REVOLUTIONIZING E-UNIFORM FOR SOLDIERS:THE POWER OF SOLAR ENERGY

[1]S. Madhavi, [2]K.Sri Sai Sravani [3]P.Nitish,[4]T.Yashwanth

[1] Assistant Professor, Department of Electronics and Communication Engineering, St. Peter's Engineering College,Hyderabad,Telangana, India

[2,3,4] Undergraduate Student, Department of Electronics and Communication Engineering, St. Peter's Engineering College,
Hyderabad, Telangana, India

ABSTRACT

The aim of the project is to develop an Electronic uniform for soldiers. The system has a coolerand warmer system inside it. The soldiers are provided with mode switch for selection of cooler/warmer. The cooler/ warmer are powered through solar energy.Soldiers are supposed to workat extreme temperatures (very high or very low temperatures). This will lead to health damage.So, a E- uniform is designed to avoid adverse effects caused due to temperature changes.

The temperature sensor sends analog signal to micro controller;the ADC samples the input signal and converts to digital data which consists 0's and 1's. The microcontroller analyses the data and compares with pre-stored temperature limits. If temperature exceeds beyond prescribed limit, the microcontroller signals the relay driver circuit to on the relay to which the peltier plate is connected. If internal temperature is regulated to moderate temperature, thefans would turns off andthis process continues. All this equipment is placed in soldier jacket and solar panel on the soldiers cap.

Keywords:Peltier Plates, solar panel,diode(1N4007),LedIndicators.

INTRODUCTION

An embedded system is a computer system that is created to carryout one or a few specific focused tasks, frequently under real-timecomputing limitations. One or more main computing cores, whichare commonly microcontrollers or digital signal processors, manage embedded systems.

A modest portion of all programming is dedicated to embedded development. Additionally, there are many different embedded architectures, as opposed to the Unix and PC worlds, where thereare just a few main ones each with a single dominant instruction set. The tools are therefore more expensive as a result. Additionally, it implies that they are becoming less advanced andlesser featured. A compiler problem of some kind will almost inevitably be discovered at some point on a large embedded project.
Issues like memory cache misses, which don't matter in PC programming, can damage you when working with massive data

sets. Another difficulty is memory. Embedded systems typically have the least amount of memory possible due to the same cost- saving concerns. Therefore, algorithms need to be memory- efficient.You also can't afford to let the RAM leak.

Due to the daily introduction of new goods to the market that makeinventive use of embedded computers, the applications for embedded systems are essentially endless. Hardware including microprocessors, microcontrollers, and FPGA chips has significantly decreased in price in recent years. In order to developa new form of control, it is therefore wiser to simply purchase thegeneric chip and create your own unique software for it.

Hardware control by embedded systems is common, so they needto be able to react to it instantly. If this is not done, measurementsmay not be accurate or hardware, such as motors, may be harmed.The absence of resources makes this much more challenging. Theability to prioritise certain tasks above others is a requirement foralmost all embedded systems, as is the ability to postpone or skiplow priority chores like user interface (UI) in favour of high priority tasks like hardware control.

LITERATURE SURVEY

An e-uniform that provides better confidence to the soldiers in extreme weather conditions was suggested in the paper[1]. The PIC microcontroller (PIC16F877A)'s ADC converts the temperature sensor's simple voltage readings into computerised data. Temperature sensors are used to measure temperature. The warm and cold limit levels of temperature are used to evaluate advanced capabilities. If the temperature rises above the edge cooler's threshold, a fan will start up. The timer starts, and the LCD display shows the status of the framework.

The paper's[2] suggested equipment is an IoT and solar-based tracking, controlling, and monitoring system for soldiers operating in harsh climate conditions. The GPS, GPS, and heartbeat detector statistics are sent to the PIC18F452 microcontroller.

EXISTING SYSTEM

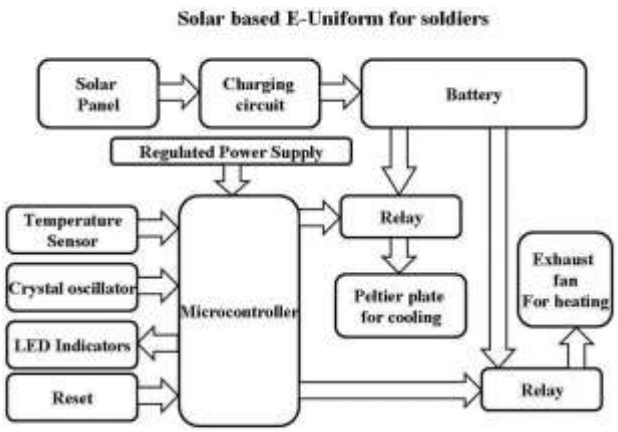
There is a suit on the market right now that allows for controlled temperature inside, but it is very expensive. It's because the suit has a lot of mechanical and grasping components. Pumps and radiators are included in the suit to offer a warming and cooling effect.These pumps spray water on the body to cool it. The electricblanket is another tool, but its main disadvantage is that it requiresa lot of upkeep.

PROPOSED SYSTEM

The idea behind the E-uniform is specifically created with soldiers' safety and security in mind.the safety precaution that is considered under severe weather conditions. In order to provide the wearer a sense of normal temperature inside the jacket during severe weather, specially constructed E-Jackets use the peltier effect.When there is extreme heat or cold, a peltier plate is utilised to keep the body's temperature normal.Inside the jacket, the heating and cooling effects are caused by peltier plates.Solar panels are employed as the system's power source to make it eco-friendly.With the aid of a DPDT relay switch, a temperature sensor (LM35) is employed to gauge the ambient temperature thathas an impact on the peltier plates.

The main blocks of this project are:

1. Micro controller
2. Reset button
3. Crystal oscillator
4. Regulated power supply (RPS)
5. Led indicators
6. Solar plate
8. Peltier plates
9. temperature sensor 10.Relay 11.Rechargeable battery



Upward compatibility exists between the PIC16F73 CMOS FLASH-based 8-bit microcontroller and the PIC16C73B/74B/76/77 and PIC16F873/874/876/877 devices. It has an ICD, two comparators, eight channels of 8-bit Analog-to- Digital (A/D) converter, two capture/compare/PWM functions,
200 nanosecond instruction execution, self-programming, synchronous serial port that may be set up as either a 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

The PIC microcontroller can link to crystal oscillators with speedsranging from DC to 20Mhz. Typically, a 20Mhz oscillator will beused with the CCS C compiler, and it is extremely inexpensive. A22pF or so capacitor needs to be linked to the 20 MHz crystal oscillator. Please see my wiring diagram.The PIC microcontrollerhas five input/output ports: ports A, B, C, and D,E.

On the PIC microcontroller, there are 5 input/output ports: ports A, B, C, D, and E. Every port serves a unique purpose. The majority of them have I/O ports.
A power supply is an electrical energy source. A power supply unit, or PSU, is a device or system that provides electrical or othertypes of energy to an output load or group of loads. The phrase ismost frequently used in reference to electrical energy sources, lessfrequently to mechanical ones, and infrequently to others.

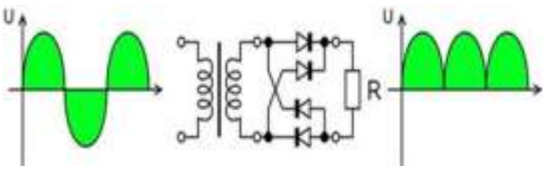
Changing an electrical source's shape and voltage to what is wanted. For electronic equipment, this usually means changing anAC line's voltage to a well-regulated, lower-voltage DC. DC power supply units with low voltage and low power are frequentlyincorporated with the equipment they power, including computersand home gadgets.

The diagram depicts the bridge rectifier circuit. Four diodes in the circuit are wired together to form a bridge. The bridge's diagonally opposed ends receive the ac input voltage. The bridge's other twoends are connected by the load resistance.

While diodes D2 and D4 stay in the OFF state, diodes D1 and D3conduct during the positive half cycle of the input ac voltage. Theload current will flow via RL because the conducting diodes are connected in series with the load resistance.

Diodes D2 and D4 conduct for the input ac voltage's negative half cycle, whereas D1 and D3 do not. The load resistance RL will be in series with the conducting diodes D2 and D4, so the current will flow through RL in the same direction as it did during the prior half cycle. As a result, a bidirectional wave becomes a unidirectional wave.

Fig1- Bridge rectifier: a full-wave rectifier using 4 diodes



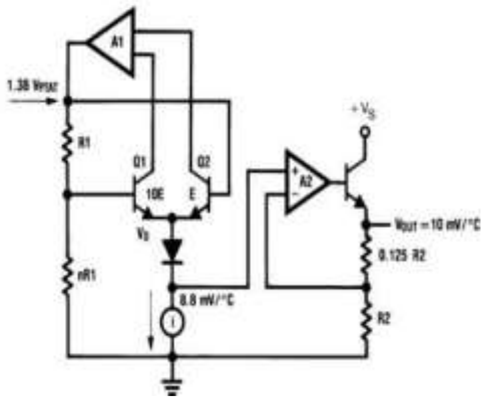
DS18B20 temperature sensor interfacing with PIC16F877

The parasite-powered circuitry is displayed in PARASITE POWER. Every time the DQ or VDD pins are high, this circuit "steals" power. As long as the time and voltage specifications are met (see the part headed "1-Wire Bus System"), DQ will deliver enough power. Two benefits come from parasite power: 1) By parasiting off this pin, remote temperature detection is enabled without the requirement for a local power source, and 2) the ROM may be read in the absence of normal power. When a temperature conversion is occurring, enough power must be supplied over theDQ line for the DS18B20 to be able to do precise temperature conversions. The DS18B20 can operate at a maximum current of
1.5 mA , The 5k pullup resistor means that the DQ line won't have enough drive. If numerous DS18B20s are on the same DQ and trying to convert at the same time, the issue becomes really serious. The DS18B20 can be guaranteed to have enough supply current during its active conversion cycle in two different ways.

First, if temperature conversions or copies to the E2 memory occur, a strong pullup is provided on the DQ line. As demonstratedin Figure 2, this can be achieved by pulling the DQ line directly into the power supply via a MOSFET. When a protocol that requires copying to the E2 memory or starting temperature conversions is issued, the DQ line must be changed to the strong pullup no later than 10 seconds later. The VDD pin needs to be connected to ground when employing the parasite power mode. Using an external power source connected to the VDD pin is another way to deliver current to the DS18B20, as shown in Figure.

The bus master does not have to be tied up holding that line high during temperature conversions, which is an advantage since it eliminates the requirement for the heavy pullup on the DQ line. This permits additional data flow on the 1-Wire bus while conversion is taking place. Additionally, if all of the DS18B20s on the 1-Wire bus are powered externally, any number of them can be connected, and by sending the Skip ROM instruction followed by the Convert T command, they can all convert temperatures concurrently.

Block Diagram



Peltier (Thermo Electric Plates): By putting a voltage between two electrodes that are attached to a sample of semiconductor material, the Peltier effect is a DS18B20 temperature differential that is produced. When transferring heat on a small scale from one material to another, this phenomena can be helpful. The Seebeck effect and the Thomson effect are the other two types of thermoelectric effects, making the Peltier effect one of three.

The electrodes in a Peltier-effect device are normally constructedfrom a metal with exceptional electrical conductivity. When a voltage is given to the electrodes to push an electrical current through the semiconductor, two junctions between different materials are formed in the semiconductor material between the electrodes, creating a pair of thermocouples.When more traditional cooling techniques are not feasible, thermoelectric cooling with Peltier-effect devices is utilised in computers and other equipment.The French physicist Jean-Charles Athanase Peltier, who discovered the Peltier effect, is honoured as its namesake.

Peltier Module

The thermoelectric generator's opposite is a Peltier module (Peltier cooler). In a thermoelectric generator, a DS18B20 temperature difference between the two sides is used to create electric power, but in a peltier module or Peltier cooler, electric power is used to generate a DS18B20 temperature difference between the two sides of the device. Because both operate similarly (as thermoelectric effect manifestations), the devices aretypically made of identical components and have comparable layouts.

Fig2- Peltier Module

RESULTS

The "Solar-based E-Uniform for Soldiers" who Work at Extremely High or Extremely Low Temperature with Tracking project has been successfully tested and put into practise. We can assist soldiers in working even in harsh climatic conditions by implementing this idea in real-time applications. It is a very robustand self-healing solar technology that is perfect for portable applications.

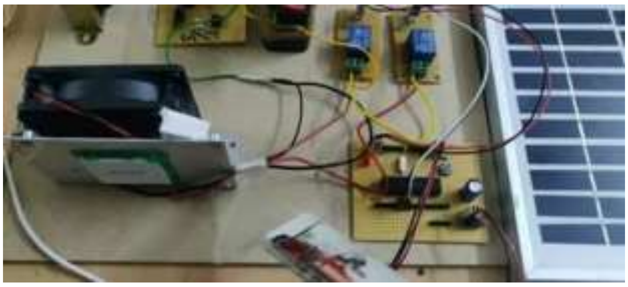


Fig3 -Hardware setup of solar based e-uniform forSoldiers.

CONCLUSION

The "Solar-based E-Uniform for Soldiers" who Work at Extremely High or Extremely Low Temperature with Tracking project has been successfully tested and put into practise. We can assist soldiers in working even in harsh climatic conditions by implementing this idea in real-time applications. It is a very robustand self-healing solar technology that is perfect for portable applications.
It has been created with integrating features for all the hardware parts used. Every module's presence has been thoughtfully considered and arranged, which helps the unit function as best it can. Second, using cutting-edge ICs, the project has been successfully carried out with the aid of developing technology. Asa result, the project's design and testing were successful.
The major goal of our "Solar based E-Uniform for soldiers" project is to use solar energy to charge a battery. The natural powersupply can be used to power and run this system.

FUTURE SCOPE

This project may be expanded in a way that boosts the solar plate's output. The solar plate's size can be increased to achieve this. By including high-quality cooling fans, we may expand the project and spread the cool air throughout the refrigerator's interior. GSM modem can be added, allowing for global SMS temperature control and monitoring of the internal DS18B20 temperature.

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