

# E-Smart Army Jacket Based On Climate Condition Using Arm Microcontroller

M.Vasanthi<sup>1</sup>, M.Suganya<sup>2</sup>, S.Anitha<sup>3</sup>, S.Ashma<sup>4</sup>, K.Janani<sup>5</sup>, M.Kaviyasree<sup>6</sup>

Assistant Professor, Department of ECE, Gnanamani College of Technology, Namkkal, Tamilnadu, India<sup>1,2</sup>

Final year B.E Students, Department of ECE, Gnanamani College of Technology, Namkkal, Tamilnadu, India<sup>3,4,5,6</sup>

**ABSTRACT:** Nowadays the worlds have uncertain and insecurity situation that means the war is cultivated in any time. At the same time the soldiers to join in army is very less. In this situation we have to protect or increase the soldier's life. To increase the soldier's life we have a solution in embedded system. In this project we provide the special advanced techno suit for the army soldiers. While doing a war some people of soldiers are missed at that time the military base is confused about the soldier he was dead or alive. For avoiding this problem we found this suit. This suit is multi purposed suit. It is providing the location of soldier and injuries of the soldiers though AOT data base. In some times the soldiers are stay in heavy winder and heat, for this problem we provide the automatic temperature control system. Its reduce the body temperature will goes to high and vice versa goes low increase the temperature it will helps to maintain the body health of the soldiers.

## I.INTRODUCTION

Indian Soldiers are the most important resource of our country. They play a very important role to protect the country and the country people. They are always ready for taking and holding the duty in extreme weather conditions, weather cold or hot atmosphere throughout the year. While providing security to the nation and to people of country, they may face troubles in extreme hot or cold weather conditions. The specially designed E-Suit will give better protection to the soldiers working in extreme weather conditions. This E-Suit will operate in two modes: summer mode and winter mode. Depending upon the set threshold value, the mode of operation can be decided; also by operating the DPDT relay it can drive body heater/cooler. The heater/cooler in turn will help to provide chilling or warming effect inside the uniform which helps the soldier to bear any kind of external environment. This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

## II. BITTERN WORKS

### A.ATmega16 Datasheet

Temperature related inconveniences such as heat stroke, heat rash, frostbite, hypothermia and others have been a persistent problem for people throughout history. Some of these conditions, when left unchecked, have led to unfortunate deaths. What is even more common is the unsatisfaction that people have with the weather at various points of the year. People often complain that it is either too hot or too cold. The current technological solutions made to keep people thermally comfortable such as air conditioning and heating units have come a long way and have been successful in helping people obtain comfort in their dwellings (e.g. home or car), but are not personal mobility solutions. What if one has to be out in the weather? The addition or subtraction of layers with coats and jackets or beach wear, are popular solutions to that problem, but do not always yield upmost satisfaction, for layers become cold over time and sunburn is a serious problem. This is why a heating/cooling suit is a very beneficial product for the masses temperatures, depending on the season. Creating the most comfortable thermal environment for the user within an enclosed space of small proximity while providing comfort, practicality and mobility is the objective of this suit. With the use of the thermoelectric effect, microcontroller technology and a bit of ingenuity, this suit can be realized.

### B.Timeliness in the development of thermoelectric cooling

Soldiers are important part of army, hence for their safety purpose IOT based device can be designed called as smart safety jacket. In order to collect and detect various signals for organizations, it is possible to use wearable devices

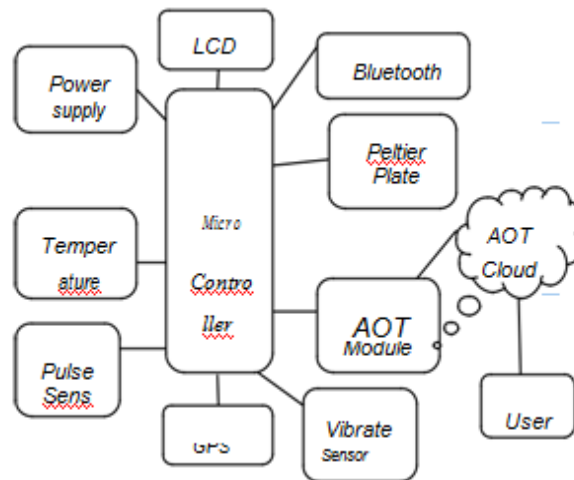
like smart jackets and other accessories. So it can become easy to respond to different situations smart jackets consists of materials and remote sensors which coordinates with regards to the human body. It can be measure and observe different parameters.

### C. Peltier effect

The climatic conditions are changing with the aera to aera. Nowadays, to the people climatic conditions are very annoying and unusual. Throughout the history of human beings, temperature related inconveniences such as heat stroke, heat rash, frostbite, dehydration, hypothermia, etc. are the major problems and one cannot escape from these problems. Some of these conditions are led to unfortunate deaths of people. Some technological solutions made to keep people thermally comfortable such as air conditioning units, are most successful in helping people in their homes & in cars etc. but not in personal mobility situations. If one wants to move in such type of climatic conditions, climate adaptable jacket is a very beneficial product. This jacket can naturally keep up these Specific temperature inside the jacket, so as to reduce the temperature the design of this jacket givesbetter protection to the soldiers & navy people who are working in extreme weather conditions.

### III.PROPOSED WORK

Soldier’s status, current location and weather condition can monitored on AOT system. The specially designed E-Suits operates on the concept of Peltier effect, to provide a sense of normal temperature, inside the jacket, in extreme weather conditions. The heart of this system is the Arduino lilypad board. The temperature sensor (LM35) detects the temperature and sends the details to the Arduino board. The Arduino send the signals to the DPDT relay which in turn drives the Peltier heater/cooler. The GPS & GSM modules are used to spot the location of the soldier. The GPS locates the position of the soldier and GSM is used to send the location to the authorized personnel or department. The LCD display is used to display the temperature and also location of the soldier.



#### Advantages of proposed system

- Easy to find soldier’s location.
- Increase the life of the soldiers.
- Quick response. Compact.
- In hospitals patients monitoring system.
- For illness people monitor at home.

#### IV.HARDWARE COMPONENTS

##### A. BATTERY

An electric battery is a collection of one or more electrochemical cells in which stored chemical energy is converted into electrical energy. The principles of operation haven't changed much since the time of Volta. Each cell consists of two half cells connected in series through an electrolytic solution. One half cell houses the Anode to which the positive ions migrate from the Electrolyte and the other houses the Cathode to which the negative ones drift. The two cells are may be connected via a semi permeable membranous structure allowing ions to flow but not the mixing of electrolytes as in the case of most primary cells or in the same solution as in secondary cells.



Fig.2. Battery

##### B.MICRO CONTROLLER

PIC16F877 belongs to a class of 8-bit microcontrollers of RISC architecture. It has 8kb flash memory for storing a written program. Since memory made in FLASH technology can be programmed and cleared more than once, it makes this microcontroller suitable for device development. IT has data memory that needs to be saved when there is no supply. It is usually used for storing important data that must not be lost if power supply suddenly stops. For instance, one such data is an assigned temperature in temperature regulators. If during a loss of power supply this data was lost, we would have to make the adjustment once again upon return of supply,

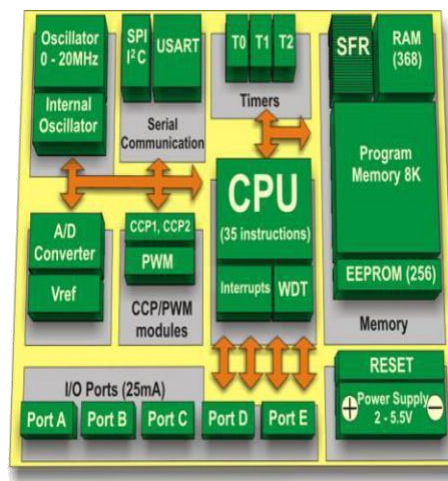


Fig.1 proposed diagram

RISC architecture

- o Operating frequency 0-20 MHz
- o Precision internal oscillator



Fig.3. Block Diagram of Microcontroller

PAM- 7QM is used. It is used to trace the location of the soldier.

D.GSM

The GSM modem used in this jacket is SIM800. GSM (Global System for Mobile Communications, originally Group Special Mobile), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. The GSM standard was developed as a replacement for first generation (1G) analog cellular networks, and originally described a digital, circuit switched network optimized for full duplex voice telephony.



Fig.4.Pin Diagram

C.GPS

GPS (Global Positioning System) is a worldwide radio-navigation system formed from a constellation of 24 satellites and their ground stations. The outcome of a typical GPS survey includes geocentric position accurate to 10 m and relative positions between receiver locations to centimeter level or better.



Fig.5.GPS module

The GPS receiver is capable of receiving signals from up to 65 GPS satellite and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. In this E- Jacket the GPS parallax

This was expanded over time to include data communications, first by circuit switched transport, then packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS). Further improvements were made when the 3GPP developed third generation (3G) UMTS standards followed by fourth generation (4G) LTE Advanced standards. "GSM" is a trademark owned by the GSM Association.

#### E.ARDUINO UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.



Fig.7.Arduino UNO board

To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike. Arduino was born at the Area Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

#### F.E-MILITARY SUIT

Neat and tailored design with breathable fabric is soft shell fabric exterior with fleece lining ensures you don't lose any excess heat and comfortable warmth. Heat across body, is 3 carbon fiber heating elements generate heat across core body areas (left & right chest, mid-back); Adjust 3 heating settings (high, medium, low) with just a simple press of the button.



## I.VIBRATE SENSOR

A vibration sensor is a device which senses vibration and converts it into an analog electric signal whose magnitude depends upon the vibration applied. Since they convert vibration into an electrical signal, they are also termed as vibration transducers

### WORKING PRINCIPLE

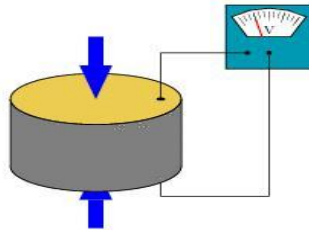


Fig.11.Vibration sensor

## J.PELTIER

Thermoelectric coolers operate according to the Peltier effect. The effect creates a temperature difference by transferring heat between two electrical junctions. A voltage is applied across joined conductors to create an electric current. When the current flows through the junctions of the two conductors, heat is removed at one junction and cooling occurs. Heat is deposited at the other junction. The main application of the Peltier effect is cooling. However the Peltier effect can also be used for heating or control of temperature. In every case, a DC voltage is required. Thermoelectric coolers from II-IV Marlow act as a solid-state heat pump. Each features an array of alternating n- and p-type semiconductors. The semiconductors of different type have complementary Peltier coefficients. The array of elements is soldered between two ceramic plates, electrically in series and thermally in parallel. Solid solutions of bismuth telluride, antimony telluride, and bismuth selenite are the preferred materials for Peltier effect devices because they provide the best performance from 180 to 400 K and can be made both n-type and p-type. The cooling effect of any unit using thermoelectric coolers is proportional to the number of coolers used.



Fig.12.Peltier plate

## K.LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.



Fig.13.LCD display

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

### L.RELAY

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.

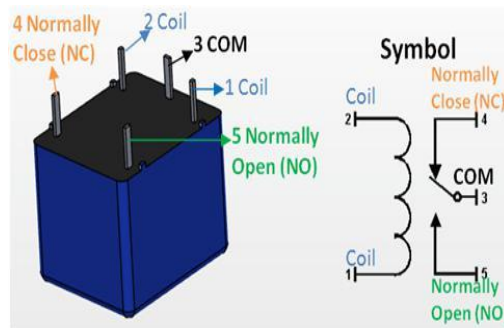


Fig.14.Relay

### SOFTWARE COMPONENTS:

#### A.ARDUINO IDE

The Arduino IDE (integrated development environment) is a cross-platform application written in the programming language Java. It is originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. A program written with the IDE for Arduino is called a sketch. Sketches are saved on the development computer as text files with the file extension into Arduino Software (IDE) pre-1.0 saved sketches with the extension. The Arduino IDE supports the languages C and C++ using special rules of code structuring.



Fig.15.Arduino board



## B.AOT MODULE

Android is now nearly eight years old and despite the green robot android peeking out of phone shops up and down the high street, there are still plenty of people who don't know what Android is. If you fit into this category then have no fear; this article is your complete guide to understanding what Android is, what it can do and where to find it, including the best Android mobile phones, Android apps, which games you can play on Android devices, the very best features you can enjoy and how to update to the latest version.



Fig.16.AOT Module C.BLUETOOTH

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup.

Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

## V. CONCLUSION

The specially designed E-Smart Suit tries to summarize the main smart clothing applications developed in the last decade in the military field. . This system is smaller, lighter and with low power consumption, so it is more convenient. This can help soldiers to work even in extreme climatic applications. The U.S. Army, in the collaboration with MIT, is investing to create the uniform of the future .These jackets can be wearable in all conditions and in all seasons. We can utilize this jacket to shield us from over-heating and over-cooling. We can also place gas detective sensors so that we can detect the gases which are harmful for the human beings.

## REFERENCES

- [1] Felix Felgner, Lukas Exel, Marco Nesarajah, and Georg Frey, "Component-Oriented Modeling of Thermoelectric Devices for Energy System Design", IEEE Transactions On Industrial Electronics, Vol. 61, No. 3, pp. 1301-1307, March 2014.
- [2] Je-Hyeong Bahk, Megan Youngs, Kazuaki Yazawa, Ali Shakouri, "An online simulator for thermo-electric cooling and power generation", 978-1-4673-5261-1/13/\$31.00 ©2013 IEEE.
- [3] Man Prakash Gupta, Min-Hee Sayer, Saibal Mukhopadhyay and Satish Kumar, "Ultra-thin Thermo-electric Device for On Chip Peltier Cooling ", Vol. 1, NO. 9, pp. 1395-1405, 2011 IEEE.
- [4] Rasit Ahiska, Hayati Mamur, "A review: Thermo-electric generators in renewable energy", International Journal of Renewable Energy Research" Hayati Mamur et al., Vol.4, No.1, 2014.
- [5] Surith Nivas M, Vishnu Vardhan D, Raam kumar, PH, Sai Prasad S , Ramya.K, "Photovoltaic Driven Dual Purpose Thermo-electric Refrigerator for Rural India", International Journal of Advancements in Research & Technology, Vol.2, Issue 6, pp. 111-117, June-2013.
- [6] Chakib Alaoui, "Peltier Thermo-electric Modules Modeling and Evaluation", International Journal of Engineering (IJE), Vol. 5, Issue 1, pp. 114-121, 2011.
- [7] Manoj Kumar Rawat, Prasanta Kumar Sen, Himadri Chattopadhyay, Subhasis Neogi, "Developmental and Experimental Study of Solar Powered Thermo-electric Refrigeration System", International Journal of Engineering Research and Applications (IJERA), Vol.3, Issue 4, pp.2543 2547, Jul-Aug 2013.



- [8] Website of Thermalforce.de, Berlin, Germany. [Online]. Available: <http://www.thermalforce.de/de/product/thermogenerator/>
- [9] Adarsh K S, Arun Dinesh, Jyothy Elizebeth D: “Solar Based E-Uniform For Soldier’s Who Work At Extreme Temperature Regions”, International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June,2015, pp. 993 – 998.
- [10] Ajay Kumar MTech Student Siddhartha Institute of Technology & Sciences Ranga Reddy Dist, Telangana, India. S Vani, MTech Assistant Professor Siddhartha Institute of Technology & Sciences Ranga Reddy Dist, Telangana, India: “Solar Battery Powered Heating and Cooling Suit” International Journal & Magazine of Engineering, Technology, Management and Research Volume 2, Issue 7, July 2015 ISSN 2348-4845.
- [11] John David Warren, Josh Adams and Harald Molle, “Arduino Robotics”
- [12] Je-Hyeong Bahk, Megan Youngs, Kazuaki Yazawa, Ali Shakouri, “An online simulator for thermo-electric cooling and power generation”, 978-1-4673-5261-1/13/\$31.00 ©2013 IEEE.
- [13] <https://tetch.com/peltier-thermo-electric-cooler-modules/>
- [14] <http://www.google.co.in/patents/US83975>