AUTOMATIC TEMPERATURE CONTROLLED SUIT USING SMART FABRIC

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Abstract: In this paper, Smart fabrication is the destiny of next decade, the project is a design of smart fabrics.The smart fabric is used in many field of applications like defence, sports, fashion, medical and etc., The design applied to the defence area is to reduce the overall weightage of suit, also to detect and maintain the overall body temperature of the soldier.

Keywords- Smart Garments, Nano Technology, Smart Fabrics, Conductive Fabric, Intelligent Fabric, Thermal Suit, Advanced Military Suit

I. INTRODUCTION

Smart fabrics (figure 1) are defined as fabrics that can sense and react to environmental conditions or stimuli, from mechanical, thermal, magnetic, chemical, electrical, or other sources.

Around the world military forces are exploring how smart clothing can be used to increase the safety and effectiveness of military forces. In extreme environmental conditions and hazardous situations there is a need for real time information technology to increase the protection and survivability of the people working in those conditions.

Improvement in performance and additional capabilities would be of immense assistance within professions such as the defence forces and emergency services

2.EXISTING SYSTEM

In the existing, army uniform is maintain for all weather condition. Thermal suit is provided for soldier working in extreme weather condition which does not adjust their body temperature.

This disadvantage is completely eliminated in Smart Fabrics.

3.PROPOSED SYSTEM

The proposed smart fabric has the fabrication mechanism that built a single suit which is adaptive to the all the weather condition instead using 3 suits.

Smart fabric can reduce the weight of the suit upto1Kg.Conductive fabric can be woven, knit, sewn, cut or braided. This is a great benefit for manufacturers who can use conductive fabrics for their flexibility, low weight, and versatility.

Using this conductive fabric material the efficiency of the suit increases and durability

4. BLOCK DIAGRAM

The following Block diagram 1 is used to know the working of smart fabric suit. The temperature sensor will be sense the temperature of the surrounding environment.
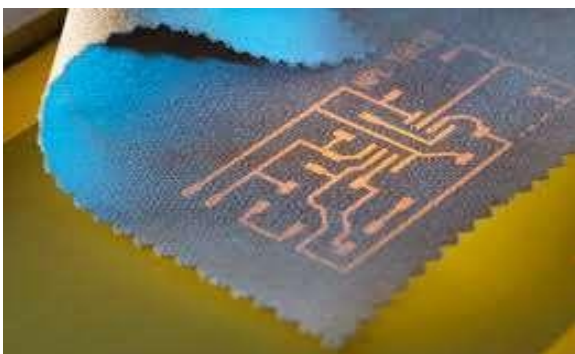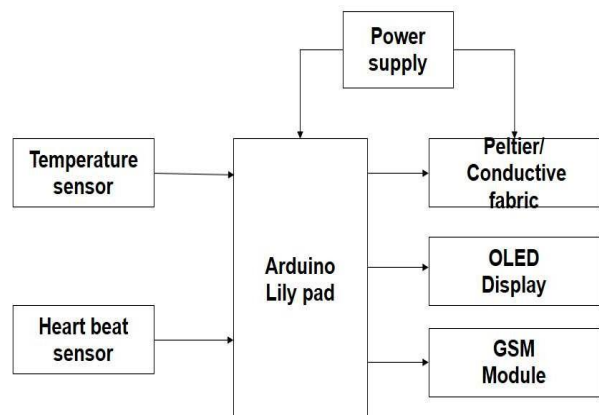

Figure 1.Smart Fabric

Block Diagram

The heart beat sensor will be monitoring the heart beat rate continually. If any abnormal action is, happen it will easily find and sent the emergency alert to hub station.

The digital input gets stored in the arduino nano, The input is recognized and the OS language is scripted by the Arduino Lilypad, which instantly sends alert messages to the concerned person with the help of in-built GSM module, The GPS device is capable of sending location of the soldier.

5.HARDWARE DESCRIPTION

A. Arduino lilypad

LilyPad, Arduino family of boards is especially designed for wearable applications. We have discussed many type of Arduino development boards and all those boards have one thing in common besides of input and output pins is their operating voltage from which we can turn on the board. That operating voltage was from any external device and we also need to regulate that supply so that our board doesn't get damage. But LilyPad Arduino works on batteries that are rechargeable providing us an easy connection with actuators and sensors for easy integration in fabrics and clothes.

B. Temperature Sensor

The temperature sensor measures the body temperature and environment temperature.

The MCP9701 can accurately measure temperature from -10°C to +125°C. The output of the MCP9701 is calibrated to a slope of 19.53 mV/°C and has a DC offset of 400 mV. The offset allows reading negative temperatures without the need for a negative supply.

C. Conductive Fabric

A conductive textile is, a fabric which can conduct electricity. Conductive textiles can be made with metal strands woven into the construction of the textile or by conductive yarns, which are conductive due to a metal-coating.

Conductive fabrics are materials that are made from, coated or blended with conductive metals including but not limited to gold, carbon, titanium, nickel, silver, or copper. Base fabric materials include cotton, wool, polyester, and nylon.

D. Heart Beat Sensor

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heartrate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

E.GSM Modem

GSM Modem is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network and internet through simple AT commands. Also we can find the location of the soldier using cellphone tower

F. Piezoelectric

Crystalline materials produce small amounts of electricity when a force is applied that changes their shape in some way. When small amounts of pressure are applied to a quartz crystal, a small voltage is produced from the changing charge created by the moving electrons

6. SOFTWARE DESCRIPTION

Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, Mac OS, Linux) written in C and C ++. It is used to write and upload programs to Arduino compatible boards, but with third-party cores, with the help of other vendor development boards.

7.WORKING PRINCIPLE

Environment temperature is measured as an input using temperature sensor.The measured readings is given as the input to Arduino Lilypad.

In which corresponding heat produced by the conductive fabric. Heart beat sensor measures real-time heart beat and calculates BPM with the algorithms implemented by Arduino lilypad.

8.ADVANTAGE

- ☐ Durable battery life
- ☐ Washable
- ☐ Light weight
- ☐ Energy efficiency
- ☐ Integratable with human body

9. RESULT

In the future, combat soldiers can be dressed in high-tech uniforms, fitted with everything, from navigation and water purifying systems to climate control. combat soldiers can be dressed in high-tech uniforms, fitted with everything, from navigation and water purifying systems to climate control

More than decade will pass a before super suits make the combat soldiers stronger, smarter as shown in fig

Figure 2

10. CONCLUSION

Smart fabrics are combining new materials with adjustable properties with typical IoT features. This combination allows to carry elements of it directly on the skin which brings technology one step closer to the human body. In some areas smart fabrics have barely left the labs while in others there is already a strong push into the markets especially when it comes to healthcare and sports & defence but also in dedicated work scenarios.

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