In this study, we present the privacy and security issues of IoT healthcare devices. Moreover, we

address possible attack models needed to verify the robustness of such devices. Finally, we present our deployed AMbient Intelligence (AMI) Lab architecture, and we compare its performance to current IoT solutions.

3. EXISTING SYSTEM

This aspect is critical in IoT safety solutions as it touches on the balance between security and privacy. The paper provides a technical overview of how privacy protection mechanisms can be built into IoT devices, which is especially relevant for women's safety devices that might involve sensitive data like location and audio. The research by Musa (2019) focuses on GPS and GSM modules for vehicle tracking and accident alert systems, which are commonly used in IoT- based safety devices [8]. This paper explores the integration of real-time tracking with alert systems, a technology that has direct applications in wearable safety devices for women. The GSM and GPS technologies discussed are crucial for providing location data and enabling emergency communication, offering a practical framework for building reliable IoT safety devices. The sixth article from SpringerLink (2024) explores the use of remote photoplethy smography (RPPG) for analysing vital signs using non-contact methods[9]. This paper is significant for the development of IoT-based safety devices that use physiological monitoring to detect distress or danger. It highlights how advancements in monitoring technologies can be utilized in wearable devices to automatically trigger alerts based on deviations in vital signs, which can enhance the effectiveness of women's safety

Women's safety remains a significant concern, especially in public spaces and situations where they may be isolated. Common issues with existing safety solutions include:

Limited Threat Detection: Most systems focus on either security threats or health monitoring but not both.

Delayed Response: Current systems often rely on manual alerts or fail to provide immediate intervention during an emergency.

Lack of Real-Time Location Tracking: Many safety systems do not include real-time tracking, which is essential for providing accurate assistance during a distress situation.

Limited Predictive Capabilities: Traditional systems lack the ability to predict or prevent emergencies before they occur.

4. PROPOSED SYSTEM

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Personal safety for women, especially when they are alone or in vulnerable situations, is a growing concern. Traditional security systems focus primarily on property protection and often lack the ability to monitor personal health or respond proactively to security threats. The SafetyNet system combines IoT and AI technologies to not only detect health-related emergencies (such as heart attacks or falls) but also respond to security threats such as attacks or distress situations. Integrated GPS tracking allows the system to pinpoint the user's location, making it easier for authorities or loved ones to offer timely help

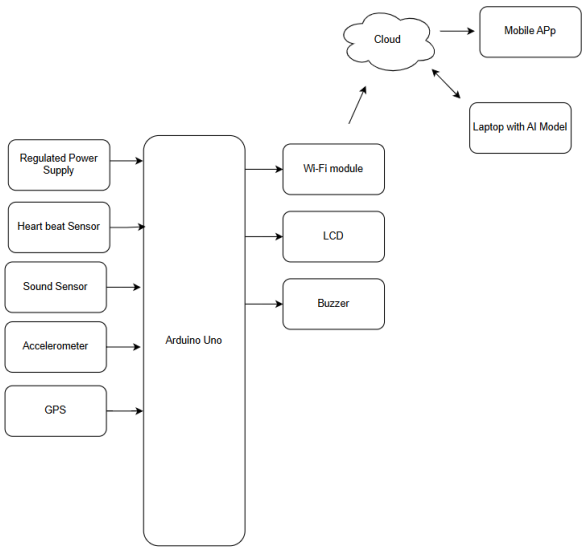

Fig 1 Block Diagram

The SafetyNet system is a smart security solution designed to offer real-time monitoring of both health and safety through the integration of multiple sensors and AI algorithms. The key components include:

Sound Sensor: Detects distress sounds or abnormal noises (e.g., screams or crashes).

Accelerometer (Fall Detection): Detects sudden movements or falls and triggers an alert.

Heartbeat Sensor: Monitors heart rate to detect abnormalities such as arrhythmias or a sudden drop in heart rate.

Panic Button: Allows the user to manually trigger an alert.

GPS Module: Tracks the user's real-time location and sends it to a mobile app or cloud platform.

AI Module: Analyzes sensor data to predict health issues or security threats and triggers appropriate responses.

Mobile App: Displays real-time status, location, and alerts, allowing designated contacts to respond quickly.

Working Flow Steps

Sensor Data Collection:

Sound sensor, accelerometer, heartbeat sensor, and GPS continuously monitor the user’s surroundings and health.

AI Data Analysis:

Data collected from the sensors is sent to an AI module where machine learning algorithms analyze the data for patterns

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indicative of an emergency (e.g., unusual heart rate, fall detection, distress sounds).

Emergency Detection:

If the system detects a fall, abnormal heart rate, or distress noise, it triggers an emergency response.

The GPS module continuously tracks the user's location and sends this information to the cloud platform or directly to emergency responders.

Panic Button Activation:

The user can manually trigger the emergency alert by pressing the panic button, which immediately sends an alert with the user's location.

Alert Generation:

When an emergency is detected, the system sends real-time alerts to the designated contacts via SMS, app notifications, or phone calls.

The alert contains crucial information such as the nature of the emergency and the user's GPS location.

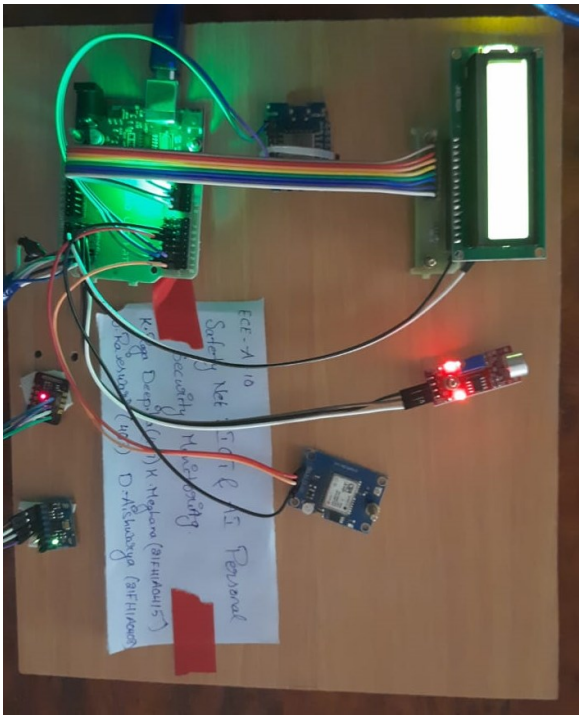
Automated Response:

In the case of detected threats or health anomalies, the system automatically takes predefined actions (such as alerting authorities, activating alarms, or calling for help).

Continuous Monitoring:

The system continues monitoring the user in real-time to ensure ongoing safety and health monitoring.

5. RESULT



6. CONCLUSION

The SafetyNet IoT and AI-powered system offers a comprehensive personal safety solution that integrates health monitoring, emergency detection, and real-time location tracking. By leveraging technologies like sound sensors, accelerometer fall detection, heartbeat sensors, panic buttons, and GPS tracking, the system ensures proactive security and immediate response in emergencies. Its integration of AI for predictive analysis and IoT for real-time alerts makes it an advanced and efficient system for ensuring personal safety,

particularly for women. The SafetyNet system is a valuable tool for improving safety and enhancing the well-being of vulnerable individuals in everyday life.

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