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Solar based E-Uniform for Soldiers

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Abstract: Everything around us is equipped with technologies and we are desperately trying to run these with clean energy. But the thought of making bullet proof jackets smart never occurs to mind. Soldiers who protect our country must not only be given a simple kevlar vest but an E-Uniform which runs on clean energy. In this research paper, such uniform is proposed. The uniform gives soldier better protection as well as resistance towards heat and cold in extreme weather conditions. It is equipped with a solar panel that charges the battery. The peltier plate installed gives the cooling and heating effect required. The uniform also has GPS for accurate location of soldier and GSM for contacting the soldier. It also has metal detector for detecting land mines.
Keywords: Kevlar, Peltier plate, GPS, GSM, Metal Detector.

I. INTRODUCTION

Soldiers are the most important resource of a country. They protect its people and come to aid whenever called upon. They are always ready for performing their duties no matter how harsh the conditions are. The soldiers sacrifice many things for their country. There are many problems the soldier may face during his/her deployment. The Soldier may get lost or abducted by enemies or may need to contact the army or base. At very low temperature one of the major problem is the risk of hypothermia. Also the soldier may get contact with a landmine. Hence the soldiers must be well equipped with technology.

The specially designed uniform will give protection as well as resistance towards heat and cold. There is a set threshold value according to which the peltier plate provides cooling and heating effect. The temperature sensor used here is LM35 which is a precision circuit temperature sensor whose output voltage is linearly proportional to celsius temperature. Sensor provides the analog value which is converted into digital format by using ADC in the Arduino. Here, the Arduino is present as micro controller which is the most important part of the uniform. The Arduino makes the embedded system complete. The various sensors present provides value to the micro controller which gives instructions to peltier plate, GPS, GSM etc. The solar panel provides clean energy to run the embedded system.

A 12 volt DC lead acid rechargeable battery is used for storing the energy. A conventional battery charging unit is used for giving supply to the circuitory. The system operates in summer mode or winter mode. The temperature sensor detects the outside temperature which helps in deciding the mode. The H-Bridge IC is operated such that it can drive the heater/cooler according to the mode. The metal detector will detect any metal like bomb and intimate the soldier with a buzzer indication. The uniform will make it easy for the soldier to survive and perform his/her duties in any environment.

II. EXISTING SYSTEM

The soldier is provided with a simple kevlar vest which protects him/her from bullets. Also a suit is available in the market which provides controlled temperature inside it but its cost is very high. It is because many parts of the suits are mechanical and gripping devices which is not conventional at all. Moreover the suit consists of pump and radiators to provide chilling and warm effect.

Fig.1 - A simple Kevlar vest

III. PROPOSED SYSTEM

The concept of E-Uniform or E-Jacket to be precise, discussed in this paper is especially designed for the safety and security of soldiers. The safety measure which is taken into account is at extreme weather conditions. Peltier plate is used to provide normal temperature to body when there is excessive heat or cold. To make the system eco-friendly solar panels are used as the power source of the system. Arduino nano board is used as the controlling device interfaced with other functional modules of the system. Temperature sensor (LM35) is used to detect the temperature of the environment which cause effect on the peltier plates with the help of DPDT relay switch. The peltier plates are responsible for heating and cooling sensations inside the jacket. GPS device will help to trace the location of the soldier and GSM will send the location spots to the control department. The metal detector placed inside E-Jacket for safety has made it more advanced because it detects the nearby metals like bomb, etc.

A. Block Diagram

The E-Jacket design will require the following list of components :

1) Solar Panel
2) Arduino Board
3) Relay
4) Temperature Sensor
5) Metal Detector
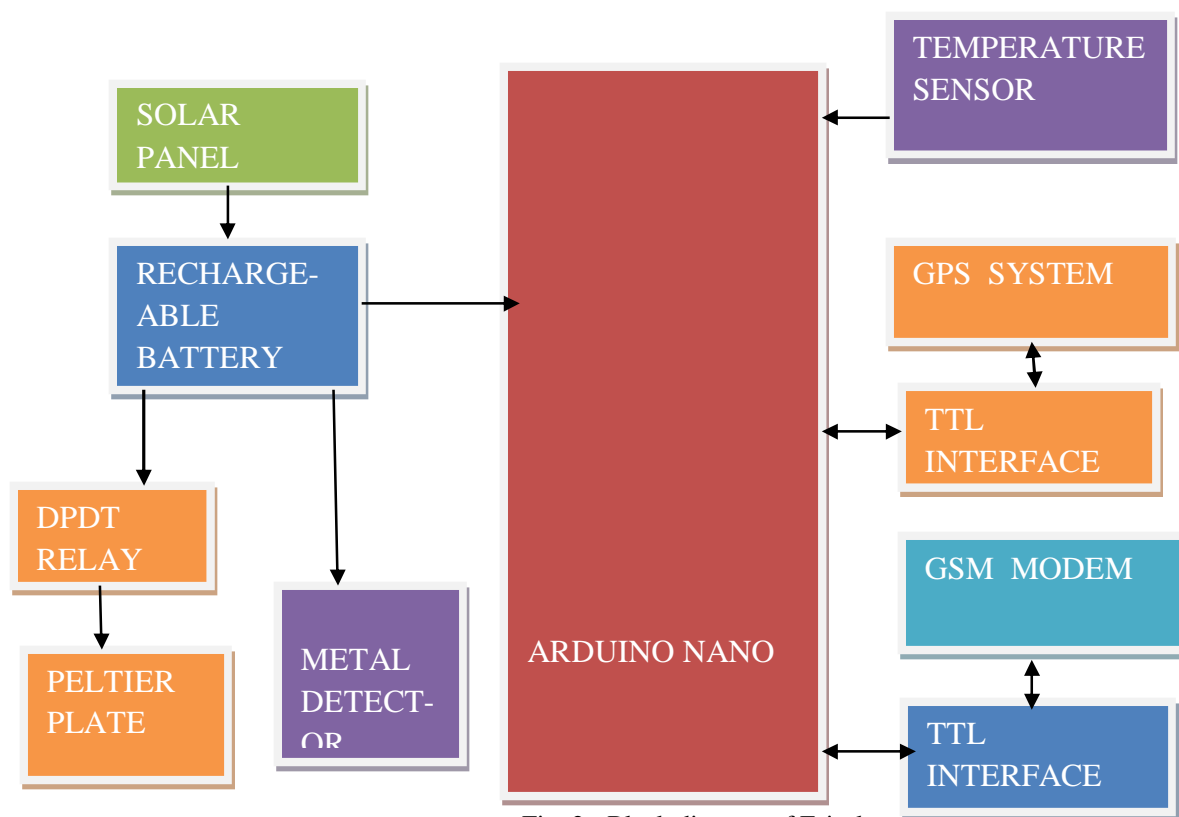*6)* Peltier Plate
7) GPS Module
8) GSM Module

Fig..2 - Block diagram of E-jacket

Now, our main task is to regulate the power supply into the designed system, so that jacket would work efficiently as per the soldiers requirement. When the temperature of environment starts to differ from normal temperature, then peltier plates provide hot and cold sensations to soldiers body according to his requirements. Metal detector act as alert mechanism by detecting land mines ,bombs etc.The GPS and GSM interfaced with arduino will help the control departments to spot the location of soldier.

B. Arduino IDE

The software used for Arduino devices are called as IDE(Integrated Development Environment). It is an open source platform ,means these are free to use and readily available to anyone. This requires some basic skills to operate and anyone can modify and optimize the boards for better functionality. The IDE environment is distributed into two parts called as editor and compiler and are used to write,compile and upload programs into the Arduino Module. The environment support both these languages c and c++ for writing codes. The IDE environment mainly distributed into three sections. It contains menu bar, text editor for writing codes known as sketches and output pane for highlighting the compilation status of running code and errors occurred. The file saved with .ino extension need to be converted into hex file and then loaded into the module by a loader program in board's firmware.
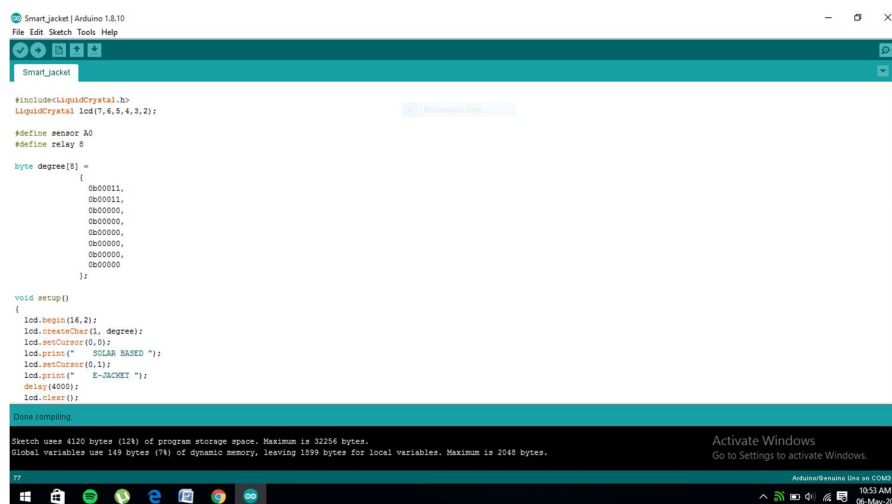

Fig.3- Programming in Arduino IDE

IV. SYSTEM DESIGN

In this paper, entire process involves security and protection services provided to the Soldiers in extremely hot as well as cold atmosphere. As we know, both very hot and cold temperatures could be dangerous to health. In our system, on the basis of drastic weather conditions faced by our soldiers an E-Uniform is designed. This E-Uniform will provide protection to the soldiers to overcome these drastic weather conditions.

For completion of this entire process, we require Temperature Sensor, Metal Detector, LCD, Solar Panel, Rechargeable Battery, Peltier Plates and Arduino Nano. Temperature Sensor is used here to check temperature at any time (in ^{o}C), the value of temperature is being displayed on LCD whereas Solar Panels and Metal Detector are used to provide power supply to internal circuit and detect metal objects respectively.

Since, the output of the system is providing protection to the Soldiers in extremely hot and cold weather conditions.

In this model, relays are used which have several poles and contacts, an electric switch is also present. They are used to control high voltage, current int the circuit as well as to perform logical functions. However, we have also introduced Etching Process which requires the use of chemicals. Basically, in this process Ferric Chloride is used for solution but we have also used Ammonium per Sulphate and Nitric Acid.

A. Functions of various components:

1) Temperature Sensor
a) Temperature Sensor is used to determine the temperature of the environment where the Soldiers are working.
b) It detects the temperature and sends the details on the display screen of LCD.

2) Arduino Nano
a) Arduino Nano's pins have been connected to the Peltier plates for polarity change so as to work indifferent modes of climatic conditions.
b) The power source is automatically selected to highest voltage source.

3) *Solar Panel*
a) Solar Panels are used in this to power up the internal circuitry of the E-uniform.
b) A 12 V DC lead rechargeable battery is used for storing energy.

4) *Peltier Plate*

Fig. 4- A Peltier Plate.

a) Peltier Plate is used provide chilling or warm effect inside the uniform which helps the Soldier to bear any kind of external environment.
b) They work in both winter as well as in summer modes.

5) *Metal Detector*

Fig.5- A Metal Detector.

a) Metal Detector is a device which is used to detect metal objects and intimate the soldiers.
b) It produces a buzzer-sound whenever a metallic object/bomb is being detected.

6) *LCD*
a) LCD is used to display the reading recorded in both summer and winter modes by the temperature sensor.
b) Thus, it makes the system user- friendly.

7) *GSM*

Fig.5 - A GSM module.

a) GSM are mostly used for transmission i.e. mobile services and data services.
b) It is also used for converting analog input data into output data.

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8)   *GPS*

Fig. 6- A GPS module.

a)   GPS are mostly used for positioning, navigation, tracking and other purposes.
b)   It is basically useful for determining position and time of GPS receiver.
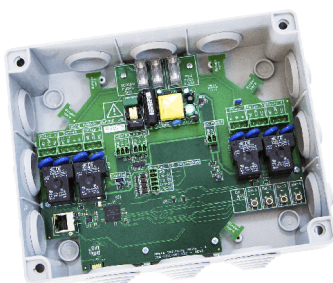
9)   *Relay*

Fig. 7- A DPDT Relay Switch.

a)   Relays are basically used for isolating two circuits electrically and also connecting them mechanically.
b)   That's why they are used in those areas where lots of circuits can be controlled with one signal.

V. CONCLUSION

As it has been already stated in our hypothesis, we believe that Soldiers are the strengths who secure our nation day and night without any failure. We can also add on to the behave of Soldiers that they are the imperative components in the entire nation. So, as to provide protection and better insurance to our respectful Soldiers we have come upon with an E-Uniform. This jacket works in both summer as well as in winter modes. However, we can also say that if Soldier is present in extremely hot region and cold region then cooling framework and heating framework will work respectively. Thus, we can say that a jacket is designed and fabricated in such a way that it will safe-guard the person in both extremely hottest as well as coldest atmospheres.

The main components required for designing such an effective jacket are: Temperature Sensor, Peltier Plates, Arduino Nano, Solar Panels, LCD and Metal Detector. For designing and fabricating such an effective jacket to safe-guard Soldiers an offshore platform have been studied using a frame model in computer program SACS.

VI. ACKNOWLEDGMENT

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