SOLAR POWERED E-UNIFORM FOR SOLDIER

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ABSTRACT

The concept of using solar-powered electronic clothing for soldiers stationed in hot locations is explained in this study. The uniform's fabric can be woven with solar panels to provide electricity for various features, such as communication devices, heating and cooling systems, and lights. The use of solar energy can provide a longer-lasting and more ecologically friendly alternative to traditional batteries. While the e-uniforms may contain heating elements to keep soldiers warm and prevent hypothermia in freezing weather, they may also have cooling systems to regulate body temperature and prevent heat stroke in extremely hot conditions. The usage of communication devices could assist improve soldiers' safety in the field by enabling them to interact with superiors and obtain real-time information.

I. INTRODUCTION

Warriors are the Army's most imperative asset. Warriors assume an important part to make sure one's nation. The term warriors incorporate administration men and ladies from the military, Air Force, Navy, and Marine. While giving security to the country, they could challenge inconveniences in hot/frosty climate conditions. Both exceptionally hot and icy temperatures might be unsafe for well-being. This venture may be a solution for this circumstance. During this venture, an E-Uniform is planned which provides better security to the officers who are working in great climate conditions. A temperature sensor is employed to see the temperature whenever. The DHT11 is a circuit temperature sensor, whose yield voltage is directly relative to the Celsius (Centigrade) temperature.

In this undertaking, we are getting to plan an EUniform which provides better assurance to the fighters who are working in amazing weather. This Uniform will make the trooper figure in any kind of environment. Here we are utilizing Solar Panels to regulate up the within the hardware of the E-uniform. A 12 V DC lead corrosive rechargeable battery is employed for putting away the vitality. We are utilizing a routine battery charging unit

additionally to offer supply to the hardware. A temperature sensor and heartbeat sensor utilized for checking the wellbeing of the trooper in any circumstance. ESSP 32 miniaturized scale controller is that the heart of the circuit because it controls all of the capacities.

II. EXISTING SYSTEM

Existing system applications are limited as it provides body temperature regulation only, but nothing more than that. It does not provide any means of Security, Navigation and Monitoring at a remote place.

III.PROPOSED SYSTEM

After doing a lot of research and study some papers found out to be valuable resources for the development of the project. All contain different methodologies and techniques which are used to achieve efficient and userfriendly uniform for Soldiers.

In this project, solar panels are used for charging a Lead Acid Battery (12V, 1.3Amp), a Peltier thermoelectric/Fan device which when connected to the battery generates a cooling effect on one side, and heat is dissipated on another side through the heat sink. A regulator 7805 is used to drive the internal cooling fan and LED. Here we are using Microcontroller (ESP 32) that allows dynamic and faster control. Liquid crystal display (LCD) makes the system user-friendly. Here we are using an LCD display for displaying the variations in voltage values that are present in the rechargeable battery.

The system is operated in two modes summer mode and winter mode. By selecting the mode of operation, we are operating the system such it can drive the body temperature according to heater/cooler. The heater/cooler, in turn, will help us to provide a chilling or warming effect inside the uniform which helps the soldier to bear to any kind of external environment and he can work productively without heat stress or cold stress.

The metal sensor will detect the metal-like bomb, any other planted weapon in-ground and intimate the soldier with a buzzer indication.

ESP 32

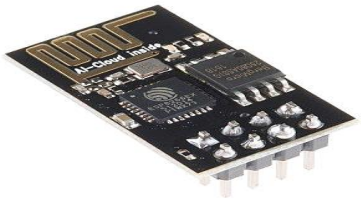
ESP32 based boards come in a variety of shapes and sizes and pinout of each board is different to other. Also, not all pins of the ESP32 Microcontroller SoC will be available on a development board as some

pins might be permanently tied to a dedicated function.

One such case is the Flash Memory. We know that all ESP32 boards come with 4 MB of Flash Memory to store the programs. So, some of the GPIO Pins (6 to be specific) are connected to SPI Flash IC and those pins cannot be used as regular GPIO Pins.

Hence, it is important to understand the pinout of popular ESP32 boards so that you will know what pins are available for use in projects.

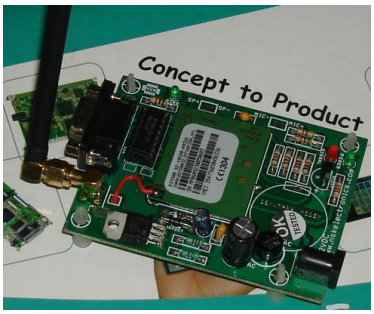
WIFI MODULE ESP8266



The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your lpc 2148 device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box). The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF part.

Global Systems for Mobile Communication (GSM):

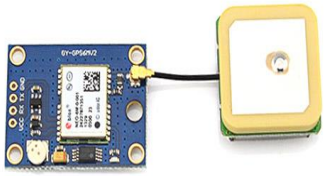


GSM (Global System for Mobile communication) is a prevalent digital mobile telephone system used globally, particularly in Europe and across 190 countries worldwide. It employs Time Division Multiple Access (TDMA) technology to transmit digitized and compressed data down channels, each accommodating three streams of user data in distinct time slots. Operating at either 900 MHz or 1,800 MHz frequency bands, GSM boasts over one billion users worldwide One of GSM's key functionalities is its ability to facilitate roaming, allowing users to seamlessly use their mobile phones in different countries through roaming agreements between network operators. When a mobile subscriber enters a new location area, the Visitor Location Register (VLR) updates the

Home Location Register (HLR) with the new location information via SS7 messages

For call routing, when a user dials a GSM mobile subscriber's Mobile Subscriber ISDN Number (MSISDN), the Public Switched Telephone Network (PSTN) routes the call to the Home Mobile Switching Center (MSC). The MSC queries the HLR based on the MSISDN to obtain routing information, utilizing global title translation tables. The HLR, upon receiving the Routing Information Request, maps the MSISDN to the International Mobile Subscriber Identity (IMSI) and retrieves the Mobile Station Roaming Number (MSRN) from the current Visitor Location Register (VLR). The MSRN serves as a temporary number for the duration of the call, allowing the MSC to complete the call using the provided MSRN. This complex process ensures efficient and accurate call routing for GSM mobile subscribers

GLOBAL POSITIONING SYSTEM (GPS):



The NEO-6MV2 GPS module is a compact and cost-effective GPS receiver widely used for location tracking. It utilizes the u-blox 6 positioning engine, offering accurate longitude and latitude data in a small package. Its innovative design ensures excellent performance even in challenging environments.

Using the NEO-6MV2 GPS module is straightforward. Simply connect power to the module and interface its output with a microcontroller's UART. This allows the microcontroller to receive and process the GPS data for various applications, such as navigation systems. The module's popularity among hobbyists and developers is attributed to its ease of use and reliability, making it a preferred choice for projects involving location tracking and navigation.

VIBRATION SENSOR:

The vibration sensor, also known as a piezoelectric sensor, is a flexible device used to measure various processes by converting mechanical vibrations into electrical signals. It operates based on the piezoelectric effect, where changes in acceleration, pressure, temperature, force, or strain result in the generation of electrical charges.

These sensors have a sensitivity typically ranging from 10 mV/g to 100 mV/g, with options for lower or higher sensitivities depending on the application requirements. It's crucial to select the appropriate sensitivity based on the expected levels of vibration amplitude during measurements.

The sensor detects system vibrations using different optical or mechanical principles, making it versatile for various applications. Additionally, it can even be utilized to detect fragrances in the air by measuring capacitance and quality. Overall, the vibration sensor plays a vital role in

monitoring and analyzing vibrations in different systems for maintenance, safety, and performance optimization purposes.

BUZZER

A buzzer or beeper is an audio signaling device used for various purposes such as alarms, timers, and user input confirmation. There are two main types: electromechanical and electronic.

Electromechanical buzzers are based on an electromechanical system similar to an electric bell but without the metal gong. They typically involve a relay connected to interrupt its own actuating current, producing a buzzing sound. These buzzers were often mounted on walls or ceilings to amplify the sound.

Electronic buzzers utilize a piezoelectric element driven by an oscillating electronic circuit or audio signal source. They produce sounds like clicks, rings, or beeps to indicate actions such as button presses. Electronic buzzers are widely used in modern applications due to their versatility and reliability.

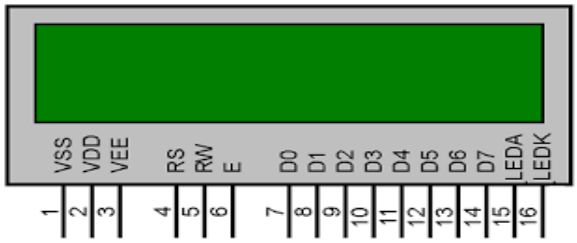
IR SENSOR:

The infrared era has become ubiquitous in modern technology, national security, and various industries like agriculture and business. Infrared sensors are essential components of infrared measurement systems, categorized into five main classes based on their functions: radiometers, search and track systems, thermal imaging systems, infrared distance measurement and communication systems, and hybrid systems combining multiple functionalities.

These sensors operate on two main detection mechanisms: photon detectors, which rely on the photoelectric effect, and heat detectors, which utilize thermal effects. The composition of infrared systems typically includes a main optical system and auxiliary optical components, which together facilitate the detection and measurement of infrared radiation.

Overall, infrared sensors play a crucial role in various applications by accurately detecting and measuring infrared radiation, making them indispensable in fields requiring precise spatial location, temperature measurement, and object detection**.**

LCD



It is called Liquid Crystal Display. We are going to use 16x2 characters LCD. This will be connected to microcontroller. The job of LCD will be to display all the system generated messages coming from the controller. LCD will provide interactive user interface. This unit requires +5VDC for it proper operation. This module is used for display the present status of the system.

IV RESULT DISCUSSION

For soldiers who work in extremely high or low temperatures, the creation and use of solar-powered e-uniforms has produced encouraging results in terms of improving military performance, safety, and comfort. The outcomes and ramifications of the solar-powered e-uniforms for troops will be covered in this section.Improved Performance: It has been demonstrated that the solar-powered e-uniforms improve troop performance in high-temperature environments. Increased comfort, flexibility, and movement are made possible by the uniform's design, which can help soldiers do their jobs more effectively. By incorporating cutting-edge materials, such as phase change materials, the soldier's body temperature may be controlled, preventing hypothermia or overheating.Safety Improvement: The solar-powered e-uniforms have also demonstrated positive outcomes in terms of improving military safety.

V.CONCLUSION

To sum up, the development and application of solar-powered electronic uniforms for soldiers who serve in severely hot or cold environments is a significant technological advancement. This state-of-the-art technology can successfully handle the problems faced by soldiers who operate in challenging areas. Better comfort, performance, and safety are just a few advantages of the solar-powered e-uniforms. Lower costs and a smaller carbon impact are the results of using solar energy to lessen dependency on traditional power sources. The process of making solar-powered e-uniforms incorporates cutting-edge materials, energy storage and management systems, and modern technology. This method has demonstrated great potential for improving the robustness and performance of solar-powered e-uniforms.

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