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Solar Protective E-Jacket

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Abstract-— **The climatic condition is changing with era to era and are very unusual and unpredictable. Due to metabolic heat generation of our body, we are very uncomfortable in extreme conditions, especially when we have to work in difficult conditions which may led to unfortunate deaths. Some technological solution made to keep people thermally comfortable such as air conditioning unit, are most successful in helping people in their home & in cars etc. but not in mobility situation. If one wants to move in such type of climatic condition, climate adaptable jacket is a very beneficial product. This technology uses Atmega microcontroller which can naturally keep up the specific temperature inside the jacket using temperature sensor, so as to cope-up with normal body temperature i.e. (37C or 98F); it initiates the fan that is placed inside the jacket. The design of this jacket gives better protection to soldier, navy and people who are working in extreme conditions. This jacket allows the user to control and monitor the internal temperature of the jacket from high to low temperature and vice-versa, with the use of the Thermoelectric Plates and display its result. The additional features are user's health and positioning monitoring using IoT Module and Wi-Fi Module.**

Keywords - Microcontroller, Wi-Fi Module, IoT Module, Temperature Sensor, Thermoelectric Plates

I. INTRODUCTION

In market, there are number of equipment's used for temperature monitoring and control, and cost is very high. The reasons behind this are that, a number of mechanical parts and gripping devices are been used. This Jacket consists of Thermoelectric Peltier Plates to provide cooling and heating effect. This jacket can be used in any of worst conditions. This jacket can be used to adjust the internal temperature to that of normal body temperature. This Jacket is designed in such a way that the person using this Jacket can be beneficiary to adjust in extreme cold and hot condition. The different climatic conditions such as extreme cold and extreme hot temperatures could be dangerous for human survival. Heart stress can be caused, due to excessive exposure to heat or cold. Also, hypothermia or dangerous overcooling of the body can be caused by very cold temperature. Important resources of Army are soldiers. Soldiers play a very important role to protect one's country. While providing security for the country, they may face troubles in extreme hot/cold weather conditions, in such a situation this Jacket can be useful. Not only soldiers, but any person working or living in any of extreme weather conditions can use this Jacket.

II. PROBLEM STATEMENT

A. *Objectives*

Main aim of this project is to design automatically adjustable experimental setup for jacket temperature.

The specific objectives are:

- Implementation of remotely controlled Data. acquisition experimental setup for temperature measurement.
- To measure the outside and inside temperature.
- To design and develop climate adjustable jacket.
- To atomized a measuring experimental set-up.

B. *Relevance*

The climatic conditions are changing from era to era. Nowadays, climatic conditions are unpredictable. Throughout the history of human beings, temperature related inconveniences such as heat stroke, heat rash, frostbite, dehydration, hypothermia, etc. are the major problems and one cannot escape from these problems. Some of harsh weather conditions have led to unfortunate deaths of people. Some technological solutions are made to keep people thermally comfortable such as air conditioning units, which are most successful in helping people in their homes & in cars etc. but not in personal mobility situations.

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III. LITERTURE SURVEY

The project solar projective jacket is based on the research of number of project ideas clubbed together, which includes; 1." WEATHER CLOTHING AND THERMAL ADAPTION TO INDOOR CLIMATE". 2." SAM -SMART ADAPTABLE MANAGEMENT JACKET". 3." ADAPTABLE JACKET BASED ON CLIMATE CONDITION USING ARM MICROCONTROLLER".4."
SMART ARMY JACKET". The adaptive thermal comfort model links to indoor comfort temperature to prevail weather outdoor, helping them in shifting to higher side in warm weather and lower in cool weather. Adaptive engineering standard's hold the potential to conserve energy, but to work effectively it is necessary that all occupants are freely adaptive, mainly with variable indoor climate regime prevailing inside that building, with primary side through survey of clothing adjustment. A general survey of clothing insulation value of garment worn in shopping mall showed significant variation with standard variation about 34%.
Which means
(1clo = 0.155msq kw^-1) value. The change of clothing depends on climate condition outside.
Due to daily change in temperature, people are uncomfortable. Major health issues are caused due to changing environmental conditions. For example; heat stroke, heat rash, frost bite, lack of hydration, hypothermia. This project unable us to detect both body temperature and surrounding temperature. And helps us to control the temperature manually or automatically as per requirement. This jacket acts as a guard, helping people to work comfortable irrespective of weather conditions.
If a person needs to move to off chance climatic condition, atmospheric versatile jacket is a gainful technology. This jacket permits user to control and screen the inward temperature of the jacket, with the utilization of thermoelectric impact and shows the outcome in GPS and GSM module and sensors. This jacket aims providing reliable health monitoring and position tracking of the user.

IV. PROPOSED METHOD

The proposed system is adaptable jacket based on climate conditions using microcontroller, by which the people/user can easily control the temperature of the jacket. The user controls the Peltier plate temperature by the condition of the relay. The jacket is very flexible to wear, convenient, and light in weight. The user uses this climate adaptable jacket as per his need and also there is a facility to switch on TEC and observe the temperature status in the LCD, which is placed in this jacket.

Fig a) Block Diagram of Proposed System

Thermoelectric coolers (Thermoelectric Peltier Plates) (TECs) are also called as Peltier plates or Peltier
coolers. Peltier plate converts heat (temperature) into voltage and voltage into heat (temperature). When the voltage is applied to the Peltier plates through the rechargeable battery then current will flows through the Peltier plates. The power supply unit regulates the battery voltage into 5v as it is required by the Peltier plate, so Peltier plate can adjust the temperature as to hot or cold depending on the current flow direction.
A temperature sensor (LM35) is used to sense the body temperature. The LM35 is a temperature sensor that can be used to measure the temperature and produces an output voltage proportional to temperature and is applied to a programmed microcontroller which compares the voltage with a threshold voltage and if the input is greater than threshold voltage the cooling system is activated and else heating system will be activated. The mode of operation of the Peltier plate is selected by the microcontroller based on the body temperature. It provides a facility which provides a message to the user when the temperature level is higher or lower than prescribed limits; it is done with the help of GSM and GPS modules (SIM808 MODULE) and information is displayed on the LCD display. Three different threshold temperature limits are used as follows

1. Lower limit
2. Safe limit
3. Higher limit

According to the temperature measured, the system switches between heating and cooling system as per the requirement of the user. It also checks the health status that is heartbeat of user with the help of heartbeat sensor

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and also track the current position of the user through GPS tracking.

A. Hardwade platform

Serial Number	Components	Specifications
1	Atmega 328P	8bit AVRO Operating Vts: 5V Max. feq: 20MHz
2	Rechargeable Battery	Lithium-ion Battery: 12V/1.3Ah
3	Solar Panel	Nominal Power: Pmax(W)20
4	Peltier Plate	Heating rate: 20c/min Temp. range: -40 t0 200C
5	LM35 Temp. sensor	0.5 accuracy grantable (at +25C) Range: (-55 to 150C) Operating vtg: 4 to 30V

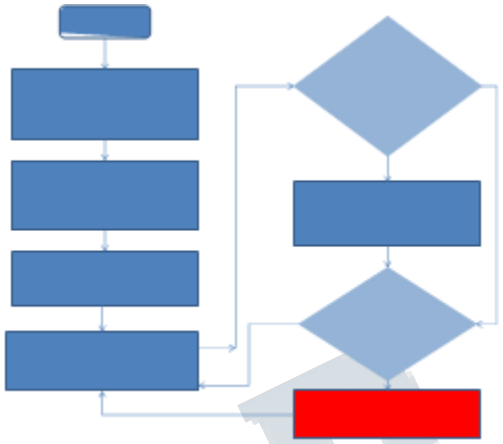
B. Software Platform

- Keil4
- ISIS Proteus Design Suite

C. Estimation cost

Serial Number	**Components**	**No. of units**	**Cost**
1.	SIM 808 Module	1	Rs. 2199
2.	Atmega 328P	1	Rs. 116
3.	Temperature sensor (LM 35)	2	Rs. 200
4.	Heartbeat Sensor (SEN11574)	1	Rs. 710
5.	LCD 16*2	1	Rs. 120
6.	Thermoelectric Peltier plates	4	Rs. 1600
7.	Rechargeable Battery (12V)	1	Rs. 1299
8.	Total		Rs. 6244

D. Flow Chart



Figb) Flow Chart of Overall System

The microcontroller coding is programmed in the following manner.

- The code starts with the initialization of the interrupt vector table (in order to handling interrupts properly), the configuration of the ports, and initialization of the stack pointer, interrupt controls, and LCD module.
- The main loop of the code checks the input pin of the LM35 sensor for temperature information in the form of binary.
- The temperature information in the form of binary is converted to decimal.
- If the Celsius scale is first selected, the main loop of the code calls the conversion interrupt routine where the data from the sensor is converted into decimal and then return back to the loop.
- The stored temperature sends to the LCD module to display. This continues to take place until an interrupt occurs.
- The main loop checks if there is hot or cold condition to make relay contact. Hence, relay is used to control the temperature for the jacket.
- If the temperature is increased TECs activated. Once it is done, the routine pops the registers from stack and returns to the main loop.
- At the same time both GSM & GPS modules are activated and the information is displayed in the LCD display and alert is conveyed to a remote electronic device.

V. FUTURE SCOPE

It be used by person working or living in any of extreme condition. Used as monitoring device for army deployed

in high and low altitude region. The main goal is to give descriptive analysis of how the trends could potentially affect the upcoming future of solar charged jackets market. We can also include raindrop sensors, humidity sensors for efficient working of jacket. In future this jacket can also be utilized as a shield by making it bullet proof. Component stability and accuracy can also be improved using Nano technology. Also, including gas sensor can help to detect harmful and dangerous gasses for human beings.

VI. CONCLUSION

The project "Solar Protective Jacket" is successfully tested and implemented. This system is smaller, lighter and with low power consumption, so it is more convenient. This can help soldiers to work even in extreme climatic applications, like troops deployed in high altitude region like Siachen or high temperature region like Barmer; this project is beneficial for people in such climatic conditions.

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