RELAXATION GAMING WRAP

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BACKGROUND

Electronic sports, also known as E-sports, is a form of competition where players compete with other players using electronics as a medium, mostly a computer, to achieve certain outcomes. It emulates sports because players are distinguished by their decision-making abilities and reflex while competing. This form of sports is becoming increasingly popular enabled by the development of electronics and technology in the past decade. More and more people, especially younger generations, are interested in E-sports because of its convenience to compete and intellectual stimulating experience. As a result, many electronic brands often sponsor E-sports tournaments for advertisement, and the prize pool for E-sports is increasing rapidly. For example, Valve hosted this year's Dota2 tournament for a total prize pool of 3 million dollars shared by top 8 teams. As the money begins to pour into E-sports, many people devote themselves as professional gamers whose job is to train and perform at their best level.

Although E-sports are becoming increasingly professional, compared to normal professional sports, they are still lacking in some fields. For example, the players often do not have dedicated medical staff to care about their health. E-sports often impose significant health issues to their participants. Notable health concerns include poor vision resulting from long time of playing in front of a monitor and skin issues resulting from using a mouse extensively during completion.

PURPOSE

The topic of our M.Eng project is a relaxation wrap aiming to come up with a solution that will relax gamer's hand and wrist without impacting gaming experience. As Electronic Sports is becoming increasingly popular nowadays. There are many professional gamers participating in various tournaments every. As a matter of fact, most professional games require a mice as primary source of input. However, using mice, especially moving and clicking for an extended period of time, brings undesirable wrist conditions.

We are developing a solution to this issue using infrared ray and massage treatment system that is controlled by microcontroller. The system will be able to monitor real-time gamer's wrist condition and provide treatment without making noticeable interruptions so that the gaming competition experience is not affected. And detailed implementation will involve embedded hardware design and C/C++ coding through real time kernels. The final goal we want to achieve is that the relaxation will produce helpful treatment by IR or massage so that the carpals/pisiform and hand muscle never feel painful or stressed after hours of intensive mouse movements. Furthermore, this invention can also help people such as programmers and designers who uses mouse throughout working hours relax their wrist.

MATERIALS AND METHODS

High Level Design

This M.Eng project primarily involves three parts to achieve desired functionality. They are the microcontroller, sensor system and treatment devices. The basic block diagram is shown below that the sensors are responsible for collecting user gaming related information and feed it to the microcontroller. The microcontroller will analyze the data and provide corresponding treatment values to the treatment devices so that the health issue caused by gaming can be mitigated.
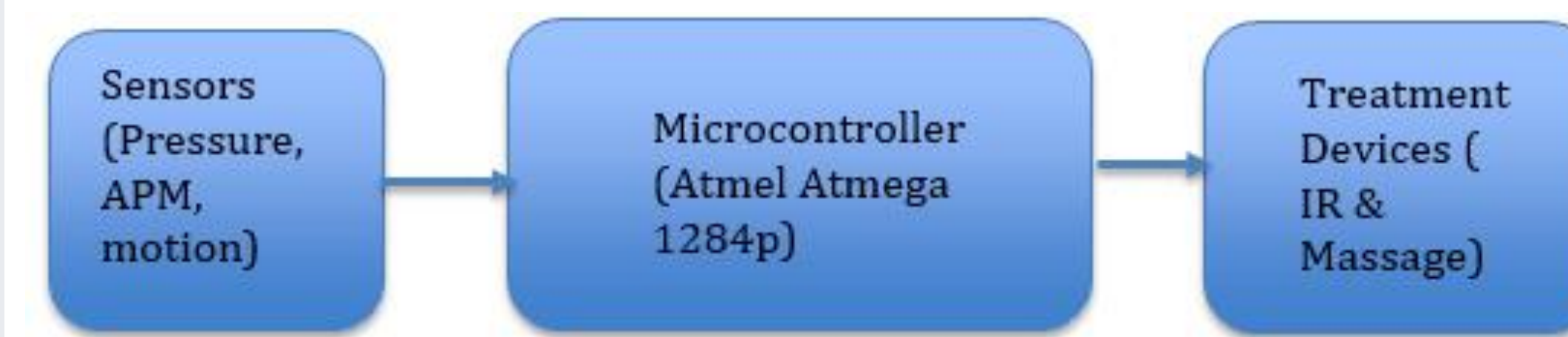
High Level Block Diagram

Microcontroller Design

The microcontroller used for this M.Eng project is Atmel Atmega 1284p due to its easiness of use. This microcontroller has the capability to be used as ADC, taking external interrupt, and providing PWM output. Those are the key features that are used in this project design. And will be explained in the following sections. Furthermore, this microcontroller runs at 16MHz speed that will allow decision making that is fast enough for the medical use. And the codes are done in C using tiny real time kernel so that all measurement and treatment tasks are performed in parallel .

Sensor System

The sensor system is responsible for taking pressure, APM (action per minute), and motion information from user. The pressure is collected by a pressure sensitive resistor and we read the varying voltage level across the resistor. On the other hand, the APM is measured by IR system that all figure motion will result in rising edge of the IR receiver and the microcontroller will read it as external interrupt. In the end, the motion information is collected by a 0.5g analog accelerometer that measures the hand acceleration in both X&Y direction.

Treatment System

The treatment is primarily done in two method. One is through IR heater that will rise the temperature under skin to help the blood flow. This IR heater's current is controlled by the microcontroller so that the heating level will vary according to sensor system input. On the other hand, the massage treatment, which is done by a vibration motor, will mitigate the stress of hand and is controlled by the Atmega 1284p through PWM waveform.

Parts Picture. (From Left to Right: IR, Pressure Sensor, Vibration Motor, Wrap, Microcontroller + Accelerometer)

Picture Explanations

The pictures above are the prototype for this project. The Atmega 1284p development board is provided by Bruce R. Land. In addition, the treatment IR is an tentative solution for demo purpose that professional IR heater should be applied for final product.

The Desired product should be made in flexible PCB so that all electronics can be spontaneously attached to the hand wrap being used for treatment.

RESULTS

Test and Verification

To fully verify the desired functionalities and our design purpose, we first test all coding through AVR studio and putty. The next steps are hardware test to ensure their performance can be successfully read or being controlled by the Atmega 1284p microcontroller. After successfully designing the overall system with the prototype (picture available below), we moved on to real world tests that we let our gaming friends to tryout this product and collect feedback on the satisfaction of this product and potential improvement on design. Regarding to mostly positive feedback, we can safely say that the design is successful and promising for real product.
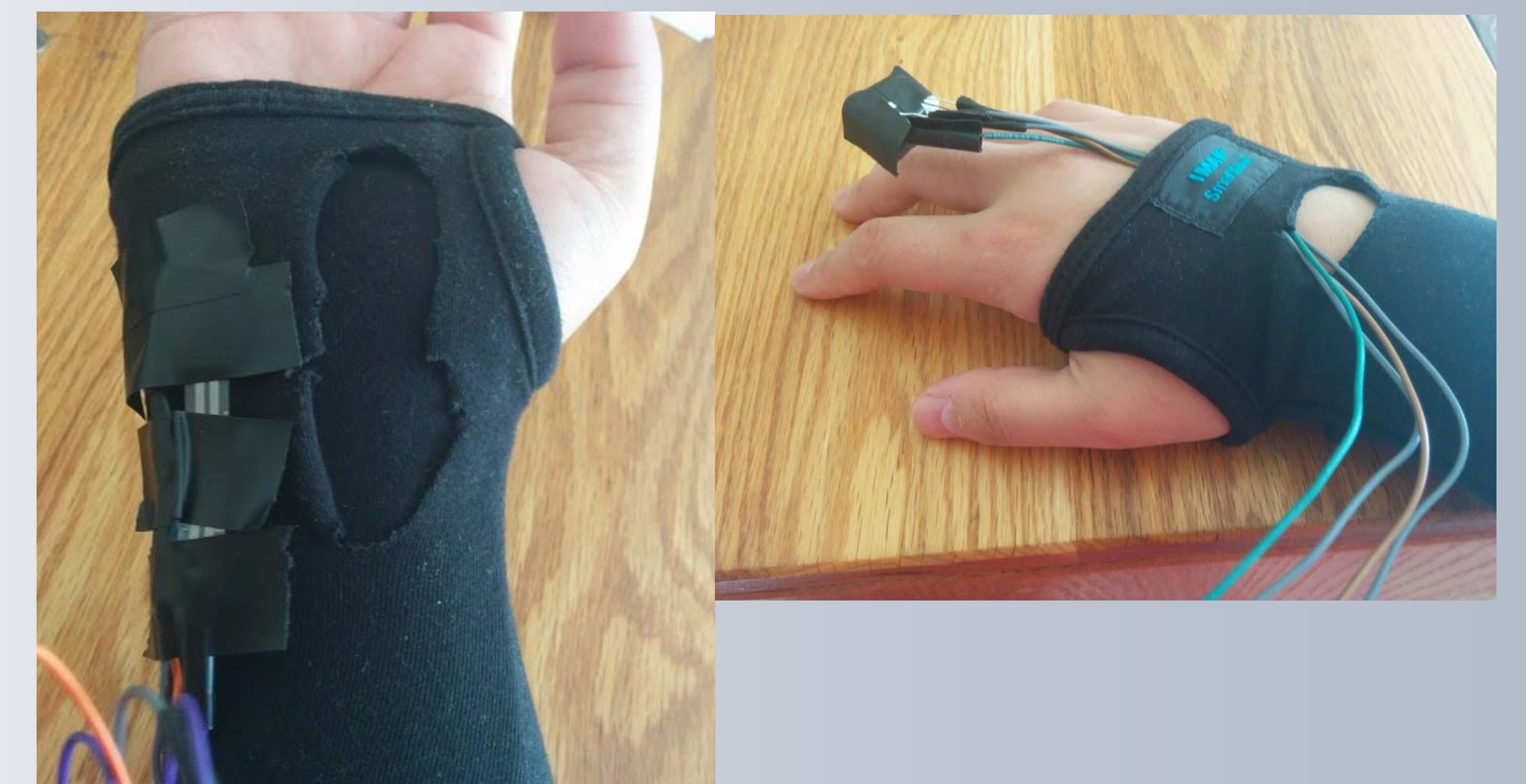
Prototype Picture.

CONCLUSIONS

According to previous description and analysis, it can be found that the solutions to problems described in previous parts are feasible. Then tension on hand due to long time and extensively usage of mouse will be mitigated by using massage and infrared ray treatment. To support such treatment, our successful design in this embedded system will provide the feasibility to provide highly adjustable levels of treatment. With respect to all electronic devices including microprocessor and other sensors, we are able to successfully collect user action and condition data and those data will be processed by the microprocessor for decision making. All detailed schematic and simulation will be provided in further reports. In addition to those approaches that are used during this M.Eng project design, we expect our final product to obtain positive feedback from test users. Further studies and experiments will be needed with respect to biomedical to learn what the best treatment is.

REFERENCES

1. Direction from Bruce R. Land
2. Atmega 1284p Datasheet http://www.atmel.com/images/doc8059.pdf
3. Tutorials from ECE 4760 http://people.ece.cornell.edu/land/courses/ece4760/