

E-UNIFORM FOR SOLDIER'S WHO WORK AT EXTREME TEMPERATURE REGIONS

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Abstract:- Soldiers are the Army's most important resource. Soldiers play a vital role to protect one's country. The term soldiers include service men and women from the Army, Air Force, Navy and Marine. While providing security to the nation, they may face troubles in hot/cold weather conditions. Both very hot and cold temperatures could be dangerous to health. In this project we are going to design an E-Uniform which gives better protection to the soldiers who are working in extreme weather conditions. This paper is gives two modes summer mode and winter mode .By selecting the mode of operation the relays drive body heater/cooler. The heater / cooler in turn will help us to provide chilling or warming effect inside the uniform which helps the soldier to bear to any kind of external environment and he can work efficiently without heat stress or cold stress

Keywords: PIC microcontroller, GPS, GSM, Temperature sensors, LCD

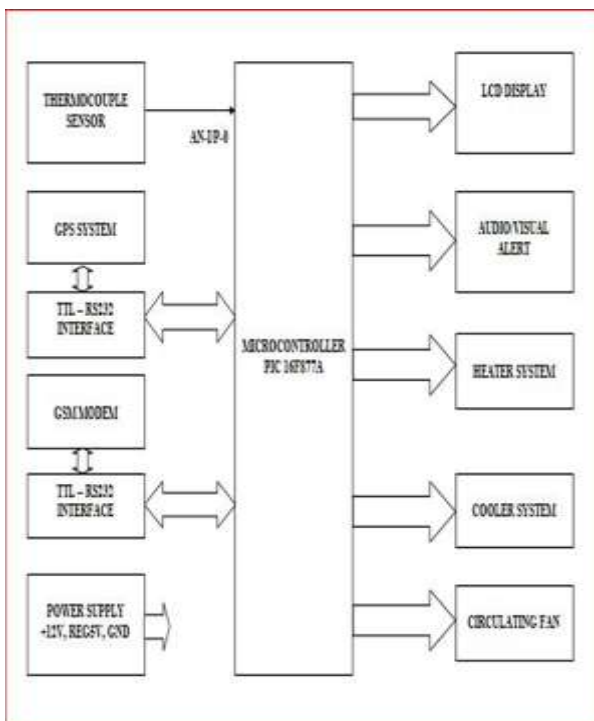
.I. Introduction

Soldiers are the Army's most important resource. Soldiers play a vital role to protect one's country. The term soldiers include service men and women from the Army, Air Force, Navy and Marine. While providing security to the nation, they may face troubles in hot/cold weather conditions. Both very hot and cold temperatures could be dangerous to health .This project is a remedy for this situation.

In this project an E-Uniform is designed which gives better protection to the soldiers who are working in extreme weather conditions. Temperature sensor is used for check the temperature at any time. The LM35 is a precision circuit temperature sensor, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. Sensor gives the analog voltage which is converted into digital by using ADC in the PIC microcontroller (PIC16F877A). These digital values are checked with the heat & cold threshold level of temperature. If the temperature is more than the heat threshold, cooler & fan will be activated, timer starts & status of the system is shown on LCD display. If the temperature is less than the cold threshold, heater & fan will be activated, timer starts & status of the system is shown on LCD display. If the timer exceeds a specified time limit Microcontroller identified that the current system is in failed mode. So it sends a message to control station as the soldier is in critical condition with his position co-ordinates that obtained from GPS system. Notifications will be shown in the LCD display.

As above the basic platform is PIC16F877A microcontroller IC which is programmed in Micro C. In the circuitry of this project, a power supply system, buzzer for beep sound, LEDs for indicating various conditions, optional keyboard for changing the message receiving number and a router for selecting GPS and GSM service according to the requirements

II. Block Diagram



III. Block Diagram Description

PIC Micro Controller

PIC16F877A is high performance RISC (Reduced Instruction Set Computing). Watch dog timer is present inside this IC. Watch dog timer will automatically reset the PIC IC from infinite loop condition. 5 ports are present in PIC. They are, Port A, Port B, Port C, Port D, Port E. Here port A have 6 pins. Port B, Port C and Port D have 8 pins each. Port E have 3 pins. Port A and port E having analogue capability

It consists of three timers. Timer 0, Timer 1, Timer 2. Timer 0 is 8 bit timer/counter. It is both readable and writable. Timer 1 is 16 bit timer/counter. It consists of two 8 bit registers. Timer 2 is an 8 bit timer. Another feature of PIC16F877A is ADC and USART. ADC

is an analog to digital convertor module. USART is Universal Synchronous Asynchronous Receiver and Transmitter. Here USART is used for transmit and receive the data to and from the serial port. Port C6 and Port C7 are used as a transmitter and receiver port. USART consists of two registers. They are TXSTA (Transmit status and control register) and RCSTA (Receive status and control register). We enable the TXEN (Transmit enable bit) and BRGH (baud rate high bit) in the TXSTA register. We enable SPEN (serial port enable bit) and CREN (continuous receive enable bit) in the RCSTA register

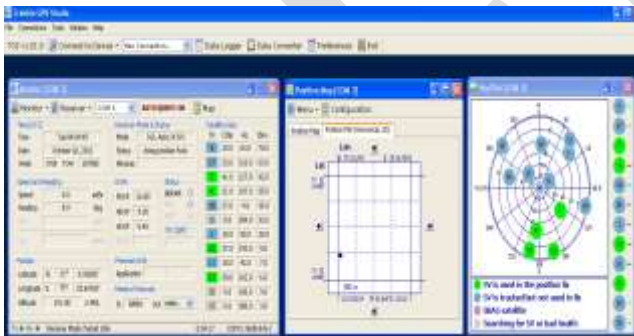
GPS (Global Positioning System)

Conventional methods of surveying and navigation require tedious field and astronomical observations for deriving positional and directional information. Rapid advancement in higher frequency signal transmission and precise clock signals along with advanced satellite technology have led to the development of Global Positioning System (GPS). The outcome of a typical GPS survey includes geocentric position accurate to 10 m and relative positions between receiver locations to centimetre level or better[3]. GPS has been under development in the USA since 1973. The US department of Defence as a worldwide navigation and positioning resource for military as well as civilian use for 24 hours and all weather conditions primarily developed it. The Global Positioning System (GPS) is the only fully functional

Global Navigation Satellite System (GNSS). Utilizing a constellation of at least 24 Medium Earth Orbit satellites that transmit precise microwave signals, the system enables a GPS receiver to determine its location, speed, direction, and time.



It have 65 channels with ultra high sensitive It 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



GSM (Global System for Mobile Communication)

GSM (Global System for Mobile Communications, originally Groupe 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. 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

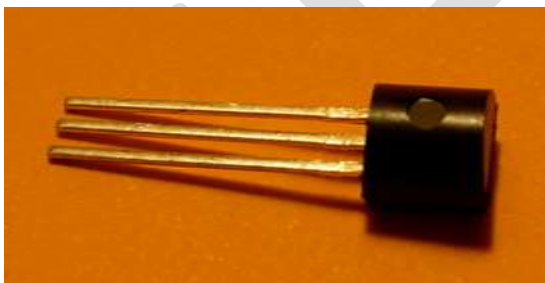
generation (3G) UMTS standards followed by fourth generation (4G) LTE Advanced standards. "GSM" is a trademark owned by the GSM Association.



GSM is a [cellular network](#), which means that [cell phones](#) connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network [macro](#) [micro](#), [pico](#), [femto](#) and [umbrella cells](#)[2]. The coverage area of each cell varies according to the implementation environment.

Temperature Sensor

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of $\pm 1/4^\circ\text{C}$ at room temperature and $\pm 3/4^\circ\text{C}$ over a full -55 to $+150^\circ\text{C}$ temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to read out or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies [4]. As it draws only $60\ \mu\text{A}$ from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a -55° to $+150^\circ\text{C}$ temperature range, while the LM35C is rated for a -40° to $+110^\circ\text{C}$ range (-10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-22 package.



LCD (Liquid Crystal Display)

A liquid crystal display (LCD) is a [flat panel display](#), [electronic visual display](#), or [video display](#) that uses the light modulating properties of [liquid crystals](#). Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and [7-segment](#) displays as in a [digital clock](#)[5]. They use the same basic technology, except that arbitrary images are made up of a large number of small [pixels](#), while other displays have larger elements.

LCDs are used in a wide range of applications including [computer monitors](#), [televisions](#), [instrument panels](#), [aircraft cockpit displays](#), and signage. They are common in consumer devices such as video players, gaming devices, [clocks](#), [watches](#), [calculators](#), and [telephones](#), and have replaced [cathode ray tube](#) (CRT) displays in most applications. They are available in a wider range of screen sizes than CRT and [plasma displays](#), and since they do not use phosphors, they do not suffer image burn-in. LCDs are, however, susceptible to [image persistence](#).

The LCD is more energy efficient and can be disposed of more safely than a CRT. Its low electrical power consumption enables it to be used in battery-powered electronic equipment



It is an electronically modulated optical device made up of any number of segments filled with liquid crystals and arrayed in front of a light source (backlight) or reflector to produce images in colour or monochrome. Liquid crystals were first developed in 1888. By 2008, worldwide sales of televisions with LCD screens exceeded annual sales of CRT units; the CRT became obsolete for most purposes

IV. Circuit Description

GPS and GSM integration with the temperature regulation is a modern approach to provide more security to a soldier who works at extreme weather conditions. Here temperature sensor is used for measuring the temperature at any time. According to the value obtained from the sensor, one of the mode is activated ie, cooler or heater. GPS is used to find the position of the soldier at critical condition and GSM is for sending the message to the army office.

A 16 keys 4x4 matrix keypad is used to store the mobile numbers in the EEPROM of the PIC16F877A microcontroller. In this the mobile numbers stored according to the requirements.

If temperature more or less than the normal value it will cause health problems. So we are setting a threshold value for the temperature. Every time the sensor checks the temperature, if this value is greater than the threshold value, heater system will get activated. Also if this value is less than the threshold value, cooler system will get activated. A message will send to the army office automatically through the GSM when the system is in failed mode. This message contains vehicle's situation of the soldier and the location of the soldier. Message sending indications will be displayed on the LCD.

The GPS and GSM are connected to the PIC microcontroller through RS232 interface with the help of a router IC. The main function of router IC is to select GPS and GSM according to the need of communication. Router IC connects GPS in the time of coordinate reception and GSM at the time of message sending.

Buzzer will become active at the time of message sending. LEDs are for various indications.

Power supply circuit is for converting supply from 12volt to our desired 5volt

V. Application & Future Scope

Nowadays in the varying climatic conditions E-uniform make drastic changes in the day to day life. It is very helpful mainly in the fields of military applications.

This uniform can also be used in various other applications. It can be successfully implemented in areas like construction fields especially in Gulf countries, used for scientists who are working in extreme weather conditions like in Antarctica and also used in mining fields .It helps to get more working time and productivity.

For the future expansion, this uniform can easily powered by a small portable solar panel and make it more eco friendly. The use of solar panel gives continuous output of power without less maintenance.

In future this uniform may be used by civilians who are living in extreme weather conditions.This project can be extent by using an android device. The android GPS in phones enables apps to get location and navigate. With the right apps, it can replace a

handheld outdoor GPS. Android apps can get allocation with the help of cell towers and also without cell towers. An android phone has a real GPS chip in it which can get the location from GPS satellite. We can use an android GPS app that use of line maps, they allows us to download offline topo maps in advance and store them on our storage card.

VI. Conclusion

Soldiers are one of the important factors in a country. Because they are the forces who protect our country day and night living behind sleep and rest. Therefore it is our responsibility to protect them. Same is the significance of this project. So here design an E-Uniform which gives better protection to the soldiers who are working in extreme weather conditions.

This project is operated in two modes summer mode and winter mode. If the weather condition is too hot then the cooling system will operated and if it is too cool then the heating system will operated. If this system may fail GPS will find out the position of soldiers and send messages via GSM to the control station.

This project has a significant role in our day to day life .Also it can be used in various streams of industrial applications

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