To: Professor Paul Ross Date: April 15th, 2014

From: Jacob Hanshaw

Subject: Progress Report on Project Firestone: April 1st, 2014 to April 13th, 2014

**Introduction to Field**

Indoor rock climbing is a healthy and exciting activity that is growing in popularity. However, indoor rock climbing is currently only a poor imitator of outdoor rock climbing. It does not take advantage of opportunities unique to the medium.

For the uninitiated, an indoor rock climbing gym provides a similar experience to rock climbing outdoors by bolting many pieces of rock to otherwise flat pieces of wall. Each of these pieces of rock is called a hold. Indoor walls add difficulty by limiting which holds a climber can use to scale the wall. A collection of holds used to scale the wall is called a route. Matching colored pieces of tape are placed near all the holds on a route to show the climber which holds they can use to complete the climb.

**Problems with Existing Technology**

This system of using tape to mark out routes wastes employee time and tape. Climbers often find the pieces of tape hard to see and peeling tape or layered tape (which occurs either when the gym runs out of potential colors or if multiple routes use the same hold) can be confusing. Since the process is such a hassle, new routes are created rarely. Climbers inevitably feel left out if they have climbed all the possible routes that they can handle or all the routes are either too easy or too hard. Overall, the interaction with the facility is limited and a gym may find difficulties maintaining the interest of the climbers.

**Project Firestone Solution**

Our solution solves these problems and provides new opportunities for gyms and hobbyists alike. We propose that transparent climbing holds be created with embedded multi-color LEDs and touch sensors to tell when a particular hold is in use. These holds would be communicated with wirelessly to allow effortless retrofitting and be controlled through a companion mobile application. This solution allows anyone to create their own routes, routes to be generated for a user of a certain skill level, games to be created that take advantage of the dynamic nature of the holds, and climbers could be ranked based on balance and time taken to complete a route. Users could even create their own custom routes and monitor their progress outside of the gym resulting in greater engagement with a particular gym.

**Value Added**

We believe this solution has market potential with rock climbing gyms as it saves gym owners the constant cost of employee time spent taping up and re-taping routes, the novelty of the product would attract new customers, and it adds engagement outside of the gym through its companion apps and site which could allow gyms to better maintain customers. We also believe that the solution has market potential with hobbyists who create their own walls as the solution saves them effort, is novel, allows them to track their progress as a climber, and allows them greater control over their rock wall.

**Prior Art**

Our research has shown only a single competitive patent. The patent in question was published after our project began. That patent outlines a wireless LED rock climbing hold that uses pressure-sensing technology and communicates with a computer. However, our design uses vibration-sensing technology and communicates with a mobile application. As far as actual products are concerned, there are wired holds that light up, but those would require drilling holes through the wall and great effort to move. There is also no system that exists to control them. There also exists a hold that contains its own battery, but it also cannot be controlled. This means that routes cannot be created.

**Work Completed**

We have already created and tested an initial wired prototype. We have also designed and are currently building a wireless solution which will involve communication from a mobile application to a board that receives http requests and transmits radio signals and through those signals in to the holds. We have successfully prototyped the communication through most of our devices. However, we have used a stand-in component for a piece of hardware that has not arrived yet. Our research is complete and our meeting with the Law and Entrepreneurship Clinic went well. However, we will need to further develop our business plan before going further done that road. Also, we have contacted a videographer and a local designer to aid with logo development and branding.

**Work Remaining**

Our next step is to build our last missing hardware component. The parts for which should be coming in the next couple days. Once we have a basic working prototype we plan to contact local gym owners to get feedback on the desirability of the design, the current cost to the owner, what the owner would be willing to pay for the solution, how the solution is purchased, if the owner would prefer an alternate finance system, and to ask them about any other problems they would like to be solved. We also plan to reach out to rock climbing wall builders and hobbyists for feedback and to learn more about the wall creating process.

Beyond these steps more research into the safety of the design, new features, customer needs, potential market size, profit margins, business creation, and marketing will be necessary. However, many of these steps are beyond the scope of the initial project design.

**Problems**

Through this process, our group has reached several setbacks. Our initial wired prototype was destroyed, finding the proper parts to fit in a small area and with minimal power consumption was difficult, producing our PCB boards and getting all the parts took longer than expected, a patent was recently published that is similar to our idea, an inaccurate layout of the microcontroller was a hard to find bug that has required the PCB boards to be remade, and there have been some problems with networking amongst various devices. However, at this point, most of these problems have been solved. The redesigned PCB boards should arrive soon and network communication has been figured out for the most part. However, the similar patent will likely require communicating with the patent holders and licensing the patent. Up to this point, there have been no problems with the report associated with the project, however, the guidelines for the report do not seem to be geared toward a project report and are therefore somewhat ambiguous.

Appendix A:

This paper records the triumphs, pitfalls, and general progress of the Project Firestone Senior Design Project. The goal of the project is to save rock climbing wall owners time and effort as well as make the entire process of climbing a rock wall more interesting and fun. Research went into the design of this project and that research was done through looking over datasheets and questioning our university professors and advisors. Research has also been done on the market feasibility of such a product. This research has been done by using Google patent search to find similar products, Google search to find similar products, talking to local entrepreneurs, and discussing how to construct a business with the University of Wisconsin – Madison Law and Entrepreneurship Clinic.

yuanyu. (n.d.). LED Climbing Holds. Instructables.com. Retrieved April 1, 2014, from

http://www.instructables.com/id/LED-Climbing-Holds/

The above resource showed a basic do-it-yourself wired light up rock climbing hold design. This gave the project initial direction. It also helped us decide what material to use for the hold.

Barry, E. (n.d.). Power Pitch. Yahoo Finance. Retrieved April 1, 2014, from

<http://finance.yahoo.com/blogs/power-pitch/turning-rock-climbing-hobby->millions-125132801.html

and

Yara, G. (n.d.). Tempe maker of rock-climbing holds turns hobby into livelihood.

azcentral.com. Retrieved April 1, 2014, from

<http://www.azcentral.com/business/articles/20120802tempe-rock->climbing-holds-maker-hobby-livelihood.html

The above resources describe the current market of rock climbing surface holds. These articles help give use initial estimates of the potential market size. They also tell us a bit about what hold buyers desire in holds.

Wireless pressure sensing rock climbing handhold and dynamic method of

customized routing. (n.d.). Google Patent Search. Retrieved April 1, 2014, from <https://www.google.com/patents/US8668626?dq=rock+climbing+hold+wireless&hl=en&sa=X&ei=7f85U_2hHKTr2QWq4IGoBw&ved=0CEcQ6AEwAg>

and

Patent WO2012076825A1 - Climbing hold device and associated climbing wall

system - Google Patents. (n.d.). Google Patent search. Retrieved April 1, 2014, from https://www.google.com/patents/WO2012076825A1?cl=en&dq=rock+climbing+hold+wireless&hl=en&sa=X&ei=7f85U\_2hHKTr2QWq4IGoBw&ved=0CD4Q6AEwAQ

and

Climbing hold device and associated climbing wall system. (n.d.). Google Patent

search. Retrieved April 1, 2014, from <https://www.google.com/patents/US20130337979?dq=wireless+climbing+hold&hl=en&sa=X&ei=Se86U7TEDcOkyQG-hoCYBQ&ved=0CDUQ6AEwAA>

The above resources describe the existing patent applications in the area of our project. This information helps us get a grasp on where the market could be going, what designs would be infringing on other patents, what requires licensing, and what we could patent. This is crucial in designing our product and determining market validity. It is important to note that further research shows that only the “Wireless pressure sensing rock climbing handhold and dynamic method of

customized routing” is actually valid as all other are either expired or only applications that have not been granted.

MSP430 Datasheet. (n.d.). Texas Instruments. Retrieved April 1, 2014, from

http://www.ti.com/lit/pdf/slau278

The above resource is an example of a datasheet. This particular datasheet was of great help to us and helped us design our current board. Datasheets in general are necessary to understand the parts involved and design a circuit to allow them to interact properly.

Despite this research, significantly more research could be done to the design of the project to find alternative technologies, cheaper solutions, and to analyze the strength of the holds. Additional clarification on business feasibility is also necessary. With that knowledge, marketing research could be done by contacting owners of rock climbing surfaces and the design could then be validated. Ideally, through this research and paper, the Project Firestone design team could make an educated design as to whether or not this project should be continued beyond the senior design project class.

Appendix B:

1 Introduction to indoor rock climbing

2 Problems with existing rock climbing wall

2.1 Wastes tape

2.2 Wastes employee time

2.3 Not accessible to users

2.4 Limited interaction and engagement

3 Project Firestone solution

3.1 Solution description

3.2 Affordances through solution

3.2.1 LED illuminated for dynamic changes to routes

3.2.2 Wireless control for instant updates

3.2.3 Easy accessibility for both owners and users

4 Value Added

4.1 New opportunities such as clocking routes and games

4.2 Allows users to connect to the rock wall outside of the gym

5 Initial Market Research

5.1 Similar Patents

5.2 Similar Products

6 Project Design

6.1 Initial Research

6.2 Initial Design

6.2.1 Problems

6.2.3 Solutions

6.3 Initial Prototype

6.3.1 Problems

6.3.2 Solutions

7 Project Testing

8 Business Model

8.1 Customers

8.2 Cost analysis

8.3 Feasibility

8.4 Marketing

8.5 Initial Market Penetration

9 Conclusion on success of the project

9.1 Overall failures of the project

9.2 Overall successes of the project

9.3 Future of the project