Abstract: Soldiers operating in extreme weather situations benefit from the solar-powered E-Uniform. We can power the E-electronics uniform with a modest portable solar panel. The energy is stored in a rechargeable battery. We are also using a traditional battery charging station to deliver power to electronics. This project is based on two different modes of operation: one is the summer mode and another is the winter mode. The Bridge IC is triggered to drive the body heater/cooler when the mode of operation is selected. This will enable us to deliver a cooling or warming effect within the E-uniform, allowing soldiers to withstand adverse weather conditions. The metal sensor is used here to detect the presence of metals around and provide an alert with buzzer by turning on its alarm. If a metal sensor is used, it will notify the soldier through a buzzer. Soldiers location is tracked via GSM and GPS. With the location communicated to the appropriate person through message to base station. This E-Uniform will enable soldiers to do their duties in any weather situation.

Keywords: Microcontroller ATmega16a, Solar Panel, rechargeable battery, Temperature Sensor, Heart Rate Sensor, GSM, GPS.

1 INTRODUCTION

The Army’s most important strength is its warriors. Warriors have an important role in ensuring the safety of one’s country. These warriors are men and women who serve in the army, air force, navy, and marines, and they must be at peace in any weather and climatic conditions. Our fighters’ health may be jeopardised by climate change. This initiative is a response to the situation. In this project, we created an E-uniform that will aid warriors in improving their health. Our warriors will be able to work in any environment with this uniform. To regulate the operation of the enterprise, we used a Solar Panel and also a 12 V DC rechargeable battery. We also use a temperature sensor and a heart rate monitor. In addition, we use a temperature sensor and a heart rate sensor to monitor the trooper’s health in any situation. The controller, sometimes known as the heart of the circuit, is the ATmega16a. With the help of a peltier plate, this will work in two modes: summer and winter.

II BACKGROUND

Soldiers are the Army’s most valuable asset. Soldiers are essential in defending one’s country. Men and women who serve in the Army, Air Force, Navy, and Marine Corps are referred to as soldiers. Throughout the year, they are always in charge of doing their duties in adverse weather conditions. They may face challenges providing safety to the country in very hot or cold weather. Extremely hot or cold temperatures can be harmful to one’s health and reduce one’s effectiveness. We aimed to build an E-Uniform in this project that would provide better protection to soldiers working in adverse weather situations. There are two modes in this system: summer mode and winter mode.

III LITERATURE SURVEY

Different strategies are utilised in these studies to build E-uniform that provides higher safety to soldiers working in adverse weather. Solar panels were utilised to power the E-uniform’s circuitry, according to a paper published in May 2018. Although it has advantages such as small size and inexpensive cost, it is unable to alert the device to every scenario (say mobile phone). In another article published by IJEIT in 2019, a conventional battery charging unit is also employed to deliver power to the circuits. This outfit was designed to help soldiers perform better in a variety of situations. This style of design is really expensive. All of this is accomplished through the use of several sensors and a PLC or microcontroller. GSM or GPS-based monitoring aids in the tracking of a soldier’s location. The project's main focus is on ensuring military safety and reducing health issues so that soldiers’ efficiency is not jeopardised.

IV BLOCK DIAGRAM

A Peltier thermoelectric tool, which is coupled to the battery, creates a cooling effect on one side while dissipating warmth on the other via a warmness sink. A Peltier thermoelectric tool, which is attached to the battery, generates a cooling effect on one side while dissipating warmth on the other via a warmness sink, and solar panels are used to charge a Lead Acid Battery. In this case, we're
employing a Microcontroller (LPC2148), which enables for more dynamic and faster manipulation.

The system is particularly user-friendly because to the liquid crystal display. A liquid crystal display is used to display the current and most voltage values stored within the rechargeable battery in this case. The project has two operating modes: first is summer season mode and second is winter weather mode. By choosing an operation mode that can power the body heater/cooler. The heater/cooler, on the other hand, will assist us in providing a chilling or warming impact within the uniform, allowing the soldier to acclimatise to any exterior climate and function well without heat stress or bloodless pressure. Soldiers operate in a unique environment and are frequently on the move, thus sun protection is essential for them.

An AC ripple neutralizer is utilised, which is essentially a voltage stabiliser. It will put an end to the waves that solar energy has created. The present unidirectional controller will receive this power. The new unidirectional controller maximises the efficiency of the supplied voltage. It's now time to transfer it to the rechargeable battery. We're sampling to get the output from a Lead Acid Battery. On the panel, a liquid crystal display indicates the battery's current and maximum voltages. The Peltier plate is a built-in cooling and heating mechanism in the jacket.

We'll use the built-in ADC for this. The signal is then transferred to the ADC on the controller. In this case, sampling is utilised to choose a region, which then gives us the outcome. On the liquid crystal display, the battery's current voltage and maximum voltage are displayed. Peltier plates serve as a cooling and heating mechanism in the jacket.

VI FLOW CHART

![Flow Chart of Uniform for soldiers](image)

Fig 2. Flow Chart of Uniform for soldiers

First start the system by powering on the kit by pressing the button. In this system we have used solar plate, for charging purpose them we have to expose them in sunlight. When we do so the battery gets charged (charged battery can be used for various sensors and PIC microcontroller for powering on).

For temperature sensor we have fixed a nominal temperature that is 37°C, which indicates that body has normal temperature and the person is feeling good. But if the temperature increases more than the set temperature, than winter mode gets on and then with the help of peltier plate we can help the body to normalise it's temperature and when it's gets to nominal temperature then peltier plate gets off. And same for summer mode, when the body temperature gets below the set temperature then summer mode gets on and body temperature is increased with the peltier plate (which starts heating when temperature gets below the set temperature).

Here, BPM means Beats per Minute. Normal heart rate range for human being is 60 to 100 beats per minute. We have to set this range in our code. If BPM detected by Heartbeat sensor is not in range it's more or less than or is in range then using GSM messages are sent to Base station of military.

VI HARDWARE IMPLEMENTATION

![Hardware Implementation](image)

Fig 3 Hardware Implementation

A recent way to providing better security to a soldier working in adverse weather circumstances is to integrate GPS and GSM with temperature regulation. The temperature is measured at any moment using a temperature sensor. Based on the data acquired from the sensor, one of the modes, cooler or heater, is activated. The communication is sent to the army office through GSM, and GPS is utilised to track down the soldier in critical condition.

The mobile numbers are saved in the EEPROM of the PIC16F877A microcontroller using a 16-key 4x4 matrix keypad. The cell-phone numbers are kept here according to the needs.

Extremely hot or low temperatures might be hazardous to one's health. As a result, a temperature restriction will be established. If the temperature is higher than the threshold value each time the sensor checks the temperature, the heater system will be activated. The cooling system will be engaged if this value goes below the threshold. When the system fails, the army office receives an automatic notification via GSM. This notification includes details...
about the soldier's vehicle and current position. The LCD will display message sending signals.

With the help of a router IC, the GPS and GSM are connected to the PIC microcontroller through RS232 interface. The main job of the router IC is to choose between GPS and GSM depending on the connectivity requirements. When receiving coordinates, the Router IC connects to GPS, and when delivering messages, it connects to GSM. Once the message has been sent, the buzzer will sound. LEDs are used in many different applications. The power supply circuit converts 12 volts of supplied electricity to the required 5 volts.

VII CONCLUSION

The solar-powered E-Uniform is beneficial to soldiers operating in adverse weather conditions. Soldiers can wear this uniform in a range of conditions, allowing them to perform successfully without jeopardising their health. When the metal sensor finds metal, it sounds a buzzer to alert the soldier. A heart rate sensor is used to check soldiers' health, and GSM and GPS are used to track their location.

VIII FUTURE SCOPE

The scope of this project may be expanded in the future. To make the circuit more ecologically friendly, we can power it with a small portable solar panel. In the future, civilians living in difficult climates may be able to wear this suit. Using an Android device, this idea can be expanded in the future. Users can set up programmes to track their whereabouts and navigate using the GPS function on their phones.

IX REFERENCES


