CHAPTER 1

INTRODUCTION

1.1 Background

The never ending technology world has always successfully played an important role in people's daily life [1]. Most of people's activities today will at least have one interaction with any kind of technology. In public area, at home or in the office, everything starts to become automated. Communication devices for example, have been popular since it is first invented.

Not only to users of the devices, for developers, they are always trying to create something new. Something that could make the existing technology even simpler than it has already been. Arduino, an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software, can sense the environment by receiving different kinds of input through variety of sensors [2]. This interactive microcontroller can even be easily used by designers. Those technologies have causes a new negative psychological problem called "Technostress" to people using technologies and even to those who don't use technology [3]. Over the past 15 years, the level of Technostress increases together with the increase in the invention of new technology [3].

Alongside with it, Technostress has been related to negatively toned emotions such as fear, anger, depression, despair, hopelessness, and guilt [4]. Based on Ekman, Friesen, and Ellsworth theory, basic emotions consist of anger, disgust, fear, joy, sadness, and surprised [5]. Emotions indirectly control people's thinking, behavior and actions. Emotion can be detected through several ways; using brain wave signals [6], facial expression, speech and even written text. Other than it, we could also

analyze physiological signals (such as respiratory volume (RV), skin temperature (SKT), skin conductance (SKC), blood volume pulse (BVP) and heart rate (HR)) for emotion recognition [7]. By knowing someone's emotion, it could actually help to manage the Technostress level; but it could also lead to increase in stress level when combined with technology. People's emotions are changing whenever there is a small triggered from the environment. For example, when you are just having a tiring day and you still need to deal with all the technology (such as, selecting song from thousands of list to listen to the music that suits your emotion) to get you entertained at last which sometimes even made you feel more stressful.

Thus, this research will be focusing on solving those problems explained above by still following the technology trends, using the Arduino microcontroller. While the concept used to solve those problems could actually also be used in many other circumstances, especially for medical purposes to monitor patient condition.

1.2 Scope

This research focused on developing a prototype of a working Arduino based hardware that has been programmed to detect pulse rate and skin temperature, analyze the data obtain and specify the people's emotion condition which will later be send to the PC through components called XBee. The prototype should be able to do the following functionalities:

- Reset the emotion detector

    The reset function will make use of reset button available in Arduino UNO board by coding it in a way that it will initialize all variables needed back to the first value before any updates is made.

- Detect pulse rate

    Read pulse rate input from a human's body parts and converting the voltage data gather from the sensors into a readable integers BPM number.

- Find the most accurate pulse rate

    This is where an algorithm is used to gather 10 most stable data, and compare each one of it to the threshold, if the data is accurate enough, average of the 10 data will be used as the pulse rate, or else it will replace the first data amongst the 10 with the latest pulse rate obtained.

- Detect skin temperature

    Read skin temperature input from a human's body parts and converting the voltage data gather from the sensors into a readable integer in degrees Celsius.

- Find the most accurate skin temperature

  This is where an algorithm is used to gather 5 most stable data, and compare each one of it to the threshold, if the data is accurate enough, average of the 5 data will be used as the skin temperature, or else it will replace the first data amongst the 5 with the latest skin temperature obtained.

- Conclude people's emotion condition from the pulse rate and skin temperature

  Based on the pulse rate and skin temperature most accurate data obtained, those two data are analyze based on an Emotion Correlation Table to conclude their emotion.

- Send the data obtain from a person to a PC Wirelessly

  The details of the pulse rate and skin temperature together with the emotion will then be send from the system/devices to the PC to be shown on the screen.

1.3 Aims and Benefits

The aim of this research project is to make use of today's technology, the simple micro controller, the Arduino, to provide data that could help reduce the level of Technostress faced by most people. On the other side, the functionality such as pulse rate detection when combine only with communication technology can actually be used to create a pulse rate control for patient with special treatment to help the paramedic keep control of their condition. Besides, it provides a benefit that the devices are easily available nowadays.

1.4   Structures

Chapter 1   This chapter explained the background, scope, aim and benefits for creating an ARDUINO HEART RATE AND SKIN TEMPERATURE BASED WIRELESS EMOTION DETECTOR.

Chapter 2   This chapter explains regarding the theoretical foundation. It will explain basic idea and details of how emotion and communication field are correlated. Besides, it will also include researches and devices for skin temperature sensor, wireless communication, pulse sensor and the technologies used to create the devices for emotion sensor.

Chapter 3   This chapter describes comparison of the current non-Arduino existing similar devices with the usage of Arduino components. It will also include analysis of the problem and the details of what will be accomplished from the solution.

Chapter 4   This chapter explains the hardware design, how each hardware is connected and programmed with diagrams, pictures and source code. Also how to analyze the data to obtain the emotion result from it.

Chapter 5   This chapter explains the condition suitable for using the hardware, operational procedure, test plans and it's results.

Chapter 6   This chapter discusses the author's experience and obstacle while doing creating the devices for emotion sensor.

Chapter 7   This chapter discusses the conclusion, both strength and weaknesses, and future possible improvements from the thesis.