

# Weather Sensible Smart Adaptable Jacket

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**Abstract** - People are feeling uncomfortable due to change in temperature day by day. The sudden change in environmental conditions may leads to major health issues. The proposed paper enables us to sense both body temperature, environmental conditions & controls the temperature either automatically. The main components of the paper are Arduino Uno interfaced with a temperature sensor, an LCD display, Peltier module, Wi-Fi module, Relay module & Rechargeable battery. The overall operation is to measure the temperature of the body & environmental conditions that displays on LCD module and mobile screen through Wi-Fi module. The heater and cooler in turn will help user to provide either warming or chilling effects inside the jacket. This jacket acts as a guard & helps people to work comfortable irrespective of the weather conditions against the temperature variations.

**Key Words:** Arduino Uno Board, Peltier Module, LM35 Temperature sensor and LCD Display

## 1. INTRODUCTION

The Weather conditions are extremely changing day to day. Currently the climatic conditions are very infernal & abnormal for the people. Even if any person who interested to travel outdoor must be deal with all sorts of weather conditions. Irrespective of the temperature changes [1]. The sudden change in climatic conditions can leads to major health problems such as hypothermia & heat strokes [2]. An appropriate solution is introduced by providing a touch of a single button; where people can control the body temperature with respect to the external environment conditions. Similarly in cold climatic areas it is unsuitable for the humans to continue to live. In every such surrounding of a places the jacket helps the user effectively. The main aim of this project is to help the user to control and monitor the internal temperature of the jacket as per requirements, depending on the season, the jacket will protects as a guards to the user from such illness caused due to changes in a climatic conditions and suddenly changings in the both heating or cooling effects. The jacket can act as both heating and cooling system. When climate is too hot, the jacket cools down the body and when climate is too cold, the jacket heats up the body. This system is thus an efficient and adamant solution to the drastic change in weather which causes many ill effects to humans due to sudden changes in the

temperature. The usefulness & feasibility of such a suit is the motivating factor to commence on this proposed system. This jacket allows the user to keep tracking the internal temperature of the jacket from high to low temperatures, with the use of the thermoelectric effect and displays the results in both LCD module and a smart phone. A 12 V Direct Current Lipo rechargeable battery [6] is used for storing the energy.

## 2. BLOCK DIAGRAM

The proposed system is based on the microcontroller. The heating and cooling function is obtained by using peltier module and it can be done using relay operation. The power supply to the circuit is provided by the lead acid rechargeable battery. The system consists of LM-35 temperature sensor, Wi-Fi module & 16X2 LCD screen. The climatic conditions are sensed by the temperature sensor continuously and it will display on the LCD screen. Wi-Fi module is used to communicate Arduino with mobile application. The LM35 temperature sensor [1] continuously senses the surrounding temperature and gives the analog data to the arduino. The arduino takes the analog data as its input and gives the digital data to the LCD module. The peltier module made up of two type semiconductor namely n type & p type. If the n type terminal is connected to n type & p type terminal connected to p type, the peltier module one side produces heat and the other side it produces cooling effect. If the polarity changes the heating side produces cooling & the cooling side produces heating. So this can't be done manually so we are using H-Bridge circuit to change the polarity. The H-Bridge circuit gives control over to the peltier module for heating and cooling of a Jacket. The power is supplied to the H-Bridge circuit through rechargeable battery. The switch is used to turn on/off of a peltier module. The Wi-Fi module is connected to a Arduino board. The Wi-Fi is connected to smart phone for monitor of a jacket. The battery is used to supply the current throughout the jacket.

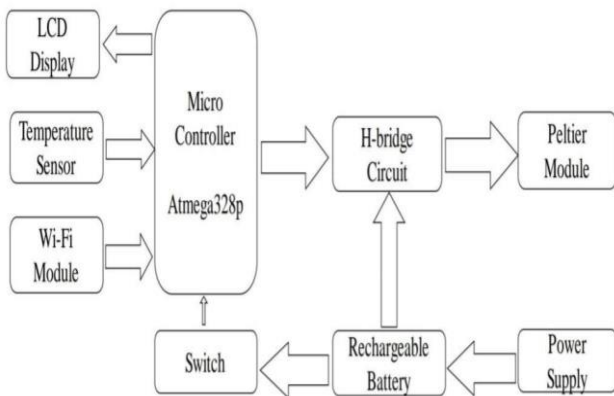


Fig -1: Block diagram of Proposed System

### 3. HARDWARE DESIGN

#### 3.1 Arduino Uno

The Arduino Uno board contains Atmega3248p microcontroller [2], it is a 28pin IC microcontroller as shown in figure 2. In that 28pins, 7pins are power pins, 6 are input/output analog pins & 14 input/output digital pins. This Arduino board operates at 5volts and it requires 7 to 12volts of input voltage. It has flash memory of 32Kb in which, 0.5Kb is used by system booter, 2Kb of static random access memory and 1Kb of electrically erasable programmable read only memory. Microcontroller is a heart of computer which is placed on a single IC. It consists of multiple CPUs, input output ports along with programmable memory.



Fig -2: Arduino Uno board

#### 3.2 Peltier Module

The Peltier modules [3] are commonly called as Thermo Electric Coolers (TEC's), it can be used either to produce heating or cooling effect shown in figure 3. It uses the Peltier effect to create the temperature difference between the two junctions of different materials. Thermo Electric Coolers are operated on Peltier effect in general which is also called as thermo electric effect. The device is made up of two semiconductors n-type and p-type. When the DC current flows through the device, the Peltier module brings heating and cooling effect. The one side of the Peltier module is heated and other side of the Peltier module is cooled. The hotter side connected with the heat sink, so that the heat remains at surrounding temperature, while the cooler side goes below the room temperature.

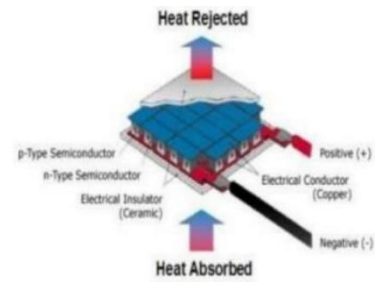


Fig -3: Peltier module

#### 3.3 Temperature Sensor

LM35 Temperature sensor [5] is used to sense the current surrounding temperature as shown in figure 4. It consists of 3 pins in which first pin is VCC, which is connected to 5volts supply in Arduino, second pin is analog output pin, which is connected to A1 of

analog input/output pin in Arduino & third pin is a ground pin, which is connected to ground in Arduino. It senses the surrounding temperature in the analog form and is given to arduino where it is converted to digital form and displayed in the LCD module. It has an advantage over the linear sensor which calculates in Kelvin, we can get the output in Centigrade scaling directly without any conversions. It can sense from -55° C to 150° C range and ensures 0.5° C accuracy.



Fig -4: LM35 Temperature Sensor

#### 3.4 Wi-Fi Module ESP-8266

The ESP8266 Wi-Fi module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network.

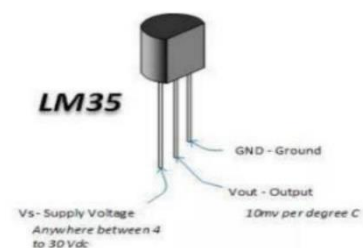


Fig -5: Wi-Fi module

### 3.5 (16x2) LCD Display

Liquid Crystal Display (LCD) as shown in figure 6 is an electronic display module. It is most commonly used in embedded papers because of cheap price, availability and provides programmer friendly. The LCD displays 32 characters, in each character there will be 32 crystals for displaying a character. In our day to day life we come across these kinds of displays such as PCO's or calculators. It operates in the range of 4.7V to 5.3V. The temperature sensed from the LM35 sensor is displayed in the LCD module.

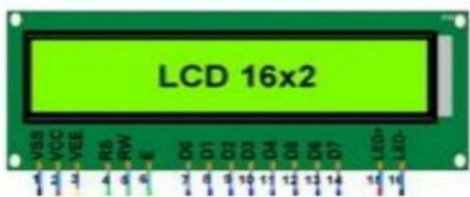


Fig -6: (16x2) LCD display

### 3.6 H-Bridge

An H bridge [5] is an electronic circuit that switches the polarity of a voltage applied to a load. This circuit are used

in our paper for heating and cooling of a jacket. The H-bridge arrangement is generally used to reverse the polarity/direction of the device. In general an H-bridge is a rather simple circuit, containing four switching element, the load at the centre, in an H-like configuration. The switching elements (Q1...Q4) are usually bi-polar or FET transistors, in some high-voltage applications IGBTs. The diodes (D1...D4) are called catch diodes and are usually of Schottky type.



Fig -7: H-Bridge

### 3.7 RECHARGEABLE BATTERY

Lipo battery is nothing but Lithium polymer battery as shown in figure 8 and these are new type of batteries, now used in many consumer electronic devices. There are many superiority to use these batteries i.e. it can capable of holding much lighter weight, and can be made in almost any shape or size. These batteries have higher capacities allowing them to hold more power and higher discharge rates. As other lithium-ion cells, Lipo works on the principle of intercalation and de-intercalation of lithium-ions from a positive electrode material and a negative

electrode material, with liquid electrolyte providing a conductive medium to prevent the electrodes from touching each other directly, a micro porous separator is in between which allows only the ions and not the electrode particles to migrate from one side to other. This Rechargeable battery[7] is a 12v 2200mah Lipo battery. Specially designed for the system devices which use 12v DC power supply, It contains built-in ON/OFF switch to save power usage. The circulation charge and discharge occurs more than 500 times.



Fig -8: Lipo battery

## 4. WORKING PRINCIPLE

The Arduino coding is programmed in the following manner. The code starts with defining of variables and declaring of functions. The main loop of the program will takes the input as a surrounding temperature from LM35

sensor in the binary form. The Arduino is responsible to convert it from binary to decimal form. The LCD module exhibits the current temperature which is sensed by the LM35 sensor which was given as an output by the Arduino. If the conditional statement is true that is, if the temperature is greater than 30°C, the cooling effect will be started with the help of Peltier module, else it goes for another conditional statement. If this conditional statement is true that is, if the temperature is less than 30°C, the heating effect will be started by connecting heat sink on one side of the Peltier module, else it goes for the main statement. After the heating/cooling effect, it enters into the main loop. The one side of the peltier heats up, if we want chillness after some time we need to change the polarities of the peltier from p type to n type and n type to p type. This change of action is done by H-Bridge circuit. Only two peltier module turns on, if the temperature is near to 30°C. This is done because the battery consumes less current. This jacket can work automatically, according to the user requirement. If the temperature rises it chills or if the temperature goes down the heating effect comes. We can update the temperature through smart phone using wireless Wi-Fi technology.

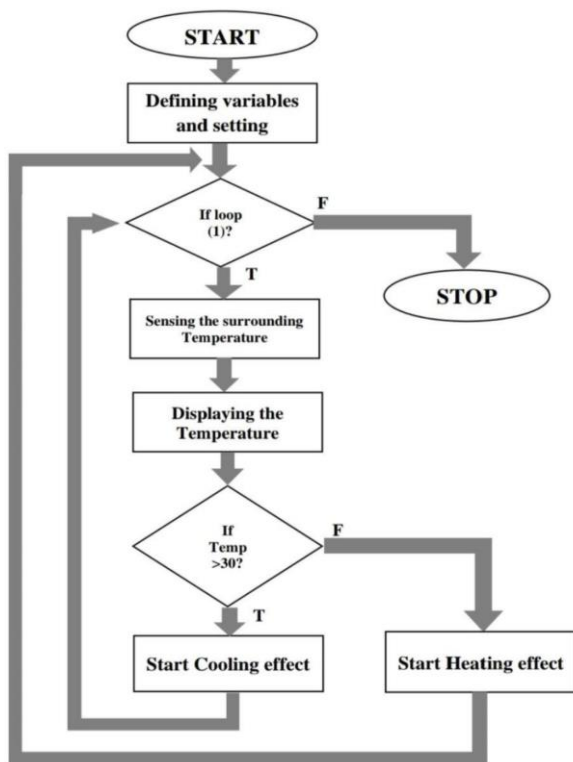


Fig -9: Flow Diagram of Proposed System

### 5. RESULTS

As per the result, the Weather Sensible Smart Adaptable Jacket maintains the optimum temperature of 30°C automatically. The temperature for the body is updated through mobile phone which is connected to the wireless

Wi-Fi module. Thus the Weather Sensible Smart Adaptable Jacket acts as both heating & cooling system either automatically. Here, the system is built using one Peltier module, increasing the number of Peltier bring out the better performance so that each Peltier can be placed in different parts of the body where the temperature sensitivity is more.

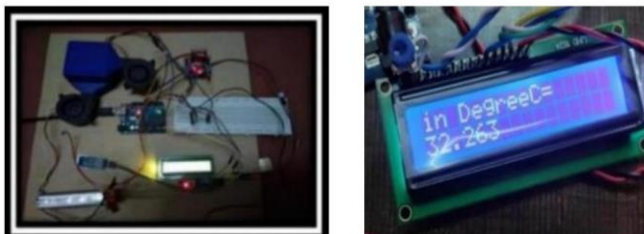


Fig -10: Result of Weather Sensible Smart Adaptable Jacket

### 6. CONCLUSION

The paper Weather Sensible Smart Adaptable Jacket concludes that it can be mainly used for the soldiers to maintain their body temperature in the extreme cold & hot conditions. Even though the Weather Sensible Smart Adaptable Jacket may be heavy to carry for normal persons but it will be useful for the soldiers in the snow falling & desert regions. It can also used for the worker who works at outdoor in cold & hot climatic conditions. This jacket allows them to monitor and to control their internal body temperature from hot and cold. In future there will be reduction of weight and there will be an improvement compared to current standards. Future there will be reduction of weight and there will be an improvement compare to the current situation.

### REFERENCES

- [1] Jeena Raju Poikayil, Jeffy Francis , Deepa Saju, Akhil Suresh and Jobin Varghese, Peltier Integrated Heating & Cooling Jacket, International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017.
- [2] Ch.Sabarish and R.S. Reddy, Solar Powered Thermal Jacket For Soldiers in Extreme Temperatures, International Journal & Magazine of Engineering, Technology, Management and Research, Volume No: 2 (2015), Issue No: 6 (June), June 2015, pp 442-446.
- [3] Gregory Paul and Edward Gim, Battery Powered Heating and Cooling suit, Department of Electrical and Computer Engineering State University of New York at Stony Brook Stony Brook, NY 11794, 2014, IEEE 2014.
- [4] S.Annapurnadevi and P. Ramesh Kumar, Adaptable Jacket Based on Climate Conditions Using ARM Microcontroller, International Journal of Engineering and Techniques, ISSN: 2395-1303, Volume 2 Issue 5, Sep - Oct 2016, pp 125-129.
- [5] Jeena Raju Poikayil, Jeffy Francis, Deepa Saju, Akhil Suresh and Jobin Varghese, Peltier Integrated Heating & Cooling Jacket, International Conference on Electronics, Communication and Aerospace Technology, ICECA 2017, pp 260-263.
- [6] Joseph Rampulla, Hypothermia & Heat stroke, heat related conditions, The health care of homeless persons-Part IIs. Sep-oct 2013.
- [7] Lipo Rechargeable battery, <https://rogershobbycenter.com/lipoguide> , accessed on 24th September 2018.
- [8] Peltier plate, <http://www.digit-life.com/articles/peltiercoolers/p6.gif> , accessed on 28th September 2018.

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