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Smart jacket based on IoT review

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ABSTRACT

Soldiers are important part of army, hence for their safety purpose IoT based device can be designed called as Smart Safety Jacket. In order to collect and detect various signals for organizations, it is possible to use wearable devices like smart jackets and other accessories. So it can become easy to respond to different situations Smart jackets consists of materials and remote sensors which coordinates with regards to the human body. It can be used to measure and observe different parameters.

Keywords— *Smart jacket, Peltier belt, ESP, DHT11*

1. INTRODUCTION

Soldiers are an important part of the army. The defiance of the country is the primary mission of the soldiers. They do not fear death, they do their tasks, duty in different conditions like in very hot or very cold temperatures. Temperature-related problems are the major problem which is caused by people. If soldiers are working in very hot temperatures then they face problems like heat stroke, muscle cramps, fainting while in very cold temperatures the problems are hypothermia, frostbite. If such problems are ignored it may lead to the unfortunate death of people working in extreme weather conditions We are designing the system which is based on different climate conditions which consist of ESP8266 microcontroller. In order to control the temperature of the entire system, Peltier belts are used. The designed system is wearable termed as "Smart Jacket". The system comprises the different sensors such as Temperature sensor, Humidity sensor, motion sensor, and notification panel. All the sensors are connected to the network through wi-fi which further makes the system more valuable and relevant. Due to this, it is possible to monitor and control real-time data from the military environment from anywhere. Sensor fetched data from the military environment can be processed through controllers and stored for future use. The android app and personal computer can be used to monitor receive information.

2. LITERATURE REVIEW

The physical principles upon which modern coolers are based actually date back or outdated to the early 1800s. In that era or previous days, the commercial modules were not available. In the year 1821, the first important discovery related to thermoelectricity came into existence. A German scientist, Thomas See beck, found that for a closed circuit made up of two dissimilar metals, an electric current would flow continuously through a circuit. But in such a situation the junctions of the metals should be maintained at two different temperatures. See beck falsely assumed or concluded that flowing heat produced the same effect as flowing electric current. In 1834, Jean Peltier, while investigating the "See beck Effect," observed that there was an opposite phenomenon. He observed and found that, when an electric current flowed within the closed circuit, thermal energy could be absorbed in one dissimilar metal junction and discharged at the other junction. Early in the 19th century, the "Peltier effect" was discovered and it is seriously exploited during the second half of the 20th century. Since the development of materials which would yield worthwhile thermoelectric refrigeration depended on knowledge of the physics of semiconductors. Peltier effect also depended on a deeper understanding of heat conduction by the lattice and new metallurgical techniques.

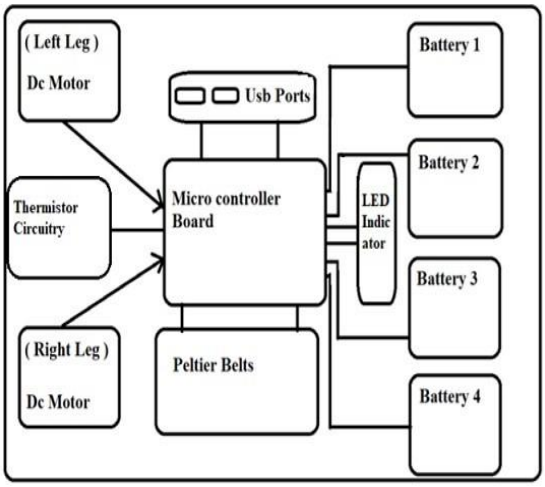

Fig. 1: System Block Diagram

3. COMPONENTS USED

Main components of the system are:

3.1 ESP8266 Wi-Fi module

The ESP8266 is little chip microcontroller. It is available at extremely low prices or we can say it is cheaper. It has integrated TCP/IP protocol stack. We can connect any microcontroller to wi-fi using the ESP8266 module. The ESP8266 has the capability to host an application. It can also offload all other wi-fi networking functions from another application processor. Along with the Arduino device, it can simply be used. It can get about as much Wi-Fi-ability as Wi-Fi Shield offers. The set of AT commands for communication with the ESP8266 wi-fi module is needed to be used by the microcontroller. By using UART having specified Baud rate, Microcontroller communicates with the ESP8266 wi-fi module.

Fig. 2. ESP8266 Wi-Fi Module

3.2 Peltier Belt

Thermoelectric coolers called Peltiers TEC1-12706 with 12V 92W power create a temperature differential on each side of the electrode. Due to Peltier one side of the plate gets hot and the other side gets cool. Therefore, the Peltier plate can be used to make warm up or cool down the sides of the plates or the device, depending on which side you want to make hot or cool.

Fig. 3: Peltier belt

For generating electricity the temperature difference between two electrodes is used. With the help of thermoelectric coolers or Peltier plate, soldiers can maintain temperature. A thermoelectric cooling module is a semiconductor-based electronic component and it functions as a small heat pump. If we apply DC voltage to TEC, the heat will be transferred from one side to the other side and it makes one side hot and another side cool. In industrial areas, for example, computer CPU, portable refrigerators, medical instruments, and so on Peltier plates are used on large scale. It works as a generator when it is exposed to different temperatures on both sides and generates electricity depending on the difference of the temperature. When the device is turned to the hot side, the device gets heat up quickly and the cold side becomes cool quickly too.

3.3 DHT11 Temperature Sensor

The DHT11 is the digital temperature sensor which is cheap or available at low cost. It uses the capacitive humidity sensor and thermostat for measuring temperatures and the surrounding air. No analog input pins are needed to measure temperature with DHT11. We can calculate relative humidity by measuring the electrical resistance between any two electrodes. DHT11 is used to measure temperature and humidity.

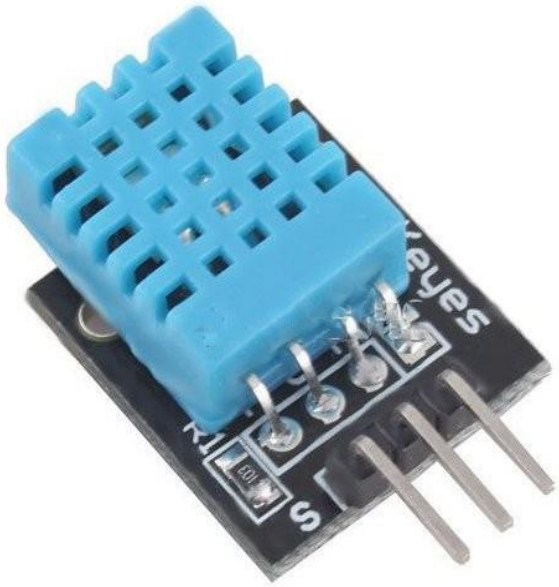

Fig. 4. DHT11 Sensor

3.4 Li-ion battery

The lithium-ion battery is a type of rechargeable battery. In this battery lithium ion move from negative to the positive electrode during discharging and reverse back when charging time of Lithium-ion batteries. Non-rechargeable lithium battery uses an intercalated lithium compound one electrode material, charging and discharging: When a battery is discharging at that time current carry current within a negative electrode to the positive electrode, via separator diaphragm. To prevent the battery from overheat and potentially burn the control system take care of overcharging.

The battery can't the charge and discharge at the same time. The battery absorbs power when it is charging at that time chemical reaction goes in the opposite direction while the battery gives out power when the battery is discharging. The positive electrode, a negative electrode and chemical (electrolyte) are the three components which are present in each cell of the lithium-ion battery. Lithium cobalt oxide(LiCoO2) is used to make a positive electrode while carbon(Graphite) is used to make a negative electrode. New Lithium-Ion Battery System for Low- Temperature Charging: RELiON has developed a new series of lithium iron phosphate batteries to overcome the drawback or problem of charging and to make lithium-ion batteries safer and more practical for low-temperature use. Such batteries can be charged at temperatures down to -20°C (-4°F). The system features proprietary technology which draws power from the charger itself, requiring no additional components. The process of the charging and heating of the battery is seamless for the user. The user only needs to plug the battery into the lithium-ion charger and then the internal system may take care of the rest process. LIBs are lighter than other kinds of rechargeable batteries. They are used heavily in portable electronics. LIB can commonly use in iPods, cell phones and laptops. The time required to heat the cells is more, the charging process in below freezing temperatures will

take a little longer. For a smaller temperature range, heating to a safe charging temperature happens proportionately faster.

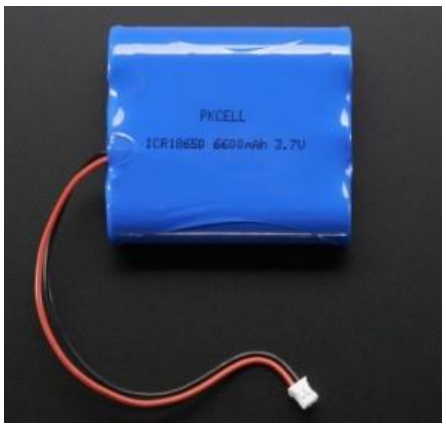

Fig. 5: Li-ion Battery

4. CONCLUSIONS

This system is smaller, lighter with low power consumption, so it is more convenient. We can wear this jacket in both seasons like summer and winter. We use a lithium-ion battery instead of a normal battery because the lithium-ion battery has a higher charging and discharging rate. This can help soldiers to work even in extreme climatic conditions. This jacket is very simple, cost effective and high efficiency for the applications in IoT.

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