

Smart Army Jacket

Partani Abhishek R¹, Gaikwad Girija S², Benade Vaishali S³

1,2,3BE in Electronics and Telecommunication Engg. SGI, Atigre (Kolhapur), Maharashtra, India

Abstract - As the climatic conditions are changing rapidly, the winters are getting much colder, especially in northern region and the western region of India. Since we developed a smart army jacket using control media devices such as GSM, GPS, SENSORS in the jacket. The smart army jacket aims for providing reliable health monitoring as well as position tracking of soldier. Some of climatically conditions are led to unfortunate deaths of soldiers. This jacket can automatically sense the temperature inside, outside using temperature sensors. We are using coils for heating purpose and the temperature of the coil will depends on the outer temperature. GPS, GSM are the models used for communication purpose. Hence for monitoring the health and the heart rate of the soldier health monitoring equipment sensors are been establish in the jacket as well.

Key Words: Atmega328 microcontroller, Electric coils, Arduino uno, GPS & GSM modules, LM35 temperature sensor, Heartbeat sensor, battery, etc.

1. INTRODUCTION

Many other jackets existing in the market can provide both cooling and hot service with the jacket. The different climatic conditions such as very cold and very hot temperatures could be dangerous to health. Since in very cold temperatures, the most serious concern is the risk of hypothermia or dangerous overcooling of the body. Henceforth we have developed a smart army jacket as an important resource for the army soldiers as soldiers play a very important role to protect our country in extreme cold conditions. The smart army jacket is proposed in such a way that it could monitor the health, internal temperature as well as emergency notification in the form of short message service for the soldier.

The jacket will be developed in three phases. In the first stage, the fibre of the jacket is been developed as according to the military standards keeping in note the weight, the colour, the finishing, stitching, pocketing and inside foaming according to military standards. The second phase of the smart army jacket relates to the GPS, GSM module and some health monitoring sensors which are smartly inbuilt into the jacket keeping in mind that the fabric material will not get affected by the electronic part. The third phase include the back pocketing which is being placed for batteries into the smart army jacket and medical emergency kit.

1.1 SYSTEM ARCHITECTURE

The system consist of the highly powerful rechargeable battery power supply. The circuitry of the system into the smart army jacket is been connected through wires and are placed in such a way that the circuitry could be removed and placed again according to the soldiers convenient. as a jacket is been designed as waterproof and inflammable the circuitry inside is placed according the same manner seeing all the worst conditions. Hence the circuitry include the blocks of at mega 328 microcontroller, LM35 temperature sensor, health monitoring sensor, GPS, GSM systems and copper coils which are connected through wires to the batteries.

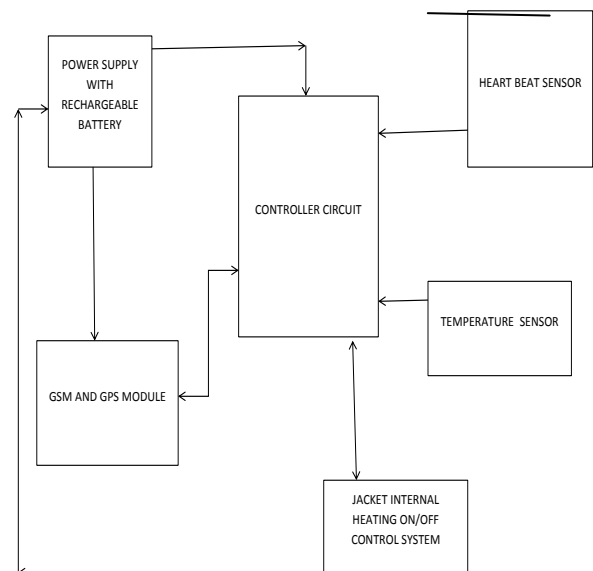


FIG.1

As shown in above block diagram the jacket itself have some additional sensors to operate intelligently, Temp sensors monitors temp of atmosphere & soldier body and send it to controller. Controller we decided depending on data gather from temp. Sensor the internal heating of jacket is required or not, if it's required then it will automatically switch ON the supply for heating system.

Jacket also has a heartbeat rate sensor, with the help of these sensors the soldier heart rate was continuously monitor. Also it's having a small GPRS module which will help to track an exact location of soldier from base station. The gather data from temp. Sensor, heart rate sensor & GPS will directly sent to base station/monitoring station for particular soldier via GSM.

The complete system is powered by a small & efficient battery, which is rechargeable through electricity or solar system depending on availability

1.2 HARDWARE SPECIFICATIONS

- a) JACKET
- b) ATmega 328
- c) GPS, GSM
- d) HEARTBEAT MONITERING SENSOR
- e) TEMPERATURE SENSOR
- f) BATTERY
- g) RELAY
- h)

JACKET:

Neat and Tailored Design with Breathable Fabric is Soft shell fabric exterior with fleece lining ensures you don't lose any excess heat and enjoy comfortable warmth; Detachable hood is specially designed for chilly mornings and extra protection on windy days; Water and wind resistance for your unrestricted movement towards outdoor. "Heat across Body", is 3 carbon fiber heating elements generate heat across core body areas (left & right chest, mid-back); Adjust 3 heating settings (High, medium, low) with just a simple press of the button.



Fig 2

ATmega 328:

The high-performance Microchip 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities,



Fig 3

It is having 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts.

HEARTBEAT MONITERING SENSOR:

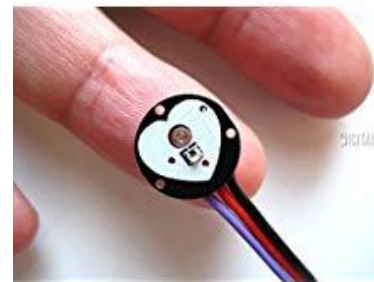


Fig 4

Heart monitoring sensor is such a type of sensor which gives an output of heart beat when figure is placed on it. While the heart beat detector is working, the beat LED flashes in unison with each heart beat. It works on the principle of light modulation by blood flow through finger at each pulse.

TEMPERATURE SENSOR:

LM35 TEMPERATURE SENSOR is used to detect the specific temperature of the internal jacket and the outward environment



Fig 5

The output voltage of this IC sensor is linearly comparative to the Celsius temperature. The operating voltage range of this LM35 ranges from -55° to +150°C. The temperature sensor also, measures and monitor battery temperature.

BATTERY:

Quick and Long-lasting Warmth Heat quickly in seconds with 12 V UL/CE-certified battery; Up to 10 working hours (3 hrs on high, 6 hrs on medium, 10 hrs on low heating setting); USB port for charging smart phones and other mobile devices.

RELAY:

A relay is a switching device as it works to isolate or change the state of an electric circuit from one state to another. Different types of Relays. Classification or the types of relays depend on the function for which they are used. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. The first relays were used in long distance telegraph circuits as amplifiers



Fig 6

they repeated the signal coming in from one circuit and re-transmitted it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

1.4. SOFTWARE DESCRIPTION:

The UNO is the best board to get started with electronics and coding. If this is your first experience tinkering with the platform, the UNO is the most robust board you can start playing with. The UNO is the most used and documented board of the whole Arduino family. Arduino IDE is a special software running on your system that allows you to write sketches (synonym for program in Arduino language) for different Arduino boards.



The Arduino programming language is based on a very simple hardware programming language called processing, which is similar to the C language.

The Arduino Uno board is a microcontroller based on the ATmega328. It has 14 digital input/output pins in which 6 can be used as PWM outputs, a 16 MHz ceramic resonator, an ICSP header, a USB connection, 6 analog inputs, a power jack and a reset button.

2. WORKING:

Wearable technologies are now pervading many applications in several fields. The aim of this review paper is to collect and summarize the actual smart clothing in the space and military field where conditions could be critical for health and safety, and outline the innovation trend for innovative services to police and soldiers.

In this project we have developed a jacket including various sensors and modules so that it will be helpful for avoiding the problems which could be face by army people. First thing is by using the temperature sensor we can sense the outer temperature and so that we can adjust the heating temperature of coils which are placed inside of the jacket. From which we can prevent ourselves from the environmental conditions.

Secondly health monitoring sensor will be helpful for monitoring the health status of human being. And as well the heart rate will be providing to the main station due to which the person seating inside main station will get to know about the health status of soldier. GPS and GSM systems are used for conveying message, that is if the soldier is in danger he can send the emergency message as well the exact location of the

soldier so that main station can know the exact position of the man and they can find him and can offer help.

2.1 OUTPUT:

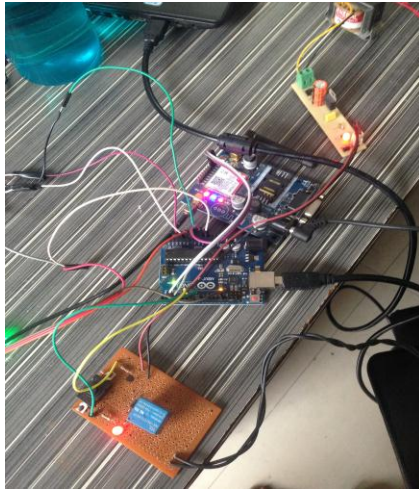


Fig 7

Fig 7 shows the interfacing of the of sensors and the GPRS MODULE, which gives the information about the temperature and the heartrate of the human being.

Relay is interfaced which will act as a switch to make the coil heating on and off.so that the heating inside of the jacket takes place.

3. FUTURE SCOPE:

It can be implemented for the army purpose. As well we can add the gas detective sensors so that we can detect the gases which are harmful for the human beings. By use of NANO technology we can improve the component stability and accuracy.

4. COCLUSION:

This paper tries to summarize the main smart clothing applications developed in the last decade in the military field. At the moment, the experience is very limited. In terms of monitoring the soldiers through a t-shirt, different systems exist on the market. The U.S. Army, in the collaboration with MIT, is investing to create the uniform of the future. For the moment, such a smart clothing uniform is not available on the market. The USA Army Natick Soldier research center is searching to make garments with new textiles and 3D printers. New applications and materials have been developed with the aim to have devices that can monitor the subjects for longer time and harvest self-energy or solar energy. The next step will be the integration of the existing wearable technologies in usable smart clothing and bring them from the lab to the field.

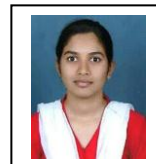
REFERENCES:

[1]<http://www.armytechnology.com/features/featuresensoren-sensibility-future-of-soldier-worn-systems/>
 [2] <http://www.mse.gatech.edu/faculty/jayaraman>
 [3]<http://zephyranywhere.com/products/bioharness-3/>
 [4] <http://www.proetex.org/>
 [5]Fernando Seoane, Javier Ferreira, Lorena Alvarez, Ruben Buendia, David Ayllón, Cosme Llerena and Roberto Gilpita, Sensorized Garments and Textrode-Enabled Measurements Instrumentation for Ambulatory Assessment of the Autonomic Nervous System Response in the ATREC Project, Sensors 13(7), 8997-9015, 2013.
 [6]<http://www.space.com/24850-astronaut-astroskin-antarticexpedition.html>

BIOGRAPHIES



Partani Abhishek R.
 Student at Sanjay Ghodawat Institute, Atigre



Benade Vaishali S.
 Student at Sanjay Ghodawat Institute, Atigre



Gaikwad Girija S.
 Student at Sanjay Ghodawat Institute, Atigre