Project Firestone

Problem:

-indoor rocking climbing routes

-taping and placing routes is difficult and wasteful

-can only be done by employees

-inevitably people feel left out (too hard or too easy, height differences, etc.)

-tape can be hard to see

-no engagement with users

-no progress tracking

-no impact outside of gym

Solution: (Qualifications)

-indoor rock climbing holds that communicate wirelessly, contain multi-color LEDs, and have a sensor to notice climbers

-routes may be created pseudo-dynamically

-games could be made

-routes may be customized to user

-routes may provide feedback to user

-routes may be created by user

-competition may arise with leaderboards and designing routes outside the gym maintain interest

-companion app and site allow user interaction

Research:

Novelty/Creativity/Innovation/Legal:

-researched similar patents, there are several for light up holds, but none for interactive holds

-interaction plays a major part in the system

Competition:

-one $65 hold without interaction (needs 4 AAA)

-wired options (require wall retrofitting and much set-up)

-one site that does not even allow direct ordering

Product:

Hold Materials:

-Polyurethane

-easy to mold small scale

-touch

-transparent

Battery:

-Needs to be cheap extremely compact with lots of power, preferably rechargeable

-Power density is a major current problem on its own

-Looked at button cell batteries, hearing aide batteries, hobby batteries, and more

-Answer: Camcorder batteries!

-Need large amounts of power and small form factor

-Rechargeable

-High-quantity manufacturing = cheap

Wireless:

-Consider size, cost, and power

-Chose CC430

-Low power

-Antenna

-Balance Size, reliability, cost, and frequency

-Higher = shorter distance, more power more throughput and vice versa

-Chose low-middle of the ground for size and tradeoffs

LED:

-Consider size, cost, power, form-factor, input

-Sampled several, too dim, power hungry, or costly

-Chose \*insert long letter-number name\*

-Small size

-Cheap

-Low power

-SMD

-PWM each LED

Sensor:

-Consider size, cost, power, form-factor, input, sensitivity

-Pressure Sensor

-Expensive, but potentially precise

-Don’t rely on change, so could be used for polling

-Custom Parallel Plate Capacitive Sensor

-Cheap

-Custom headaches, untested, need a lot of validation

-Ultimately unreliable

-Photoresistor

-Cheap

-Requires many sensors and precise placement,

-vulnerable to many different edge cases

-requires light

-activated when body over hold

-Piezo Sensor

-Cheap

-Single sensor

-only activated by changes (could be good or bad,

require always on or activates chip)

-Potentially fragile

-set off by vibrations, so noise from hitting wall or other

locations needs to be filtered out

-non-traditional use-case

Programming:

Algorithm:

-Need to locate holds on wall

-Holds don’t know location on wall

-Holds tell computer their location through color changes

-Need to turn 2D camera input into hold locations

-k-means

-hierarchical clustering

-most like color pixels

-manual placement

-OpenCV libraries

-custom algorithm

Future:

Flexible PCBs:

-Likely needed for tiny holds

Business Venture:

-Patents, LLCs, kickstarters, and the like