Accessible Switches

B14 Final Presentation

What is the problem?

User Requirements

The users seek a solution that is:

-Reliable

-Easy to use

-Affordable

-Customizable

Benchmarking

Good Software
Moderate price
Only 1 switches

word Q 5

Good Software
Good Price
No Physical solution (0 switches)

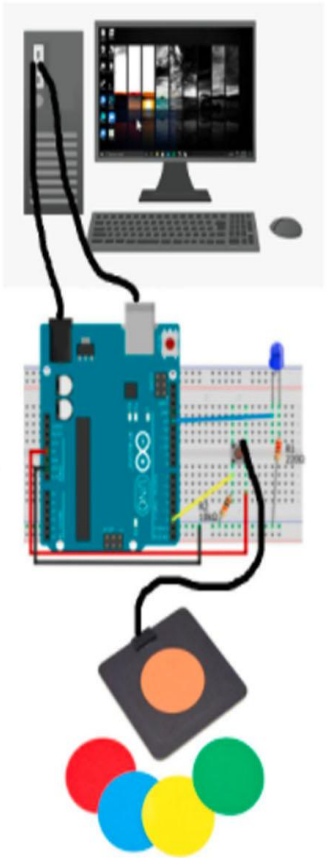
Good Software
Expensive price
5 switch solution

Target Specifications

- At least 3 switches
- Under 100$ CAD
- 2 methods for software implementation
- Options in software for variable speed and colors
- Storage required under 5GB

Concepts

- Ethan G's bisection method of finding the desired cursor
- Ethan B's Arduino Nano idea of transmitting switch signals
- Daniel's idea for interacting with windows



PC recives serial input through USB. Software picks up serial input an uses it to navigate a veritical to horizontal method.

Arduino recives input as a digital high and sends serial input to PC.

Button is pushed, signal sent to arduino.

Feasibility Study

Uncertainties and Risks

- Signal sending properly?
- Will it Short-Circuiting ?
- How inaccurate is the testing?

TELOS Factors

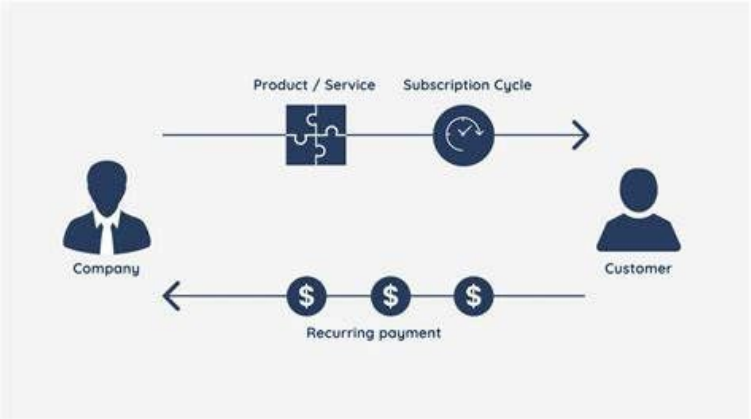
- Expertise in Electrical, Software and Mechanical Engineering
- Benefits
- Open-Source
- Organization and Communication

Business Model

-We chose the subscription business model

-Our product will cost $5.99 a month

-Why?



Economics Study

-First we listed our costs and classified them

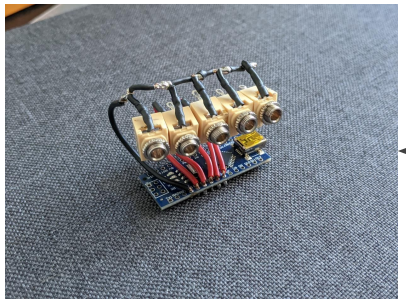
Description	End of Third Year ($)
+Revenue	+$2,300,340
-Cost of Units Sold	-$100,000
Gross Profit	=$2,200,340
-Operating Expenses	-$1,871,250
=Operating Income	=$329,090

-From an NPV analysis, 17460 units have to be sold to break even

Solution

Solution divided into two groups

Hardware Component



Converts physical button press into electrical signal for PC

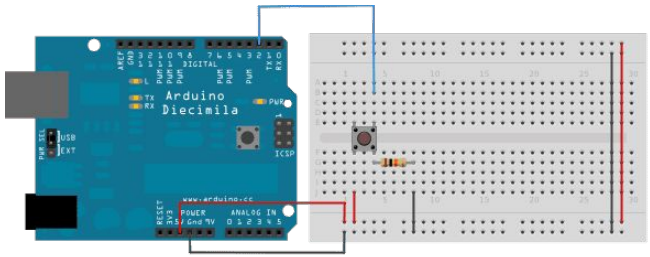
Serial USB communication

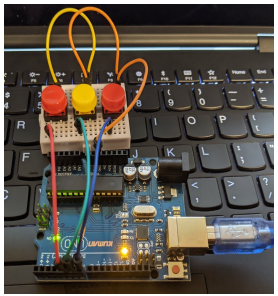
Software Component

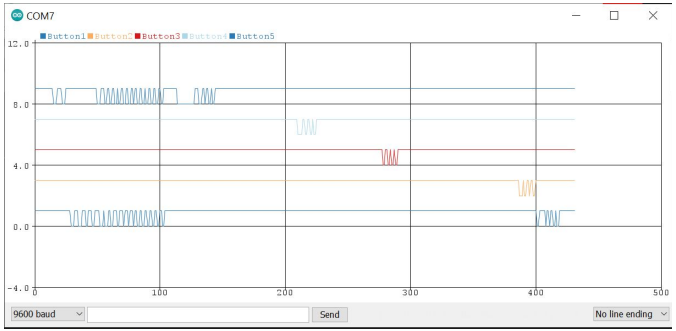
Converts electrical signal into action on PC

Hardware Component

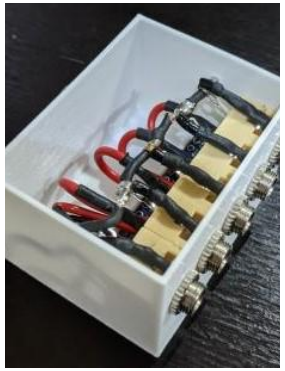
- Existing accessibility switches are Normally Open
- Arduino has built in pullup resistors on digital I/O pins
- Button press breaks pullup (digital HIGH) and connects to GND (digital LOW) when pressed

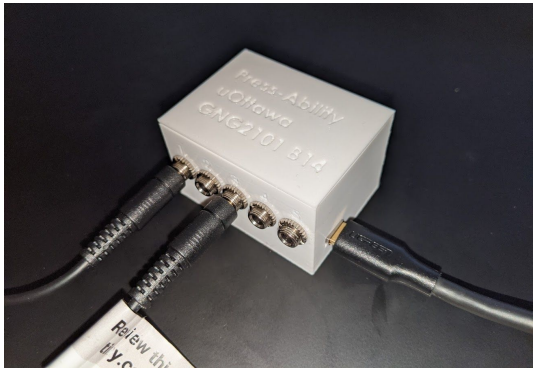






Hardware Component





Final Product features 5 3.5mm Jacks (5 more than the modern smartphone), a USB Mini port, 3D printed housing in PLA with embossed features

Software Component

1. Configuration Form

Required

COM Port - The COM port being used must be identified using windows device manager

COM1

Input Delay - minimum delay between button presses in milliseconds

(default 50)

Shortcut 1 - instantly trigger a specific click with a shortcut

Left Click

JSON Configuration file

2. Windows Mouse control

Decisions made

5 Inputs: Lots of versatility, low cost to add additional inputs

Arduino Nano: Cost effective, uses standard USB Mini, many I/O pins, plenty of CPU power and storage for this application

3D Printed Housing: Rapid Production of Housing, made completely to measure

Open Source allows end user to write own software for specific purposes

Lessons Learned

- Ideally all team members have access to hardware to test with (Difficult due to COVID-19)
- Friction Fit Lid not the best design
- More customisation would be better, allows for more users with different capabilities
- Implement a predictive speech function