

IOT based solar E-Uniform for Soldiers

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Abstract

Solar based E-Uniform gives better protection to the soldiers who are working in extreme weather conditions. Solar Panels are used to power up the internal circuitry of the E-uniform. A 12 V DC lead acid rechargeable battery is used for storing the energy. We are using conventional battery charging unit also for giving supply to the circuitry. AT89S52 micro controller is the heart of the circuit as it controls all the functions. A voltage sampler is interfaced with the system using ADC 0808 to get the voltage generated from battery as a display on a 16X2 LCD. In a very hot environment, the most serious concern is heat stroke. At very cold temperature, the serious concern is the risk of hypothermia or dangerous overcooling of the body. To overcome this E-uniform is designed. This uniform consists two modes of operation such as summer mode and winter mode.

Keywords- IOT, Solar, Peltier Plate, ESP8266, Arduino IDE, Sensors, LCD display, Battery, Buzzer, GPS.

I. INTRODUCTION

The soldier must be integrated with advanced visual, voice and data communications to receive information from the control station or from the superiority. For that Soldier might need wireless networks such as displaying maps and real time video not only to communicate with control room but also with side by side military personnel [1]. Apart from the nation's security, the soldier must need safety by protecting himself with advanced weapons and also it is necessary for the army base station to monitor the health status of the soldier [2]. Many other jackets existing in the market can provide both cooling and hot service with the jacket. The different climatic conditions such as very cold and very hot temperatures could be dangerous to health. Since in very cold temperatures, the most serious concern is the risk of hypothermia or dangerous overcooling of the body [3]. Henceforth we have developed a smart army jacket as an important resource for the army soldiers as soldiers play a very important role to protect our country in extreme cold conditions [4].

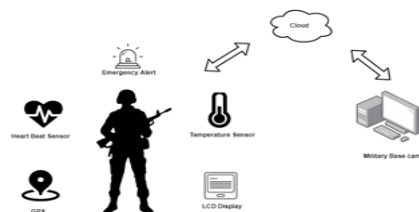


Fig.1 : General Idea of Proposed System

II. MOTIVATION

Basic motivation behind this project gives better protection to the soldiers who are working in extreme weather conditions. The peltier plate will help us to provide chilling or warming effect inside the uniform which helps the soldier to bear any kind external environment.

III. LITERATURE REVIEW

Soldier Security and Health Monitoring Thanga Dharsni, Hanifa Zakir, Pradeep Naik, Mallikarjuna, Raghu. 2018, the proposed framework can be mounted on the warrior's body to track their wellbeing status and current area utilizing GPS. These data will be transmitted to the control room through distributed computing. The proposed framework involves small wearable physiological equipment's, sensors, transmission modules. Consequently, with the utilization of the proposed hardware, it is conceivable to execute a minimal effort component to ensure the important human life on the war zone GSM is used which is irrelevant and excessive use of sensors unnecessarily [1]. Health Monitoring and Tracking System for Soldiers Using Internet of Things (IoT) Niket Patil 2017, the paper reports an Internet of Thing (IoT) based health monitoring and tracking system for soldiers. The proposed system can be mounted on the soldier's body to track their health status and current location using GPS. This information will be transmitted to the control room through IoT. The proposed system comprises of tiny wearable physiological equipment's, sensors, transmission modules Only hardware approach and no use of software systems. Didn't utilized cloud processing as well [2]. Wearable Systems for Monitoring the Health Condition of Soldiers: Review and Application Patrik Kutilek, Petr Volf, Slavka Viteckova, Pavel Smrcka 2017, systems for measuring of physical and medical data for the diagnostics of physical and psychological state have significantly spread. This study, however, examines the current technologies and usage of the wearable monitoring systems in military. The article can serve as a guide for choosing suitable and add able systems of quantitative evaluation of physical and psychological conditions of soldier's Wearable system but with higher cost. High end simulation software required [3]. Wireless detection system for Health and military application Yallalinga, Nirmal kumar S. Benni 2017, upon detection of fall/collapse the sensor system transmits the information wirelessly, which will be received by the care-taker's mobile. The sensor is a belt shaped wearable device consisting of accelerometer (tri-axial) and gyroscope. These sensors are used to classify the posture and dynamics of the user. The main aim of the project is to develop efficient algorithms to detect falls and distinguish between falls and non-falls using these sensors. GSM is outdated. Zigbee is used for wireless communication and it has many limitations such as range and obstacles in communication channel [4]. Monitoring of Soldier's Health and Transmission of Secret Codes Zeeshan Raza, Kamran Liaquat 2016, in this paper we are going to design a smart device for soldier using modern technologies and techniques. This device would be carried by soldier in warfare. The device will be able to sense heart beat and body temperature of soldier and transmit the reading on base station where the cumulative data will be displayed. A small database is organized for storage of readings. Soldier can also sent a secret message on base station. In order to make the reading accurate and precise a formula is designed which is a correlation of body temperature and heartbeat. Hardware approach, LCD is not necessary to use if we use software interfaces. No cloud processing. Secret codes are already implemented [5]. Heart Rate, Skin Temperature and Skin Humidity and their Relationship to Accumulated Fatigue Decho Surangsrirat, Songphon Dumnin and Supat Samphanyut 2016, the objective of this study is to monitor the heart rate, skin temperature and skin humidity of the new recruited soldiers during the last week of multiple weeks training period in high temperature where accumulated fatigue is expected. The measurements

are collected during their sleep. Experimental results show an increasing trend of the average resting heart rate in multiple participants. There is an increasing trend of skin temperature in one participant, the data also show consistently high skin humidity for this participant. However, there are two participants with decreasing trend of skin temperature. Average skin humidity measurements are mostly stable for all of the participants. Deals with the frustration of soldiers and not actually with health and no tracking is present [6].

IV. PROPOSED SYSTEM

The proposed system is an effective security and safety system which is made by integrating the advancements in wireless and embedded technology. It helps for a successful secret mission. This system can be used in critical conditions. Security and safety for soldiers: GPS tracks position of soldier anywhere on globe and also health system monitors soldier's vital health parameters which provides security and safety for soldiers. The smart army jacket is proposed in such a way that it could monitor the health, internal temperature as well as emergency notification in the form of short message service for the soldier.

V. BLOCK DIAGRAM

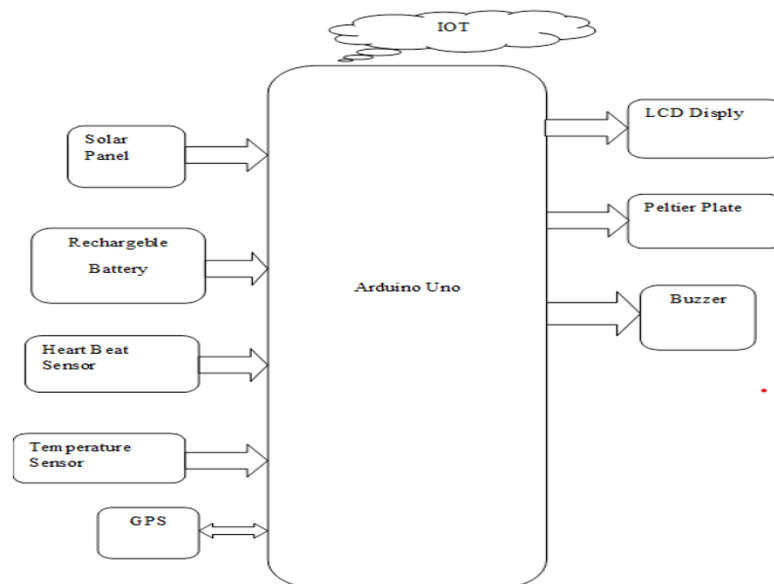


Fig.2 Block diagram of Proposed System

A. Hardware Description .

I. Arduino Uno:

Arduino UNO microcontroller is used in our project. Arduino is open source computer hardware and Software Company that has a huge project and user community that designs and utilizes microcontroller based development boards and Arduino Uno is one of Farm Automation System with IoT Application Page — 20 them which is based on ATmega328. It has 14 digital input/output pins where six of them can be used as Pulse Width Modulation (PWM) outputs. It also has 6 analog inputs, In Circuit Serial Programming header, a 16 MHz crystal oscillator, USB port, a power jack and a reset button. The board can be powered via USB power cable or an external power supply. The operation voltage of Arduino is from 6 to 20 volts. The Atmega328 has 32 KB of memory. We use it to control the glass motors, water pump, servo and sensors. This thing is chosen for low cost, general

ability, the expansive learning resources available, and the DIY community already using the platform. Arduino programs are written in C language, which is known to all of us.

Specification of Arduino Uno:

Microcontroller	ATmega328
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limit	6-20V
Digital I/O Pins	14(6 of them provide PWM output)
Analog Output Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32KB (0.5 KB is used by boot loader)
SRAM	2 KB (ATmega328)
EEPROM	1 KB (ATmega328)
Clock Speed	16 MHz

II.ESP8266 WI-FI MODEL:



Fig.3 WiFi MODEL

The Node MCU EPS Wi-Fi 8266 module provides minimum of 512kb flash memory. It is low cost user friendly plug and play module with easy to configure and set up. It is widely used to develop hardware platform in IOT application. This device is also called as mini Arduino. Every module has unique IP address which is special identification of every Soldier. Every soldier is connected with control room with the help of ESP8266 module IP address.

Feature:

- 1 Voltage:3.3V.
- 2 Wi-Fi Direct (P2P), soft-AP.
- 3 Current consumption: 10uA 170mA.

- 4 Flash memory attachable: 16MB max (512K normal).
- 5 integrated TCP/IP protocol stack.
- 6 Processor: Tensilica L106 32-bit.
- 7 Processor speed: 80 160MHz.
- 8 RAM: 32K + 80K. _ GPIOs: 17 (multiplexed with other functions).

III.Heart Beat Sensor:



Fig.4 Heart beat sensor

Heart Monitoring sensor is such a type of sensor which gives an output of heart beat when figure is placed on it. While the heart beat detector is working, the beat LED flashes in unison with each heart beat. It works on the principle of light modulation by blood flow through finger at each pulse. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

IV.GPS:



Fig.5 GPS

The GPS unit is installed in addressing system so that base camp can track their movements and real time information in all weather, at all times form anywhere on globe. It uses a third generation POT (Patch Antenna on Top) GPS module. This POT GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions provides standard NMEA0183 strings in \raw" mode for any microcontroller. The module provides current time, date, latitude, longitude of the soldier to the microcontroller. This is a standalone GPS Module and requires no external components except power supply decoupling capacitors. It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART. The module is having option for connecting external active antenna if necessary. The GPS signal is applied to the antenna input of module, and a complete serial data

message with position, velocity and time information is presented at the serial interface with NMEA protocol or custom protocol.

V. Temperature Sensor (LM35):

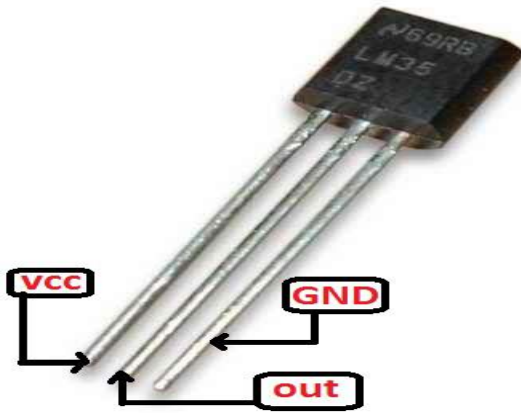


Fig 6 Temperature Sensor(LM35)

LM35 TEMPERATURE SENSOR is used to detect the specific temperature of the internal jacket and the outward environment. The output voltage of this IC sensor is linearly comparative to the Celsius temperature. The operating voltage range of this LM35 ranges from -55 to +150 c. The temperature sensor also, measures and monitor by battery temperature. The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly. Thus the ensured accuracy (at +25c) LM35 has an advantage over linear temperature sensor calibrated in Kelvin, as the it is not required to subtract a large. There are different kinds of temperature sensors which will measure temperature, like thermocouple junction, thermistor, semiconductor temperature sensors resistance temperature detector (RTDs), and so on. Based on necessity, different kind of sensor are used for activity temperature in several applications.

VI. Solar Panel:



Fig.7 Solar panel

Here we are using solar panel to power up the internal circuitry of the E-Uniform. A 12v Dc Lead Acid Rechargeable Battery is used for storing the energy. We are using conventional battery charging unit also for giving supply to the circuitry.

VI. RESULT AND DISCUSSION

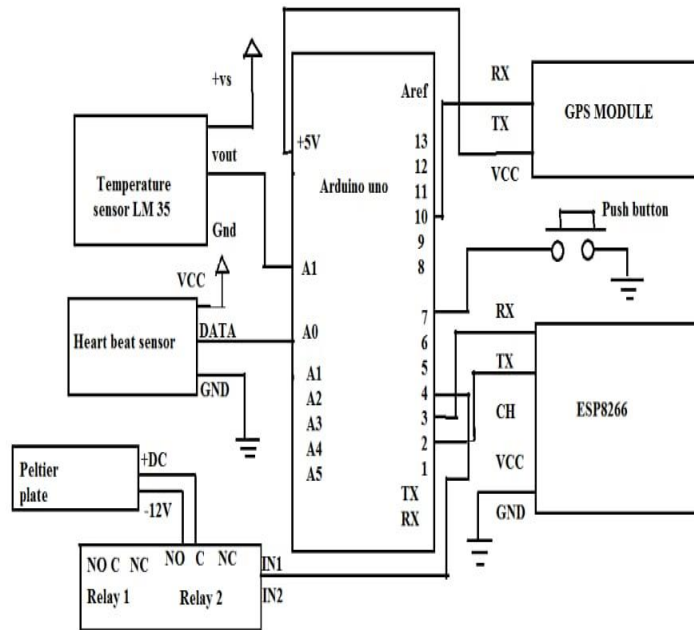


Fig.8 Circuit Diagram of System

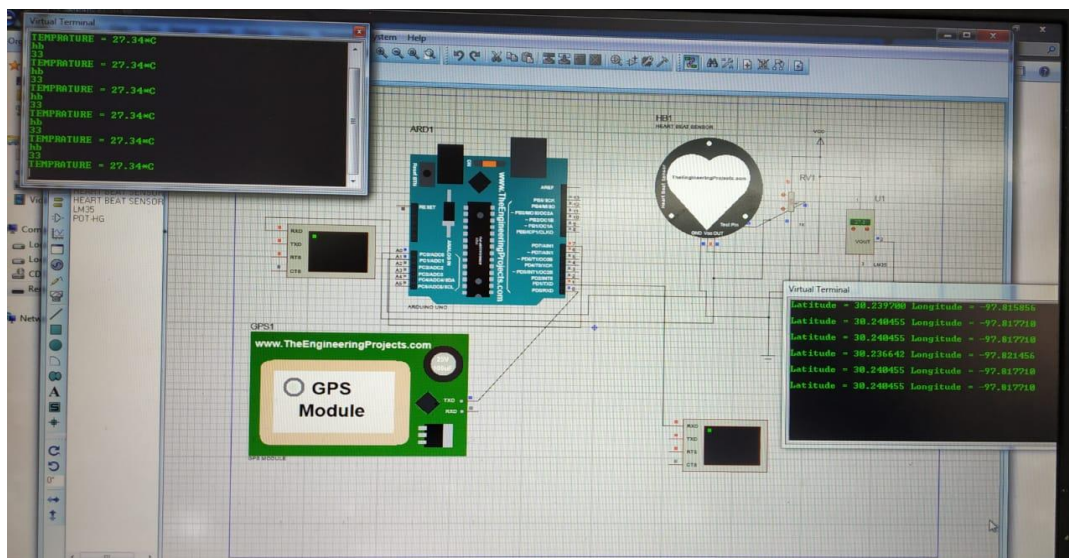


Fig.9 Result Of Hardware System

Solar based E-Uniform gives better protection to the soldiers who are working in extreme weather conditions. Solar panel are used to power up the internal circuitry of the E-Uniform. Arduino Nano is the heart of circuit as it controls all the functions. The system is operated in the summer mode and winter mode.

Barrel Jack –

The Barrel jack, or DC Power Jack can be used to power your Arduino board. The barrel jack is usually connected to a wall adapter. The board can be powered by 5-20 volts but the manufacturer recommends to keep it between 7-12 volts. Above 12 volts, the regulators might overheat, and below 7 volts, might not suffice.

VI.CONCLUSION

Soldiers are one of the imperative components in a nation. Since they are the strength who secure our nation day and night living behind rest and rest. An E-Uniform gives better insurance to warriors who working in compelling climate conditions. This is worked in two modes summer mode and winter mode. In the event the climate condition is excessively hot then the cooling framework will worked and in the event that it is excessively cool then the warming framework will worked.

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- [4] Wireless detection system for Health and military applicatio Yallalinga, Nirmalkumar S. Benni 2017.
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