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Wearable Hyperthermia Device

Abhinaya .M, Silambarasan .P, Sowmiya A. P
[123]*Student, Biomedical Engineering, PSG College of Technology, Tamilnadu, India*

ABSTRACT

In this modern era of wearable devices for monitoring patient, Wearable hyperthermia device plays an important role in the development of health care and to analyze the body temperature of human beings to identify serious disease conditions like Hyperthermia, Heat stroke etc. Extreme temperature elevation then becomes a medical emergency requiring immediate treatment to prevent disability or death. Hyperthermia differs from fever in that body's temperature set point remains unchanged. A light wearable device can improve patient's comfort and can be located close proximity to the body, thereby enhancing the energy deposition and reducing the power requirements. The system consists of hardware such as micro controller like Arduino, personal computers (for the display), sensors (to measure the body temperature), buzzer s(to alarm)and an Arduino software(version1.7.10). The Arduino is simple to use and easy for interfacing it with a sensor. The device is primarily aimed at continuously tracking the skin temperature to indicate the onset of hyperthermia. The proposed prototype system provides an interactive user interface which is simple and efficient for monitoring the body temperature and a sound alarm from buzzer in case of hyperthermia condition and hence, it will provide a better detector over the rise in temperature. The temperature status obtained will be transmitted to the monitor window via Arduino and USB cable. Analysing body temperature will be useful in hospitals for bed ridden patients and sports persons. The final prototype would enhance the users to monitor their body temperature continuously and will help in identifying the hyperthermia in its initial stage.

Keyword: Arduino, Microcontroller, Heat Stoke, Hyperthermia.

1. INTRODUCTION

Hyperthermia is upstanding body temperature due to failed thermoregulation that occurs when a body produces or absorbs more heat than it dissipates. Extreme temperature elevation then becomes a medical emergency requiring immediate treatment to prevent impairment or death. The most common causes include heat stroke and adverse reactions to drugs. Hyperthermia differs from fever in that body's temperature set point remains unchanged. The opposite is hyperthermia, which occurs when the temperature drops below that required to maintain normal metabolism. In humans hyperthermia is defined as a temperature greater than 37.5-38.3 degree Celsius, depending on the reference used that occurs without a change in the body's temperature set point. The normal human body temperature can be high as 37.7-degree Celsius in the late afternoon. Significant physical exertion in hot conditions can generate heat beyond the ability to cool, because, in addition to the heat, humidity of the environment may reduce the efficiency of the body's normal cooling mechanisms. Enzymes involved in the metabolic pathways within the body such as cellular respiration failed to work effectively at high temperatures, and further increases the can lead them to denature, reducing their ability to catalyze essential chemical reactions. Hyperthermia is also called thermal therapy or thermotherapy. In humans, hyperthermia is defined as a temperature greater than 37.5-38.3 degree Celsius, depending on the reference used, that occurs without a change in the body's temperature set point. The risk of death related to hyperthermia is greatest for the very young and the elderly. Over 600 people die each

year in the united states from the avoidable exposure to extreme heat. Individuals 65 years of age or older suffer a disproportionate number of these heat related deaths. The highest mortality rate occurs during the summer when the daily temperature can be over 100F from June to mid-September. Modern weather forecasting is reasonably able to heat anticipate a heat wave. It is therefore necessary for public health officials to identify susceptible populations and prepare appropriate shelter. The 2003 heat wave in France stands as an unfortunate example of the effects of the heat wave. It is important to note that ambient temperature does not have to reach 100 degrees for elders to be a risk of hyperthermia.

2. METHODOLOGY

The methodology adopted here is acquiring the temperature input from the finger of the human by the LM35 temperature sensor and analyzing them. There is need of current for the sensor which is obtained from USB port via arguing UNO board. Then the sensor is interfaced using Adriano and the corresponding temperatures are noted. The hyperthermia condition ranges are detected from the serial monitor.

2.1 Temperature sensor LM35

LM35 is interfaced to the Adriano through the analog input pins +5V, A1 and GND. The first pin is made high and it acts as the 5V supply pin for the LM35. The third pin is made low and it acts as the ground pin for the LM35. Analog input pin A1 is set as an output and the voltage output of LM35 is coupled to the arguing through this pin. The LM35 device does not require any external arrangement or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature LM35range.

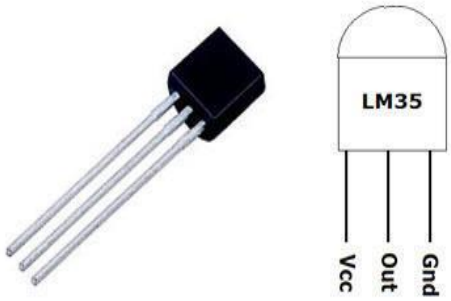

Fig -1: LM35 Temperature sensor

2.2 Arguing Microcontroller

Arduino is an open-source computer housewares and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control the physical world. The Arduino Uno can be mechanised via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer.

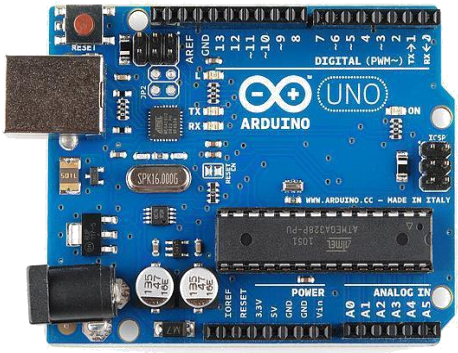

Fig -2: Arduino Boa

2.3 Buzzer

Buzzer is used to create a sound alarm whenever an action is identified inside the range of PIR sensor. A transistor 2N2222 is used to drive the buzzer. The maximum current that can be obtained or sinked from an arguing pin is 20mA (the total current being 200mA from different pins). But the buzzer will need more than just 20mA for its proper functioning.

Fig -3: Buzzer

2.4 2N2222 transistor

To give the necessary current required for the buzzer, We use switching transistor 2N222 for this purpose. It can act as a switch and at the same time it provides the required current amplification with a gain of 100 can give up to 1A current at its product. Another purpose of using a transistor in between arguing pin and buzzer are confinement. A short circuit of the buzzer will wipe out only the collector – emitter junction of the transistor. Since there is isolation at the base region of the transistor (base is connected to arguing), the loss of collector-emitter junction will not affect base and hence our arguing will be safe from getting burned! The 100 ohms resistor at the base is used to limit base current of the transistor.

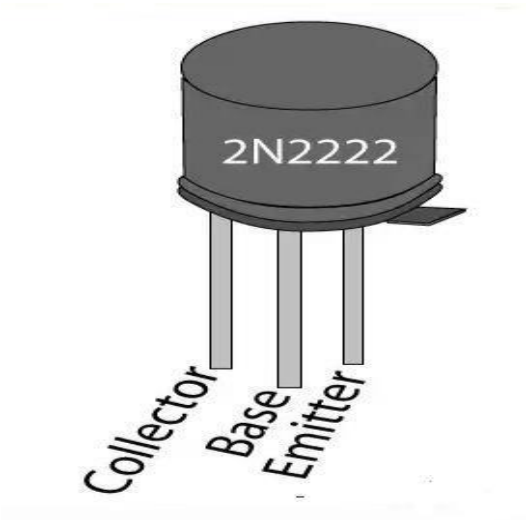

Fig -4: 2N2222 transistor

3. DESIGN

The proposed prototype system provides an interactive user interface which is simple and efficient for monitoring the body temperature and a sound alarm from buzzer in case of hyperthermia condition and hence, it will provide a better detector over the rise in temperature. The temperature status obtained will be transmitted to the monitor window via Arduino and USB cable.

3.1 Block diagram

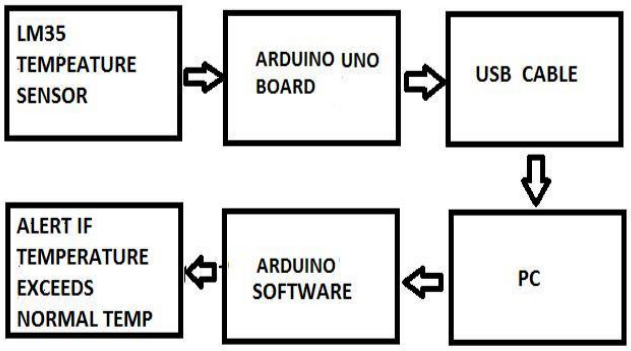

Fig -5: Block diagram

3.2 Hardware Connection

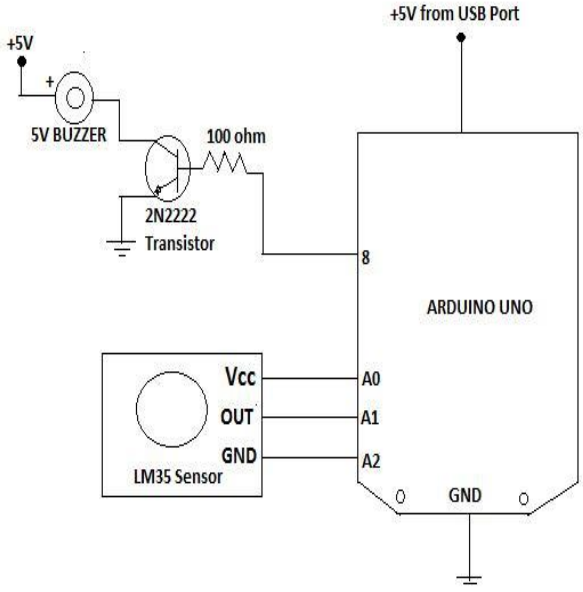

Fig -5: Hardware connection

4. CONCLUSION

In this fast moving world, it is necessary to monitor the body temperature of human body. But nobody is caring about the heat released in their body. It is very important to analyze the body temperature of human beings to identify serious disease conditions like Hyperthermia, Heat stroke etc. Therefore the intention of this project is to design an Hyperthermia device that would help us to find if the temperature goes above normal temperature. The prototype system has an interactive user interface which is simple and efficient. Features like Arduino, buzzer, and sensor are included in this project. The arduino is simple to use and easy for interfacing it with a sensor. The values from the sensor are directly read by the PC using the arduino. Analysing body temperature is useful in hospitals for bed ridden patients, sports persons. The hope is that the final tool will meet the objectives stated and provide the maximum usage to its users.

5. REFERENCES

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