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E-Jacket: Soldier Security System

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Abstract: ***E-Jacket gives better protection to the people living in extreme weather conditions. It controls the temperature inside the jacket with peltier modules by considering the climatic temperature. It tracks the location and sends an alert message with location details when heart rate of the wearer is abnormal. It also has the voice recording device.***
Keywords: Peltier effect, Relays, GPS, Atmega328P, Zigbee.

I. INTRODUCTION

Soldiers are the precious resources of our country. It is very difficult for them to carry the too much weighted cloths around the clock for protecting against cold and even normal cloths are burdensome with extreme hot climate. The existing technology provides cooling only or heat only. But, this E-Jacket provides both heat and cold according to the climatic condition. This E-Jacket is very much useful for soldiers in reducing the weight of cloths. It also continuously monitors the body temperature and heart rate of the wearer and with Zigbee, sends this information to the control room where the Zigbee receiver is located. If the heart rate of the wearer is abnormal it sends the alert message with location of the wearer and also turns ON the voice recording device.

II. BLOCK DIAGRAM

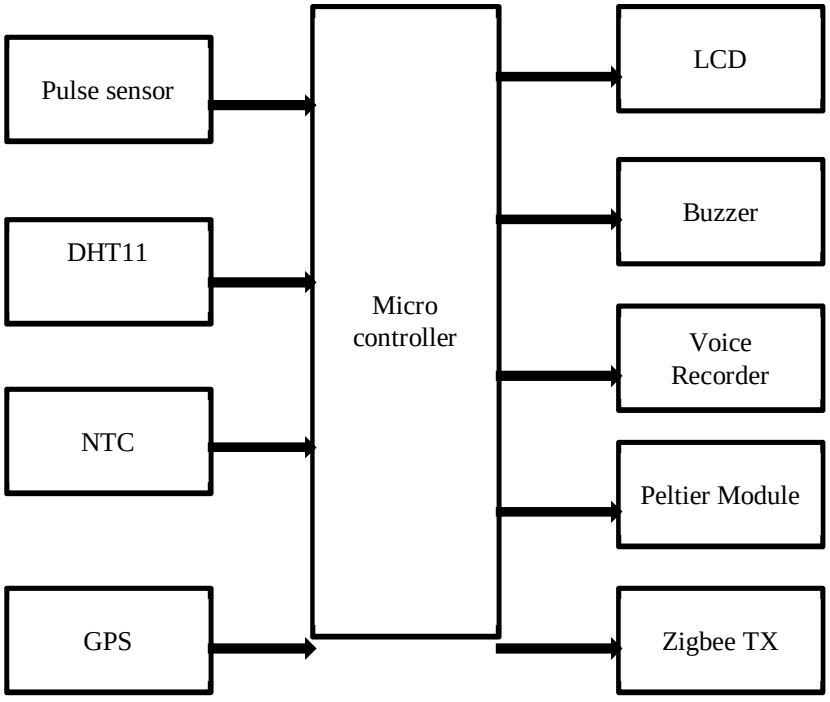


Fig. 1 Block diagram of Transmitter

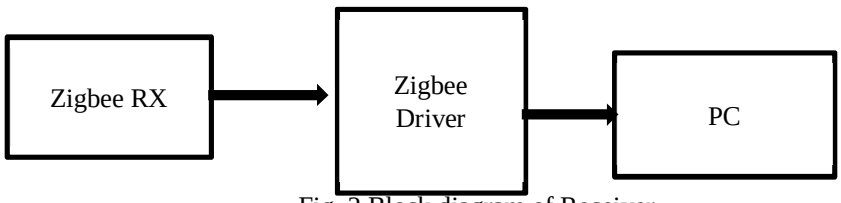


Fig. 2 Block diagram of Receiver

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1) *Pulse Sensor*: pulse sensor is an electronic device that is used to measure the heart rate, i.e. speed of the heartbeat. Heart beat is measured in beats per minute.
2) *DHT11:* It is a low cost digital sensor commonly used for temperature and humidity measurement. This sensor can be easily interfaced with any microcontroller such as arduino etc. to measure humidity and temperature.
3) *NTC:* Negative temperature coefficient thermistor. When temperature increases resistance decreases, on the other hand when temperature decreases resistance increases. This type of sensor used mostly to sense the temperature. An NTC sensor offers many advantages in temperature sensing, including miniature size, excellent long-term stability, high accuracy & precision.
4) *GPS:* GPS is known as Global Positioning System used to trace the location of vehicle. A GPS framework computes its position by accurately timing the signal sent by GPS satellites high over the Earth. GPS Receiver gets the location information from satellites. It consists of internal RTC back up and can be directly connected to USART of the microcontroller. The current date, time, longitude, altitude, speed, and travel direction/ heading among other data are provide by the module and can be used in many applications including navigation, fleet management, tracking system, mapping.
5) *Atmega328p:* Arduino Uno is an open source microcontroller board that is based on the microchip ATMEGA328P. The board is equipped with set of digital to analog input/output pins that may be interfaced to various expansion boards and other circuits.
6) *LCD:* An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates o a display 16 characters per line in **2** such lines.
7) *Buzzer:* A buzzer or beeper is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a pre-set time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.
8) *Peltier Module:* It is used for heating and cooling the temperatures. The peltier effect creates a temperature difference by transferring heat between two electrical junctions. A voltage is applied across joined conductors to create an electric current. When the current flow through the junctions of the two conductors, heat is removed at one junction and cooling at the other junction. The main application of the peltier effecting is cooling. However the peltier effect can also be used for heating or control of temperature. In every case, a DC voltage is required.
9) *Relay:* Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help o with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.
10) *Voice Recorder:* The voice recorder features simple one-key recording and long-time recording. No software to install. Not only does it make audio recordings, but it also works as a regular USB flash drive.
11) *Zigbee:* It is a wireless technology. It is an IEEE 802.15.4 based specification for a suite of high level communication protocol, used to create PANs. It is less expensive than other wireless personal area networks. It consumes low power.

III. WORKING

E-Jacket provides the sense of normal temperature inside the jacket in extreme weather conditions this is done by peltier modules. The various sensors in the E-Jacket reads the data i.e., NTC, pulse sensors reads the body temperature, pulse rate of the soldier respectively and DHT11 reads the climatic temperature around the soldier. These data is continuously displays on the LCD at soldier side and also transmits the same to the control unit where the receiver unit is place. This transmission is done by Zigbee Network. If the climatic temperature around the soldier is extremely hot (>40) the arduino turns ON the Relay1 thus turns ON the peltier module1 to provide cooling inside the jacket. If the climatic temperature around the soldier is extremely cold (<20) the arduino turns ON the Relay2 thus turns ON the peltier module2 to provide heat inside the jacket.

If the heart rate of the soldier is abnormal (>100), E-Jacket sends an alert message with the location of the soldier i.e., it says “Soldier is in danger condition at: (location)”. At this same point the arduino turns ON the Buzzer and Relay3 thus turns ON the voice recording device. The buzzer alerts the nearby people in case Zigbee fails to transmit. This voice recording device may help in further case study if in case any unpleasant things happen.

At the receiver side, the Zigbee receiver receives the signals from the Zigbee transmitter and gives the data to the Zigbee driver which in turn drives the data to the PC and the PC displays the message i.e., heart rate, body temperature of the soldier, climatic temperature and humidity where the soldier is located.

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IV. RESULT

The following are the resulting images of our project.

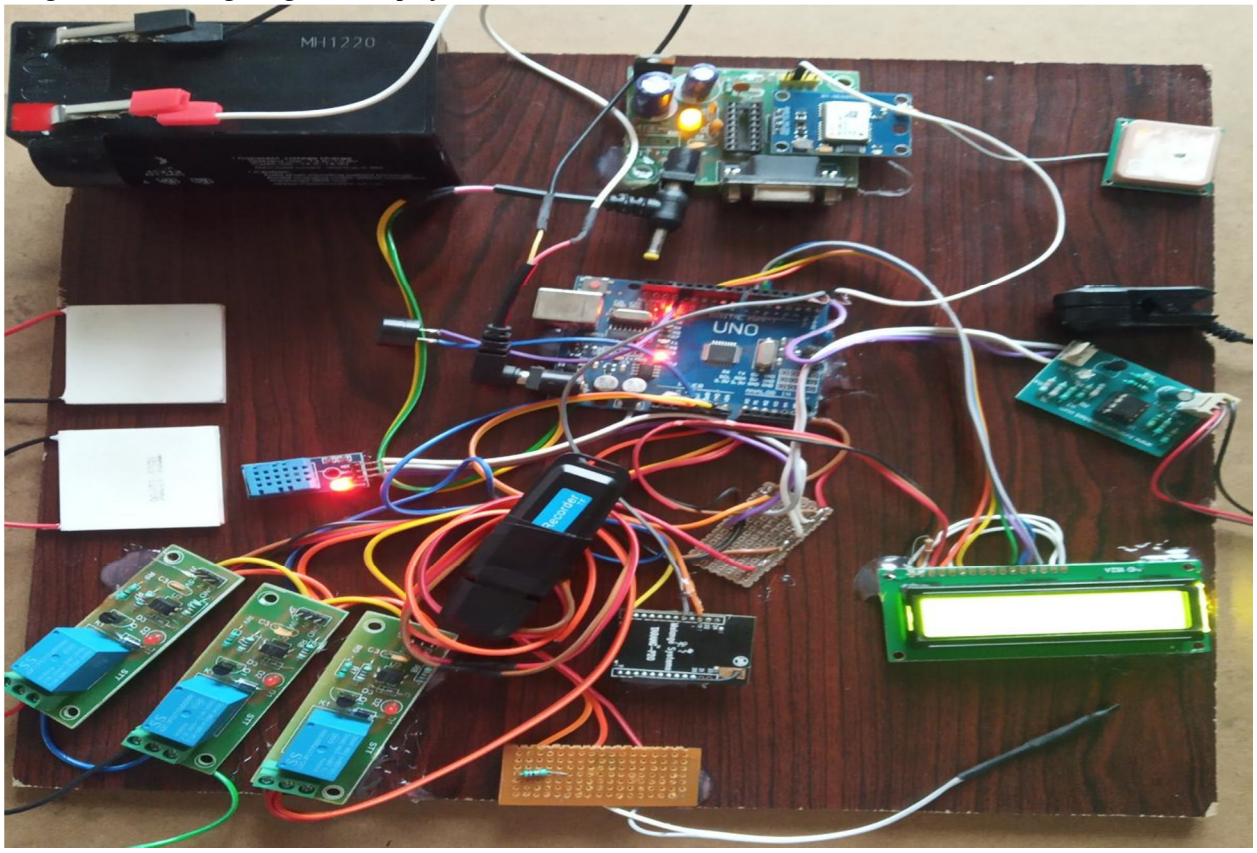


Fig. 3 project Kit

When the power supply is turned ON the display shows the project name as shown below.

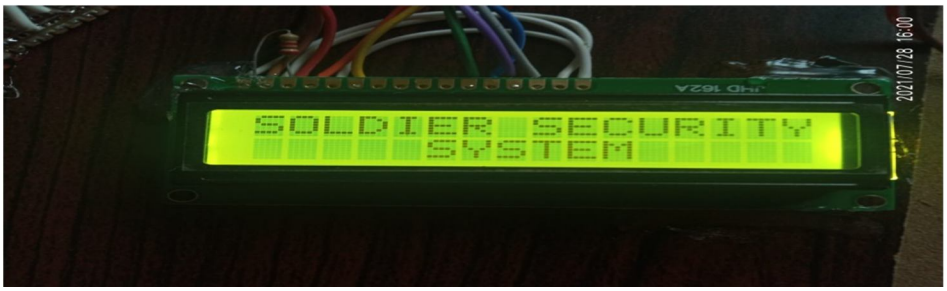


Fig. 4 title of our project

Displaying of climate temperature, humidity, body temperature and heart beat on the LCD at soldier side.



Fig. 5 data displaying on LCD

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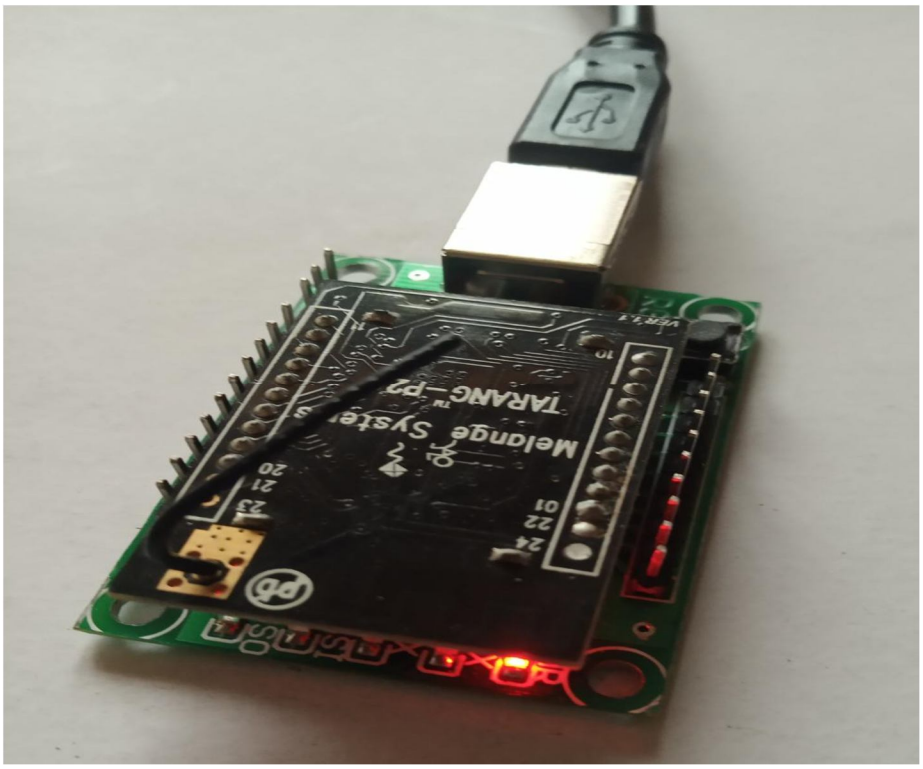


Fig. 6 Zigbee Receiver

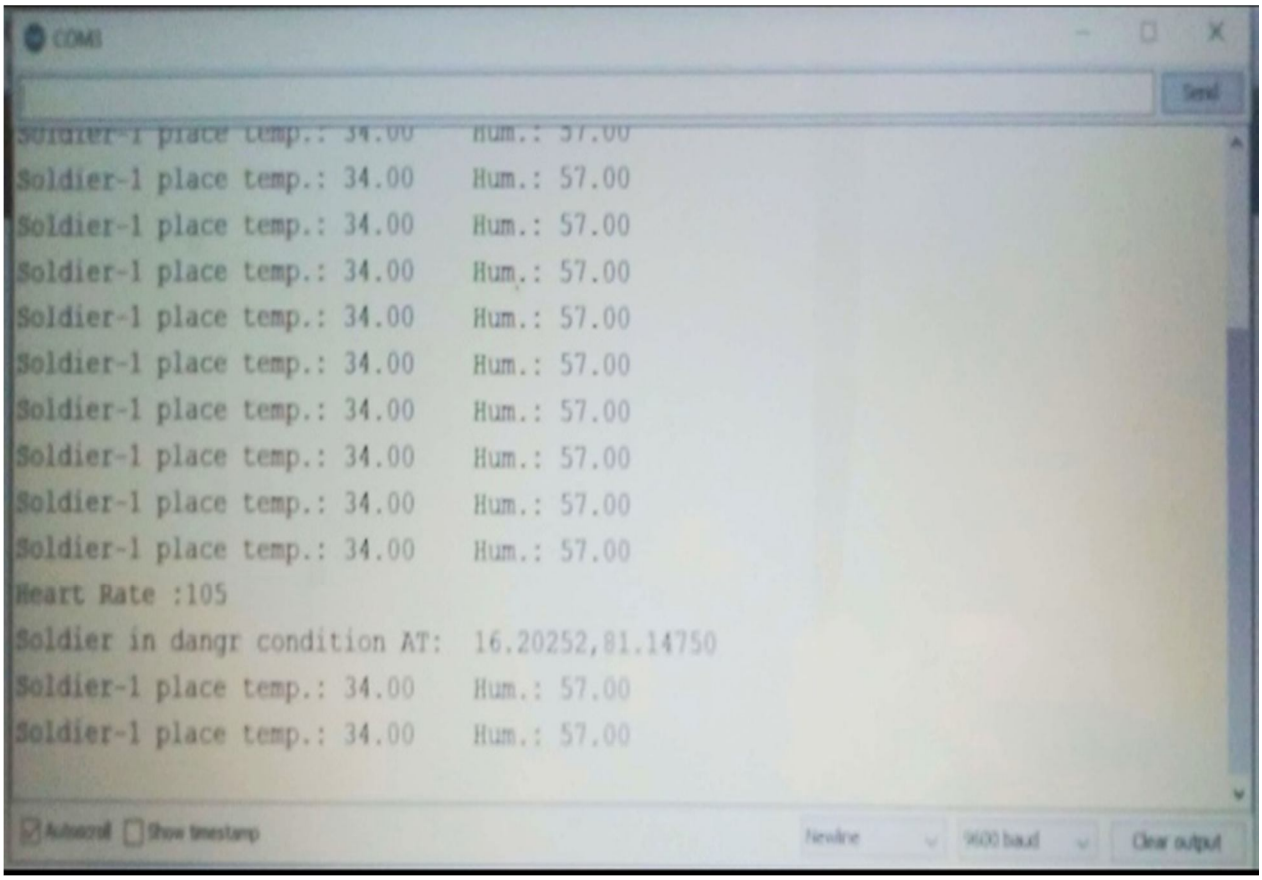


Fig. 7 PC screen at receiver side

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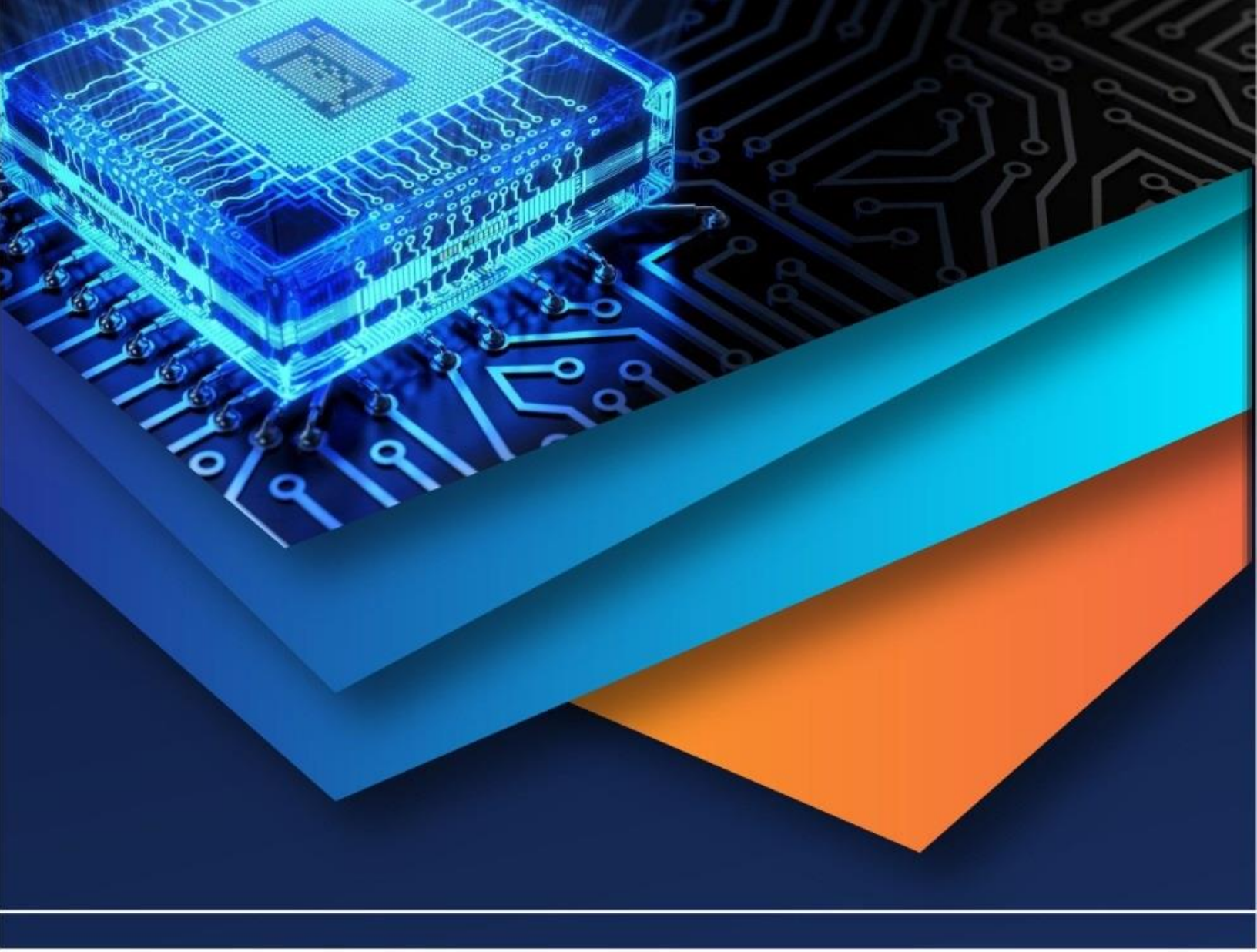
V. CONCLUSIONS

The specially designed E-Jacket is very much helpful to soldiers and to the people who are living in extreme weather conditions. This E-jacket maintains the temperature inside the jacket so that the wearer of this E-jacket can feel comfortable in any weather conditions either extreme hot or cold environment. E-Jacket also has the location tracking feature. This feature is useful to track the location of the soldiers. If the soldier is in danger condition this system alerts the control room by sending a message as “soldier is in danger condition at: (location)”. E-Jacket also has the voice recording device in it which acts as a black box, the data in this recording device is useful for further case study if in case any unpleasant situations occurs at the soldiers side.

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