E-suite for Soldiers based on Photovoltaic Cells

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Abstract—We are urgently attempting to power the technology that surround us with clean energy. However, It never occurs to me to make bulletproof coats intelligent. In addition to a basic Kevlar vest, soldiers who defend our nation should receive an E-Uniform that operates on sustainable energy. This study article suggests such a uniform. The attire improves a soldier's ability to withstand extremes of temperature in adverse weather situations. It has a solar panel installed that charges the battery. The necessary heating and cooling effect is provided by the mounted Peltier plate. Additionally, the soldier's clothing incorporates GPS to track their precise location and GSM to make touch with them. Additionally, it has a metal detector to locate metal objects like bombs and is naturally camouflaged.

Keywords—Kevlar, Peltier plate, GPS, GSM, Metal Detector,Camouflage..

Introduction

The most valuable resource in a nation is its soldiers. They defend its citizens and offer assistance when needed. Regardless of the difficult circumstances, they are constantly prepared to carry out their responsibilities. The sacrifices made by warriors for their nation are many. The soldier may encounter a variety of issues while on deployment. An enemy may kidnap or lose a soldier, or they could need to get in touch with the base or the army. The possibility of hypothermia is one of the main issues at extremely low temperatures. A landmine may also come into touch with the soldier. As a result, the soldiers need to have modern technologies.

The specifically made uniform will provide protection and be resistant to both cold and heat. The cooling and heating effects of the Peltier plate are dependent on a predetermined threshold value. The temperature sensor in question is the precision circuit temperature sensor LM35, whose output voltage is directly proportional to temperature in degrees Celsius. The analogue value from the sensor is transformed into digital representation using the Arduino's ADC. The Arduino is used in this instance as the micro controller, which is the most significant component of the outfit. Completing the embedded system is the Arduino. The micro controller receives information from the different sensors, and it uses that information to send commands to the GPS, GSM, and other devices. Clean energy is provided by the solar panel to power the embedded systems.

The energy is stored in a lead acid rechargeable battery with a voltage of 12 volts DC. Using a traditional battery charger, one may give power source for the circuitry. Either summer or winter mode can be used with the system. In order to determine the mode, the temperature sensor measures the outside temperature. The heater/cooler is driven by the H-Bridge IC in accordance with the in mode. Any metal, including bombs, will be detected by the metal detector, alerting the troops with a buzzer. The soldier will find it easier to live and carry out their tasks in any setting thanks to their clothing.

II. Existing System

A basic Kevlar vest is given to the soldier to shield them from gunfire. There is a suit on the market that has regulated temperature as well, but it costs a lot of money. The reason for this is that a lot of the suits' components are grasping, mechanical devices, which is very unconventional. In addition, the suit has radiators and a pump to produce a warming and cooling effect.

Fig.1 - A simple Kevlar vest

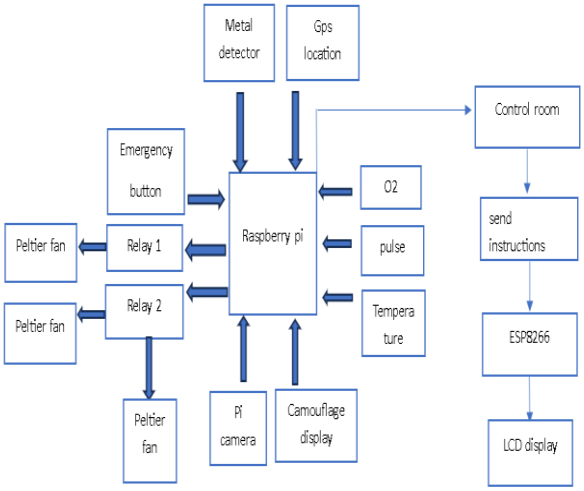

Fig..2 - Block diagram of E-jacket

Iii. Proposed System

This article discusses the idea of E-Uniform, or more specifically, E-Jacket, which is specifically created to ensure the security and safety of troops. When there are severe weather conditions, safety precautions are considered. When the body gets too hot or cold, a Peltier plate is employed to bring the temperature back to normal. The system's power source is solar electricity, which helps to make it environmentally friendly. The Arduino Nano Board serves as the device that controls it that interfaces with the system's other functional elements. Using a DPDT relay switch, a temperature gauge (LM35) is utilised to determine the ambient temperature that affects the peltier plates. The jacket's interior temperature sensations are brought on by the peltier plates.

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
9) Heart Beat Sensor
10) ESP 32 Camera
11) Battery

Our primary responsibility at this point is to control the power supply to the system that was developed so that the jacket functions as intended. troops' needs.Peltier plates allow troops to feel heat or cold on their bodies in accordance with their needs when the outside temperature starts to fluctuate. By identifying land, a metal detector serves as a warning mechanism. bombs, mines, etc. The control departments will be able to locate soldiers more easily with the use of the Arduino interfaced GPS and GSM.

B. Arduino IDE

The Arduino device software is referred to as the IDE (Integrated Development Environment). Since it's an open source platform, anyone may use it for free and have easy access to it. Although it does take some basic abilities to operate, anybody may tweak and improve the boards' functionality. The Arduino Module may be programmed, compiled, and uploaded using the editor and compiler components of the IDE environment. Both of these programming languages—C and C++—are supported by the environment. Three components make up the majority of the IDE environment. It has a navigation bar, an output pane that shows the compilation status of running code and any problems that occurred, and a text editor for authoring scripts known as sketches. The.ino-extended file must be stored

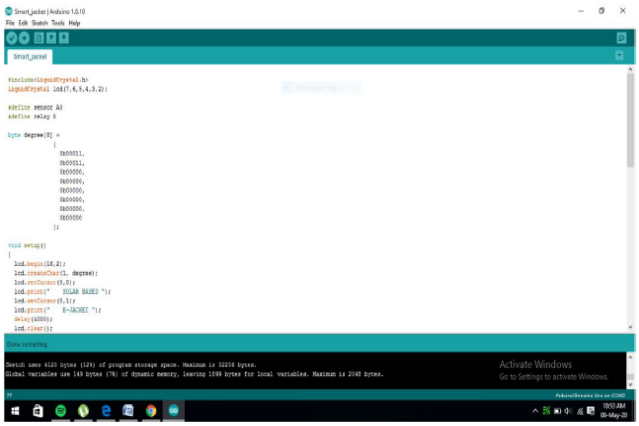

Fig.3- Programming in Arduino IDE

IV. SYSTEM DESIGN

The complete procedure described in this article includes providing safety and security services to the troops in both severely hot and cold conditions. environment. As is well known, extremes of temperature can be harmful to one's health. Our technology creates an E-Uniform based on the extreme weather that our soldiers encounter. The troops will be protected by this E-Uniform to conquer these extreme weather conditions.

Thermometer sensor, metallic detector, LCD, a solar-powered rechargeable battery, piercing plates, and Arduino nano are needed to finish this full procedure. Here, a thermometer is used to measure the temperature at any moment (in degrees Celsius), and the result is shown on an LCD. In contrast, metal detectors and solar panels are used to identify metal items and give electricity to the internal circuit, respectively.

Because of the system's output, soldiers are protected from bitterly cold and intense heat. Relays with many poles and contacts are utilised in this type, together with an electric switch. They carry out logical operations and regulate high voltage and current in the circuit. On the other hand, we have also launched the chemically-intensive Etching Process. Basically, ferric chloride is utilised as a solution in this method, but we have also added nitric acid and ammonium per sulphate.

A. The roles played by different parts:

1) Thermostat

a) The soldiers' working environment's temperature is measured using a temperature sensor.

b) It measures the temperature and transmits the information to the LCD display panel.

2) The Arduino Nano

a) In order to function in a variety of climatic circumstances, the Arduino Nano's pins have been attached to Peltier plates for polarity change.

b) The power source is instantly set to the highest voltage source.

3) Solar Panel

a) This uses solar panels to power the E-uniform's internal electronics.

b) Energy is stored in a 12 V DC lead rechargeable battery.

4) Peltier Plate

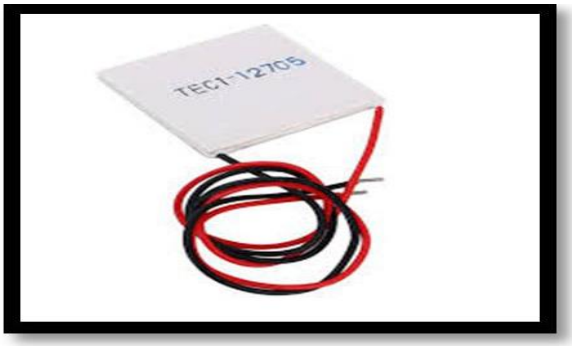

Fig. 4- A Peltier Plate.

a) Peltier plates are used to produce a warm or cool sensation within uniforms, aiding troops in sustaining any number of outside circumstances.

b) They operate in both winter and summer modes.

Fig.5- A Metal Detector.

a) metal detector is a tool used to detect metal items and alert soldiers of their existence.

b) Whenever a metallic object or bomb comes into view, it creates an audible buzzing noise.

6) LCD

a) The temperature sensor collects data in winter as well as summer modes, which are displayed on an LCD.

b) As a result, it enhances the system's usability.

7) GSM

Fig.5 - A GSM module.

a) GSM is mainly employed for data and mobile service move.
b) Analogue input data translation to output data is another application for it.

Fig. 6- A GPS module.

a) The primary uses of GPS are tracking, navigation, and positioning.
b) It is mostly helpful for determining the GPS receiver's position and time.

9) Relay

Fig. 7- A DPDT Relay Switch.

a) Relays are mainly used to link two circuits physically and electrically separate them from each other.
b) For this purpose, they are employed in situations where one signal may operate across a lot of circuits.

10) Raspberry pi

Fig. 8-Raspberry pi

a) The e-suite's Riparian Pi employs Arduino to gather data from environmental sensors, such as solar cells.
b) By tracking solar cell output and modifying power distribution appropriately, it maximises energy consumption.

V. CONCLUSION

As stated earlier in our theory, we believe troops are the immovable resources that defend our country day and night. Additionally, we could point out that soldiers behave as essential members of the nation. Thus, we have developed an E-Uniform in order to better protect and insure our noble soldiers. This jacket is functional in both summer and winter situations. On the other hand, we can also state that the heating and cooling systems will function properly if the soldier is in an extremely hot or cold location. Therefore, we may state that a jacket's construction and design ensure that the wearer will be secured.

The following are the vital components required for making such a functional jacket: temperature sensor, Peltier plates, Arduino Nano, and solar LCD, Metal Detector, Panels. In order to develop and produce a jacket that effectively protects soldiers, an offshore platform has been studied through the use of a frame model in the SACS computer software.

Vi. Acknowledgment

Presentation, inspiration, and motivation—all three of which we already know to be crucial—have always been significant. part in order to succeed in any undertaking. We would like to convey our heartfelt gratitude to the Raj Kumar Goel Institute of Technology's Department of Electronics and Communication Engineering in Ghaziabad for driving us to the top and also gave us an opportunity to get our project ready. Here, I would also want to express appreciation to my friends for their inspiring leadership, helpful advice, and kind oversight during the execution of our project. We also feel compelled to express our deep appreciation and a sense of gratitude for our guide co-guide Asst. Prof. Sandeep Bhatia and faculty member Maneesh Kumar Srivastava. Their useful guidance and friendly

supervision assisted us during the entire course, which is how the current work is developed. Not to forget that our parents serve as a major source of inspiration for us. Thus, with all due respect, we would also want to thank them.

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