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Design and Fabrication of E-Military Smart Jacket using Peltier Module

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Abstract - *Winters are becoming increasingly colder across India, especially in the north and west, as climatic conditions are changing quickly. Given that we created a smart Army jacket employing control media devices like GPS, the jacket has sensors. The purpose of the smart army jacket is to track a soldier's position and provide trustworthy health monitoring. Certain climatic factors contributed to the unfortunate deaths of soldiers. Using temperature sensors, this jacket can detect the temperature both inside and outside on its own. We use coils to heat things, and the coil's temperature will depend on the outside temperature. Models used for communication include GPS. Therefore, sensors have been put in the jacket in order to monitor the soldier's health and heart rate.*

The purpose of this project is to gather and synthesise information about actual smart clothing in the military and space sectors where environmental factors may have a significant impact on health and safety. It also outlines the innovation trend for cutting-edge services for law enforcement and troops. This project's goal is to take into account data input techniques and technologies that are relevant to information input into electronic systems that would work well with smart clothing. An overview of current advancements in the field of flexible switches is given, outlining the methods utilized to create these connections as well as the obstacles and difficulties that come with them.

Keywords:- *Peltier plate, Jacket, Military, GPS.*

1. INTRODUCTION

The most valuable resource in our nation is its army. They are vital to the protection of the nation and the citizens that live there. Soldiers are any member of the Army, Air Force, Navy, or Marines who are prepared to carry out their duty in any weather. The soldiers working in adverse weather conditions will perform better thanks to the specifically designed E Jackets. There are two operating modes for this E- Jacket: summer mode and winter mode. The mode of operation will also depend on the threshold value setting; by operating the SPDT relay, it can force the body to heat or cool.

In turn, the heater/cooler helps to produce a cooling or warming effect within the uniform, which helps the soldiers to scope with any type of external climate and allows them to operate effectively without experiencing heat exhaustion or cold exhaustion. To send and receive information to/from the control unit, the soldier must be integrated with modern healthcare monitoring, real-time GPS (Global Positioning System), and data connections.

Most workers who work in high heat environments pass away from heart disease brought on by the environment's extreme heat. Their safety from the exterior climatic conditions can be protected by wearing heat-protective apparel. The workers' flesh will still burn even though the outside fabric of their heat-protective apparel shows no outward signs of damage. It has been discovered that when workers are exposed to an external environment that is extremely hot for an extended period of time, heat will build up in the space between their garments and their bodies and persist there for some time after the thermal exposure. The skin will burn as the built-up heat is released, either spontaneously or as a result of pressure on the garments.

The suggested system is an NODEMCU- based microcontroller- based adaptable jacket that allows users to simply regulate the jacket's temperature. The Peltier plate temperature automatically changes in response to the relay circuit's state.

II. LITERATURE SURVEY

Thanga Dharsni, Hanifa Zakir, Pradeep Naik, Mallikarjuna, Raghu (2018), presented the proposed system can be mounted on the fighter's body to follow their prosperity status and current region using GPS.The proposed outline work includes little wearable physiological hardware's, sensors, transmission modules.

Niket Patil (2017), presented (IoT) based wellbeing observing and global positioning framework for troopers. The proposed framework contain minuscule wearable physiological gear's, sensors, transmission modules there was no utilization of programming frameworks or cloud handling.

Patrik Kutilek, Petr Volf, Slavka Viteckova, Pavel Smrcka (2017), presented frameworks for estimating of physical and clinical information for the diagnostics of physical and mental state have fundamentally spread Wearable framework yet with greater expense. Very good quality reproduction programming required.

Zeeshan Raza, Kamran Liaquat (2016), represents gadget for warrior utilizing present dayadvances and methods. This gadget would be conveyed by officer in fighting. The gadget

will actually want to detect heart beat and internal heat level of fighter and communicate the perusing on base station where the aggregate information will be shown.

III. PROBLEM STATEMENT

Currently, soldiers who are working in harsh weather conditions in distant areas lack adequate weather protection and real-time tracking systems. Therefore, we have included protection from adverse weather in the proposed system. Temperature-related disorders including heat stroke, heat rash, frostbite, dehydration, hypothermia, etc. have plagued people throughout history, and there is no way to avoid them. Unfortunate deaths of persons have been caused by some of these illnesses. Some technical solutions designed to keep people thermally comfortable, like air conditioning equipment, are most effective when used by people in their homes, cars, and other stationary environments but not while they are moving around on their own.

IV. PROPOSED SYSTEM

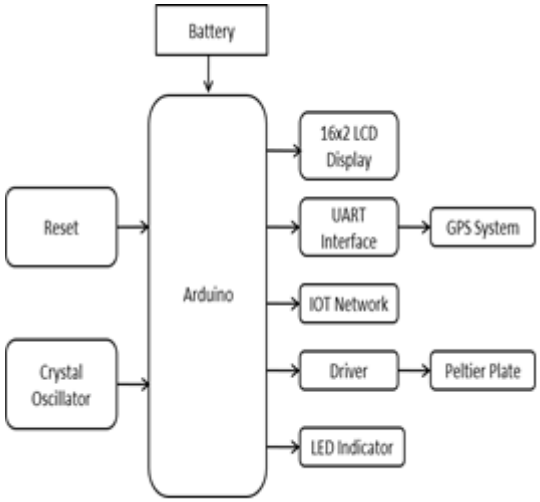
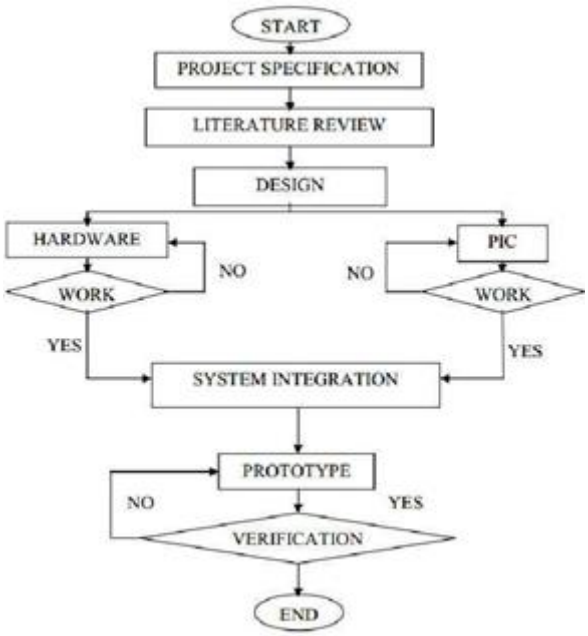


Fig: - System Architecture

Fig:- Experimental Setup

Fundamentally, project methodology is "the collection of methods or rules you apply to your project as well as the principles, theories, and values that underpin your project's final approach." Every project has a unique set of research techniques, data collection techniques, and operating settings. Our project's process includes operating system determination, model determination, and parameter verification because it is based on electronic actuation.



Required Hardware

- GPS
- Battery
- Suit
- Temperature Sensor
- Pulse Sensor
- Peltier Plate

V. RESULT AND DISCUSSION

To conclude with the result of the proposed system , we can say that the E military smart jacket works in three different conditions They are as follows – Normal temperature, high temperature and low temperature Normal temperature ranges from 30 to 32 ℃ with no effect on peltier plate High temperature ranges upto 72

℃ providing cooling effect on peltier plate Low temperature ranges to 32 ℃ providing heating effect on peltier plate A certain amount of readings were taken to check the coolong and heating effect of peltier plate. GPS and GSM modules were used to track the locations of the soldiers. The message

was received in the form of text showing the latitudes and longitudes.

Fig:- Normal Temperature

Fig:- High Temperature

Fig:- Low Temperature

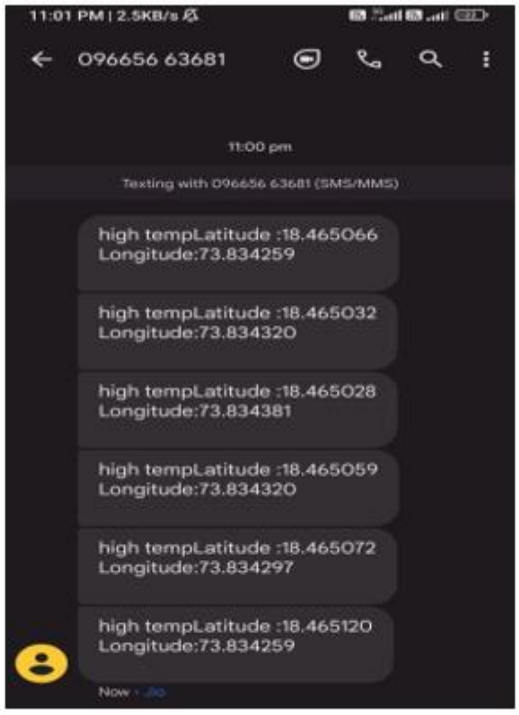


Fig:- Emergency messages with GPS location

VI. CONCLUSION

One of the key components of a nation is its military. Since they are the forces that guard our nation day and night while hiding from sleep and relaxation. Consequently, it is our duty to keep them safe. The importance of this project remains the same. Therefore, create an E-Uniform that provides superior protection for soldiers working in harsh weather. There are two operating modes for this project: summer and winter. The cooling system will run if it is too hot outside, and the heating system will operate if it is too cold. If this system malfunctions, GPS will locate the soldiers and communicate with the control centre via GSM. Our daily lives are significantly impacted by this endeavor. Additionally, it can be utilized in a variety of industrial application fields. The specifically created E- uniforms are extremely helpful for military uses, especially in environments that troops and other civilians would not typically experience.

VII. ACKNOWLEDGEMENT

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REFERENCES

1) Felix Felgner, Lukas Exel, Marco Nesarajah, and Georg Frey, “Component-Oriented Modeling of Thermoelectric Devices for Energy System Design”, IEEE Transactions On Industrial Electronics, Vol. 61, No. 3, pp. 1301-1307,March 2014.

2) Je-Hyeong Bahk, Megan Y oungs, Kazuaki Yazawa, Ali Shakouri, “An online simulator for thermo- electric cooling and power generation”, 978-1-4673-5261- 1/13/$31.00 ©2013 IEEE.

3) Man Prakash Gupta, Min-Hee Sayer, Saibal Mukhopadhyay and Satish Kumar,”Ultra-thin Thermo-electric Device for On Chip Peltier Cooling ”, Vol. 1, NO. 9, pp. 1395-1405, 2011 IEEE.

4) Rasit Ahıska, Hayati Mamur, “A review: Thermo-electric generators in renewable energy”, International Journal of Renewable Energy Research” Hayati Mamur et al., Vol.4, No.1, 2014.

5) Surith Nivas M, Vishnu Vardhan D, Raam kumar, PH, Sai Prasad S , Ramya.K, “Photovoltaic Driven Dual PurposeThermo-electric Refrigerator for Rural India”, International Journal of Advancements in Research & Technology, Vol.2, Issue 6, pp. 111-117, June-2013.

6) Chakib Alaoui, "Peltier Thermo-electric Modules Modeling and Evaluation", International Journal of Engineering (IJE), Vol. 5, Issue 1, pp. 114-121, 2011.

7) Manoj Kumar Rawat, Prasanta Kumar Sen, Himadri Chattopadhyay, Subhasis Neogi, "Developmental and Experimental Study of Solar Powered Thermo-electric Refrigeration System", International Journal of Engineering Research and Applications (IJERA), Vol.3, Issue 4, pp.2543 2547, Jul-Aug 2013.

8) Website of Thermalforce.de, Berlin, Germany. [Online]. Available: http://www.thermalforce.de/de /product/thermogenerat ion.

9) Adarsh K S, Arun Dinesh, Jyothy Elizebeth D: "Solar Based E-Uniform For Soldier's Who Work At Extreme Temperature Regions", International Journal of Engineering Research and General Science Volume 3, Issue 3, MayJune,2015, pp. 993 – 998.