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Traveler Empowerment Through IOT: Based Wearable Health monitoring Gloves for Accident Prevention

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Abstract

The Travel Empowerment with IoT-Based Wearable Health Monitoring Gloves for Accident Prevention is a cutting-edge device that uses the Internet of Things (IoT) to increase road safety and empower travelers. This innovative system includes a wearable device that resembles gloves and is equipped with state-of-the-art sensors, including GPS, GSM, ultrasonic, infrared (IR), and a heart rate sensor. The intention behind incorporating these sensors is to provide travelers with a comprehensive safety net. The gloves' GPS and GSM components provide precise position monitoring and a real-time communication with emergency services. By using this service, travelers may be sure that assistance will be dispatched right to their area in the case of an accident or tragedy. The passenger receives an extra layer of safety from the ultrasonic sensor, which proactively prevents accidents by detecting potential hazards or blockages in the traveler's immediate surroundings. By identifying any hazards that the human eye might overlook, the infrared sensor enhances the safety system even more. This comprehensive hazard detection system improves overall travel safety as well as the prevention of accidents. Additionally, a heart rate sensor included into the gloves monitors the wearer's physiological well-being over time. In the case of an emergency while traveling, the technology may promptly send out alarms in the event of aberrant heart rate patterns. The Travel Empowerment system gathers data in real-time from various sensors. The gathered data is subsequently processed by a clever algorithm. In the case of an anomaly or emergency, the gloves instantly sound a warning, providing vital information to emergency contacts, including the traveler's whereabouts, the severity of the issue, and their heart rate. This Internet of Things (IoT)-based wearable health monitoring glove system not only addresses the urgent problems of emergency response and accident avoidance, but it also allows users to track their health in real time while traveling. By enabling a complete approach to travel safety, the combination of GPS, GSM, IR, ultrasonic, and heart rate sensors gives customers a more empowered and secure travel experience.

Keywords: Heart rate monitoring 1, Infrared Sensor 2, Ultrasonic sensor 3, Wearable Device 4.

1. Introduction

We already published our first part of the review paper titled “Traveler Empowerment Through IOT based wearable health monitor glove “ in ISJREM journal. This is the completed version of our project review. The rise in traffic accidents and risks is another effect of technology. The lives of individuals are in grave

danger since our nation lacks the greatest emergency facilities. This article introduces an automated automobile alarm that, in the event of an accident, transmits basic information to the medical rescue team in a matter of seconds. This gadget will aid in the preservation of lives by detecting accidents and alerting rescue personnel in a much shorter amount of time.

The alarm message includes the location of the accident, along with its time, angle, and geographic coordinates. To save the rescue team's precious time, the message can be turned off with the use of a switch in situations where there are no casualties.

A sensor is used to detect accidents and activates the gadget; the sensor provides the microcontroller with its output. The police station and the victim's family receive an automated alert message from the microcontroller. The GPS module is used to pinpoint the accident's position while the GSM module transmits the message. Therefore, by implementing this initiative, we will be able to locate the car where the accident happened and administer first assistance as soon as feasible.

2. Methodology

The objectives of our suggested system are The proposed method aims to empower passengers and avoid accidents by utilizing Internet of Things (loT) technology and wearable health monitoring gloves. While on their travels, travelers typically confront a variety of health and safety risks, and accidents can occur unexpectedly with deadly consequences. This research proposes a way to improve passenger safety and well-being by using wearing gloves that are equipped with cutting-edge Internet of Things and health monitoring sensors. The study will also involve rigorous testing and validation, including bench testing, computer simulations of real-world scenarios, and even clinical trials, to assess the accuracy and reliability of the glove's sensor data. Furthermore, confidential health data will be protected by cybersecurity measures.

When an accident occurs, a sensor will detect it and provide the microcontroller with its output. In this instance, a button sensor is employed for detection, and it will push when the car collides with another object. The vehicle's longitudinal position and latitude are detected by the GPS. Finding the right location to offer medical aid is crucial. The user pre-saves the phone numbers in the EEPROM. These figures are subject to alter at any time. Using the GSM module, the microcontroller uses these pre-stored numbers to deliver an alarm message. The user can pre-enter any message into the system.A switch can be used to stop the message from being sent if there are no casualties.

The microcontroller will restart when the switch is flipped, and it will begin operating from scratch. User feedback and usability studies will be used to improve the glove's design and functioning based on real-world user experiences. Thanks to this iterative approach to development and testing, the loT-based wearable health monitoring gloves will be efficient, practical, and able to empower travelers to actively regulate their health and prevent accidents while on their excursions.

2.1. Need for the project

1. Travel-related health concerns: Dehydration, jet lag, and deep vein thrombosis are just a few of the conditions that can occur when traveling, particularly over extended periods of time. Concerns about physical health are common among travelers and they may have a big impact on their whole vacation experience.
2. Increasing Traveler Mobility: With millions of people constantly traveling for business, pleasure, or other purposes, travel is becoming a necessary component of modern living. Because they travel more

frequently, both domestically and internationally, travelers are more susceptible to a range of health issues and possible accidents.

3. Accident Prevention: Travel-related accidents remain a serious concern, whether they happen by land, air, or sea. Early detection of situations such as sudden cardiac arrest that may result in accidents can prevent fatalities and protect others from damage.
4. Personalized Healthcare: The trend toward tailored treatment emphasizes the need of individualized health monitoring. Since each traveler has a unique health profile, providing them with personalized, up-to-date health information can improve their overall safety and travel experience.
5. Healthcare Resource Optimization: By preventing accidents and health emergencies through early detection, this project can assist in the more efficient use of healthcare resources and relieve some of the load on emergency services.

2.1.1. Advantages

- Reliable Accident Detection
- Complete Location Tracking
- Proactive Obstacle Detection
- Real time Health Monitoring
- Prompt Emergency Alerts
- Holistic Road Safety Approach
- Improved Emergency Response Times

2.1.2. Applications

- Real Time biometrics
- Robotic applications
- Academic Application
- GPS Trackers
- Automated Vehicle
- Fleet Tracking
- SMS

3.1. Methodology

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- The vehicle's longitudinal position and latitude are detected by the GPS. Finding the right location to offer medical aid is crucial.
- The user pre-saves the phone numbers in the EEPROM. These figures are subject to alter at any time.
- Using the GSM module, the microcontroller uses these pre-stored numbers to deliver an alarm message. The user can pre-enter any message into the system.
- A switch can be used to stop the message from being sent if there are no casualties. The microcontroller will restart when the switch is flipped, and it will begin operating from scratch.

4.1 Methods of Hardware

4.1.1 Arduino

The open-source Arduino project developed kits based on microcontrollers for constructing interactive items and digital gadgets that can sense and operate tangible objects. The project is based on microcontroller board designs made using different microcontrollers by many suppliers. These systems include sets of input/output (I/O) pins, both digital and analog, that may interact with different expansion boards (also known as shields) and other circuits. The boards provide serial connection ports for loading software from personal computers, including Universal Serial Bus (USB) on certain variants. The Arduino project offers an integrated development environment (IDE) built on the Processing programming language, which is compatible with C and C++, for programming microcontrollers.

4.1.2 ATMEGA328 IC

Atmel created the ATmega328 single-chip microcontroller, which is a member of the massive AVR family of microcontrollers. This Atmel 8-bit AVR RISC microcontroller has various features such as a byte-oriented 2-wire serial interface, an SPI serial port, 32 kB of read-while-write ISP flash memory, 1 kB of EEPROM, 2 kB of SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software-selectable power-saving modes. The device operates between 1.8 and 5.5 volts. The device has a throughput of over 1 MIPS per MHz.

4.1.3 Analog Port

An analog-to-digital converter, often known as an ADC, A/D, A–D is a device used in electronics that transforms analog signals into digital signals, such as sound captured by a microphone or light entering a digital camera. An electrical device that transforms an analog voltage or current input into a digital number proportionate to the voltage or current's magnitude is an example of an ADC that may also offer an isolated measurement.

A/D conversion is crucial to embedded systems since they work with digital values and are typically surrounded by a variety of analog signals. A digital signal must be converted from analog before the microcontroller can process it. Right now, we can see how to use a PIC microcontroller to read an external analog signal and how to display the digital output-to-picture conversion on an LCD display. A fluctuating voltage between 0 and 5 volts might be the i/p signal.

4.1.4 AREF PIN

Analog REFerence is referred to as AREF. It enables us to supply an external power source with a reference voltage to the Arduino. A voltage regulator integrated circuit (IC) might be used to supply a beautiful, smooth 3.3V to the AREF pin in order to measure voltages with a maximum range of 3.3V. Subsequently, every ADC step would correspond to 3.22 millivolts.

4.1.5 Crystal Oscillator

A precise frequency electrical signal is produced by a crystal oscillator, an electronic oscillator circuit, utilizing the mechanical resonance of a vibrating crystal composed of piezoelectric material. Electronic oscillators, which generate periodic, oscillating electrical signals like sine or square waves, are also known as part of electronic circuits. These oscillators convert direct current (DC) from a power source into alternating current (AC) signals. They are commonly utilized in a wide range of contemporary devices.

4.1.6 ICSP Ports

In-system programming (ISP), also known as in-circuit serial programming (ICSP), is the ability of specific programmable logic devices, microcontrollers, and other embedded devices to undergo programming while already integrated within a complete system. This contrasts with the traditional method of programming chips before their installation into the system.

4.1.7 I/O Ports

Port for input/output. The input/output port, also known as the I/O address, I/O ports, or I/O portaddress, is what enables communication between your computer's hardware and software drivers. There are 65,535 ports in your computer with numbers ranging from 0000h to FFFFh.

A general-purpose input/output (GPIO) pin is a generic pin on an integrated circuit or computer board that may be configured to function as an input or an output at runtime.

4.1.8 PWM PIN`s

Pulse Width Modulation, or PWM for short, is not very helpful by itself if you're unfamiliar with modulation. The process of superimposing data over a high-speed signal or carrier is known as modulation in the field of electronics. average wattage. Since most lipo packs and all 18650 type batteries produce 3.7 volts at a nominal charge level, many APVs employ pulse width to control power below the battery's provided voltage. DC-DC is a flat signal.

4.1.9 Reset Button

A power-on reset (PoR) generator is activated upon the receipt of power by a microcontroller or microprocessor peripheral. This generator produces a reset signal to ensure that the device initializes in a known configuration.

4.1.10 GPS module

The Global Positioning System (GPS), previously identified as Navstar GPS, is owned and managed by the US government. Administered by the US Air Force, it functions as a space-based radio navigation system. This worldwide satellite navigation system ensures that GPS receivers, positioned anywhere on or near Earth, have unobstructed access to four or more GPS satellites, facilitating the retrieval of geolocation and time data.

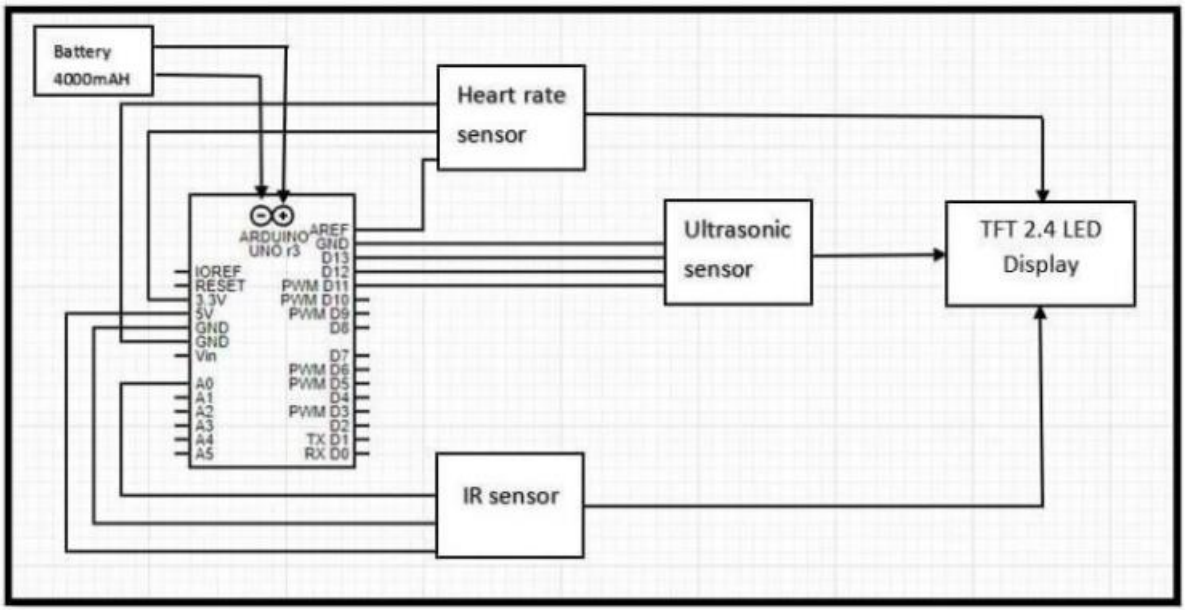

Figure 1: Hardware Block diagram. Reproduced with permission. [1] Copyright 2023, IJSREM.

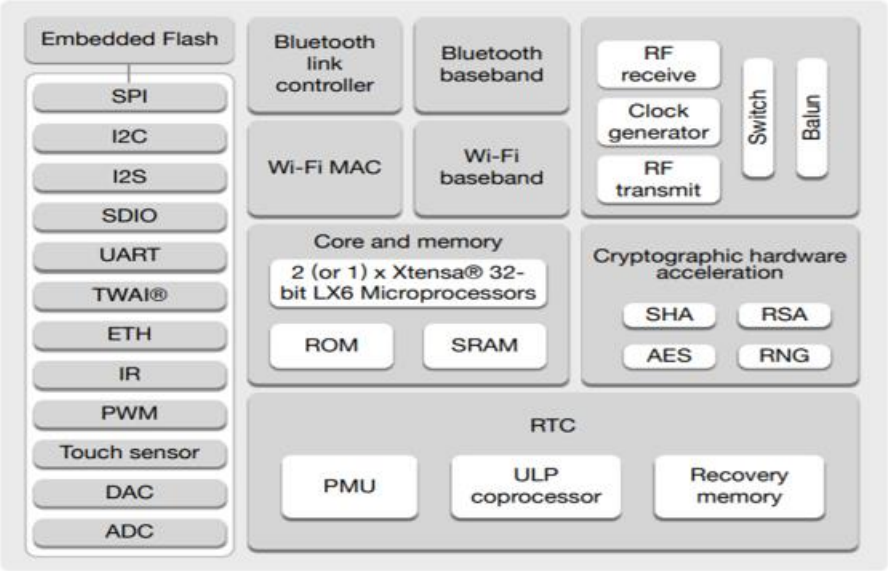

Figure 2: Block Diagram

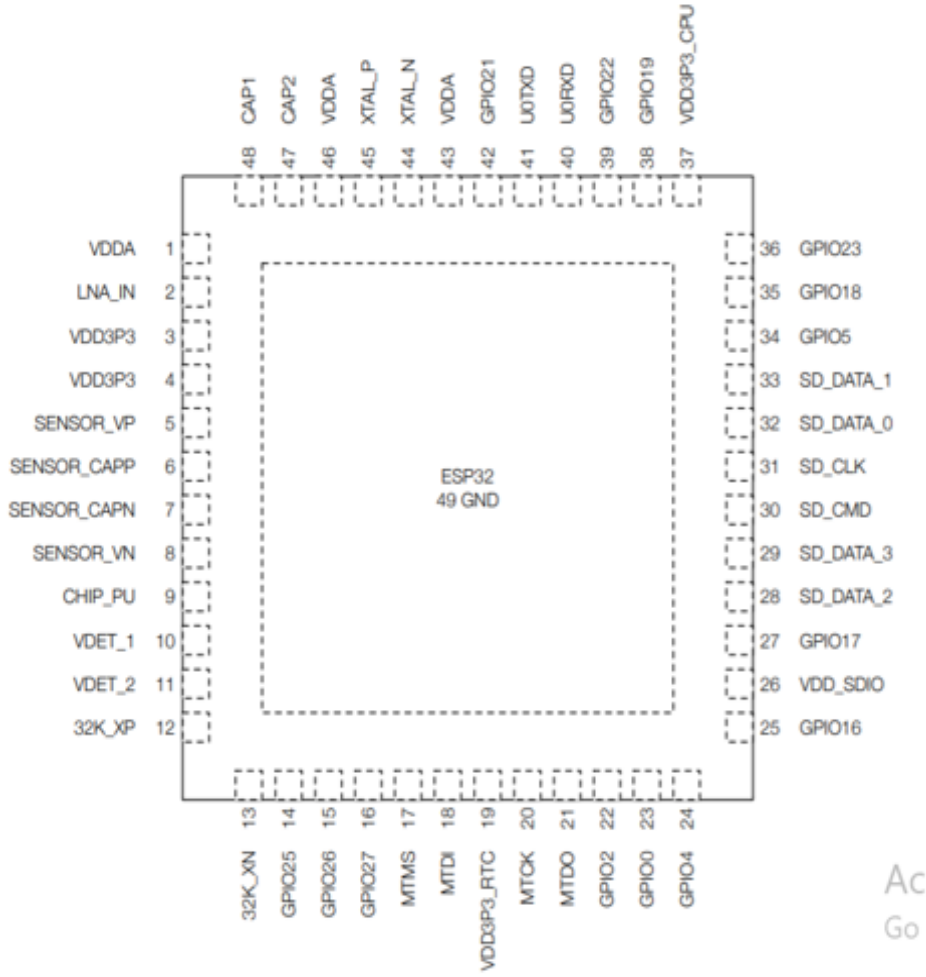

Figure 3: Pin Layout

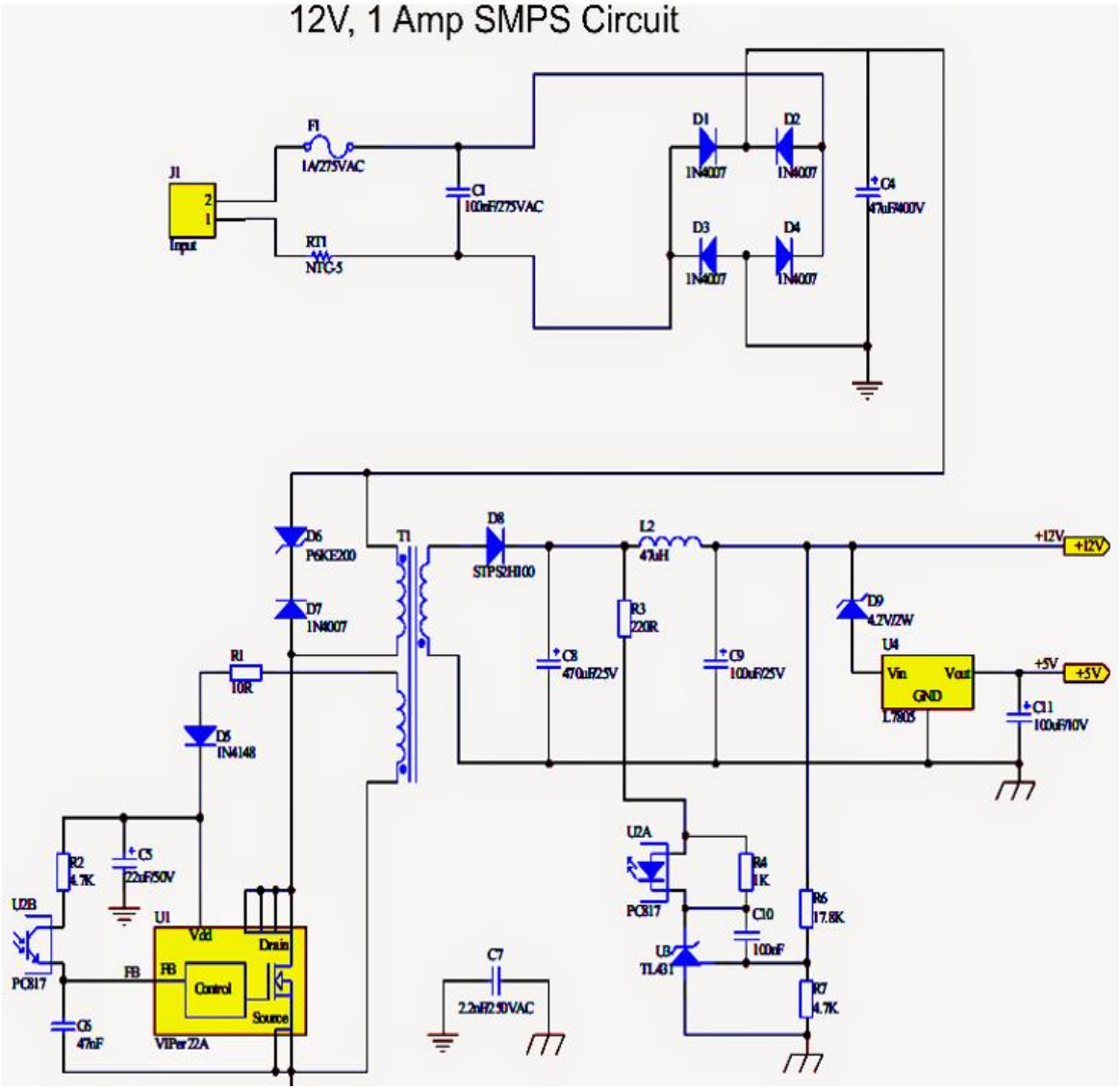

Figure 4: Circuit Diagram

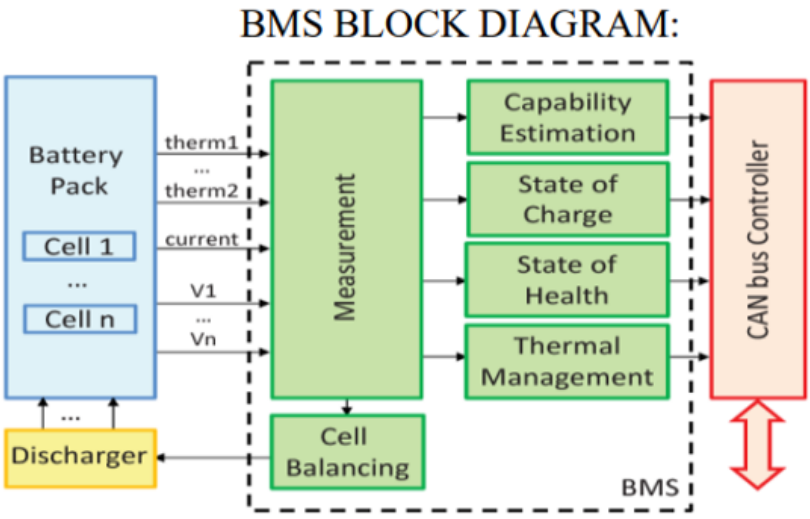

Figure 5: BMS Block diagram.

4. Conclusion

In the most practical manner possible, this approach offers the best remedy for inadequate emergency facilities offered to victims of traffic accidents. When an accident happens, these technologies enable prompt action by notifying the appropriate parties by messaging. This system's disadvantage is that it requires a network in order to function. Thus, the system won't be able to transmit the warning message in places without a network. The car business stands to gain a great deal from the suggested approach. This will make it easier for the emergency personnel to get to the scene of the collision and save many lives. By integrating it with other systems, there is always room for fresh advancements.

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