

Project Learning – User Interfaces – Touchscreen versus Button Controlled

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The treadmill's speed (and possibly angle) is to be directly controlled by a user before each run. To accomplish this in an easily understandable way, we plan to develop some sort of user interface. This document will explore two viable paths we could take.

Touchscreen:

Most TFT LCD touchscreens with Arduino shields have anywhere from 32 pins to 40 pins. Because of the high number of pins required, an Arduino MEGA or Due is needed. Some forums online suggest using a Due for its faster refresh rate, although a MEGA is still viable. The shields are needed to protect the screens, which usually take 3.2V, and the MEGA outputs 5V. Depending on what we choose, we should make sure all components will share a common voltage, either 3.2V or 5V.



An example of a touchscreen UI, courtesy of HowToMechatronics

The following website allows for bundle purchase of various screens, shields, and Arduino boards, with options to choose between Capacitive and Resistive touch, and Voltage inputs.
<https://www.buydisplay.com/>

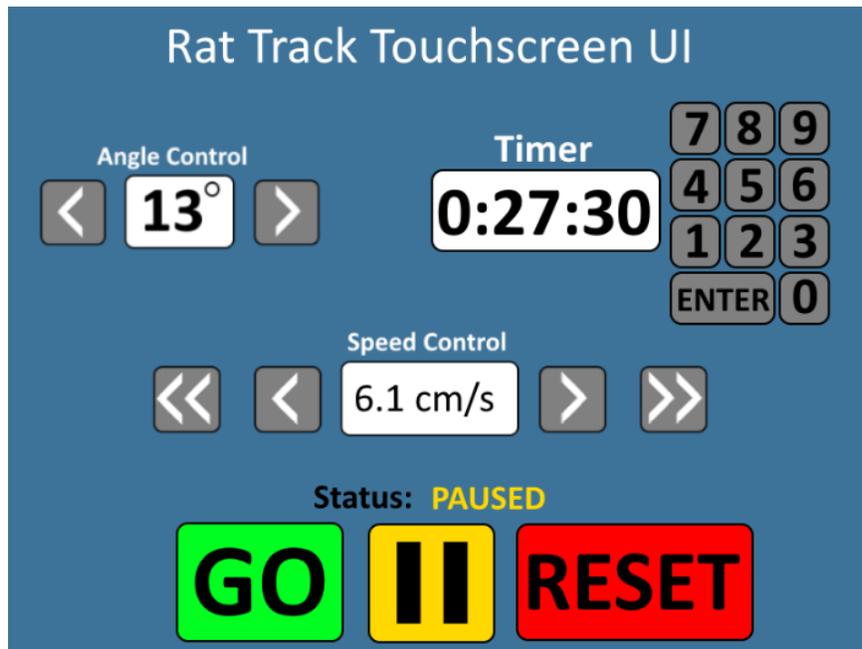
5" Arduino Touch Screen w/Shield – Decent size, Resistive touch. Cost = \$35

<https://www.buydisplay.com/default/5-inch-tft-display-arduino-touch-shield-ssd1963-library-for-mega-due>

7" Arduino Touch Screen w/Shield - Large in size, but more expensive. Cost = \$50-60

<https://www.buydisplay.com/default/7-inch-arduino-touch-screen-shield-ssd1963-library-for-mega-due>

The advantage of touchscreens is that they are slick and can be coded with multiple menus and settings for the treadmill in an easy to use and visually pleasing way. This choice also allows us to add or remove features later without needing to physically change the UI. The downside is that the touchscreen will take slightly more effort to set up and could have performance issues if using a MEGA vs Due.



A possible layout for the treadmill UI

Button Control:

The other option for a control interface is using various buttons, knobs, and switches to change the treadmill settings. This option would require not only push buttons or potentiometers, but also a small LCD screen to display information to the user. The 16x2 character LCD screen will constantly display information about the Speed, Angle, Time, and Status of the treadmill for the user to observe.

16x2 LCD Screen – 16pins (8 data, 2 for V/GND, 2 for Backlit). Not all pins need connections

Cost = \$6

https://www.amazon.com/Arducam-Display-Controller-Character-Backlight/dp/B019D9TYMI/ref=as_li_ss_tl?s=industrial&ie=UTF8&qid=1533376904&sr=1-3&keywords=16x2+Character+LCD&linkCode=sl1&tag=howto045-20&linkId=cb36ca5f805d3851cffa2d03146f1685

Push Buttons – Likely need Off-Mom function, (Solder Lug terminal) Cost = ~\$0.50 - \$2 ea

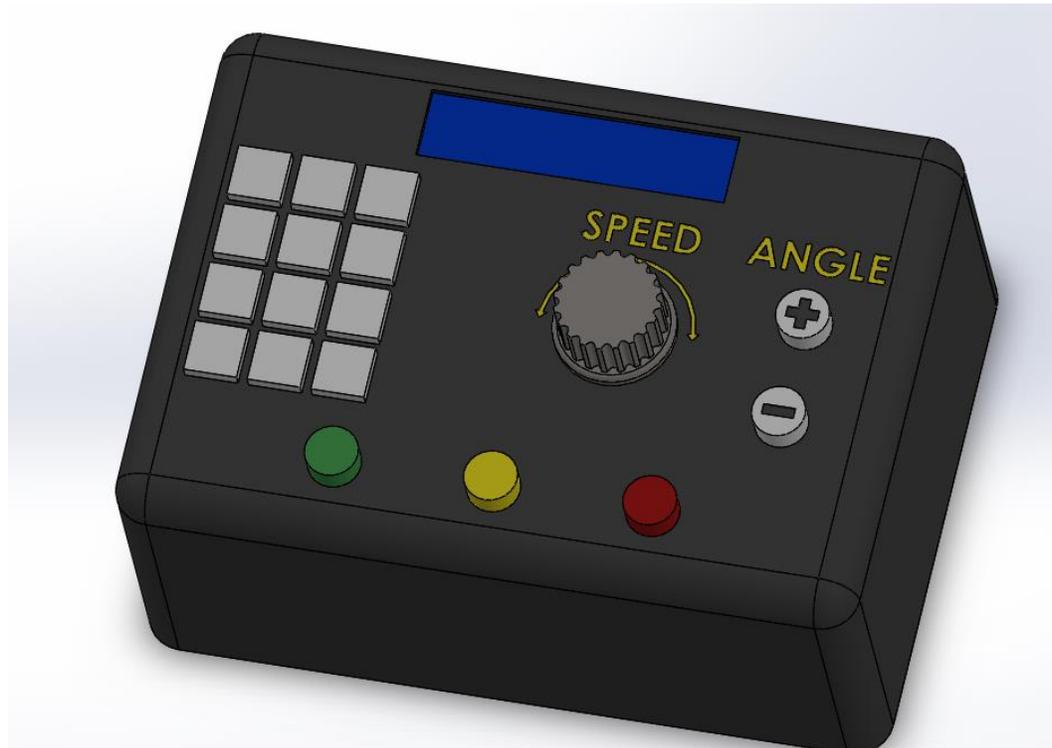
<https://www.digikey.com/products/en/switches/pushbutton-switches/199?k=&pkeyword=&pv258=34&sf=1&FV=ffe000c7&quantity=&ColumnSort=0&page=1&pageSize=25>

Potentiometer w/Knob – (Rotary type, Not necessary, but would be nice. Cost = ~\$1 - \$3

<https://www.digikey.com/products/en/potentiometers-variable-resistors/rotary-potentiometers-rheostats/84?k=potentiometer&k=&pkeyword=potentiometer&sf=1&FV=4080022%2Cffe00054&quantity=&ColumnSort=1000011&page=1&photo=1&pageSize=25>

<https://www.digikey.com/products/en/hardware-fasteners-accessories/knobs/568>

9 Digit Keypad – Potentially needed for inclusion of timer. Cost = ~\$3



Mockup of a Button Control Panel

A button interface is extremely easy to program and understand. It will allow for tactile feedback when controlling the treadmill and may feel more solid than the touchscreen. The downside to this design is that it has much more wires and soldering required, which could one day fail. The design also will be much more difficult to change later if we decide to add/subtract any features.

Conclusions: Both designs are feasible and can be implemented in a way that will be easy to operate for any user. Both options will take up a lot of pins on the Arduino board, and have their own difficulties and drawbacks. Because the team has no real preference for how the control interface should 'feel' for the user, both options will be presented for the client to decide.