

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Invention)
(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SAPE285

Project Title: The Heating Blanket

Project Type: Invention

I. Background

It is of concern to our society that aged women and the elderly population feel the wrath of the cold during Hong Kong winters. This could cause them great discomfort and make winter very hard for them to pass. So, we have developed a heating blanket to help them tackle Hong Kong's winters. We all know that Hong Kong is a city which gets quite cold in the winters, but it is a region without many centralized heating systems, so the heating blanket will one day become an essential tool to combat Hong Kong's winters. Therefore we invented a heating blanket with a controllable temperature.

II. Objective(s)

Our aim is to provide a comfy restful sleep experience to people who are having difficulty sleeping and disabled during winters. It is crucial that good night sleep can make us healthier and stronger, also it can bring us more energy throughout the day. In the market, many suppliers only sell heating blankets without a function to control the temperature. Therefore, there are many accidents caused by heating blankets throughout the year. In order to reduce such incidents, we would like to design a heating blanket with changeable temperature with controls, but also to help people to tackle their difficulties during their sleep.

III. Methodology

Heating Method

Textile and heating methods will definitely affect the heating effectiveness. To optimize the thermal conductivity of each layer, the distance between wire and the surface should be less than 50 mm to make sure the heating wouldn't be reduced due to thermal resistance of different layers according to our experiment and observation. Each layer of the heating blanket should have a specific thermal resistance to ensure the heating device would have a thermal performance

The working principle of the device

There is a simple connection device between the blanket, remote control of the blanket, a temperature detector and also there is an app that changes the temperature of a blanket.

IV. Design of Invention

The Blanket



There are in total 5 layers in our heating blanket, which are cotton cloth, cotton, velvet, neon cloth and the heater wire from the surface to the middle respectively. Each layer plays a vital role in our product.

OUR APP

Our app is called “Warmy”. “Warmy ” comes from the word “Warm” ,which is our aim to provide warmth to our users. Also adding a “y” at the back makes the app name more catchy and attractive. Our app includes three parts, which represents the IPO (input,processing,output) model of any programme. Firstly, a temperature detector. Secondly, the app itself. Thirdly, the heater. All of these items are connected to a portable charger, which capacity is enough to provide 10 hours of continuous use of the blanket.

V. Application / Market Need

Control of heater’s output

As mentioned, the temperature output is controlled by a programme. This programme uses the formula of specific heat capacity — $mc\Delta T=E$, where m is the mass of the object, c is the specific heat capacity of the object, ΔT is the temperature change in object and E equals the energy needed. This equation describes the amount of energy required to lift the blanket to a certain temperature. After this, we will simply plug E into the formula of power— $P=E/t$ to find out the power out of the heater required. We also developed an app which allows users to choose whatever temperature they want the blanket to be .

There are two sources of inputting data into the system. Firstly, we have connected a temperature sensor unit to the app, which allows us to monitor and find out the initial temperature of the blanket. This is essential for the calculation of the power and energy needed. Also, users can input data directly into the app, so that we can also consider our user’s mass, which increases the amount of energy needed to reach a certain temperature.

Limitations

As in reality, there must be heat lost to the surroundings. Therefore, the energy needed to reach the designated temperature actually increases. Also, we cannot measure the temperature too accurately due to the rounding off of the temperature value displayed by the temperature sensor. This thus lead to an error where the energy output will be either too large or too low, and it may not be able to satisfy out user’s needs.

VI. Conclusion

Make a conclusion of the design project and the way forward of the invention process

To conclude our product, our product aims to provide a comfy and comfortable sleeping experience for people during winters. In order to sooth out this situation, we designed our blanket that can control the temperature by itself with several factors, temperature and humidity. These parameters can be detected by our heat sensor also from our developing mobile application, which allows users to input their favorable temperature and collect their preferences. We also aimed that our product should surpass the ones from the market nowadays, in which those blankets will tend to overheat easily and lead to unpleasant sleeping experiences for people. We hope that we can have another opportunity to enhance our product to the next level, serve and spread warmth to everyone in the corners of the world.

Our project is developed based on our school’s previous project and the enhancement is as below:

N/A

