

Interactive Console Design for a Mars Rover Exhibit

Overview

Cardinal Space Mining and the Science Center of Iowa (SCI) are collaborating to design an exhibit on remotely programming a rover.

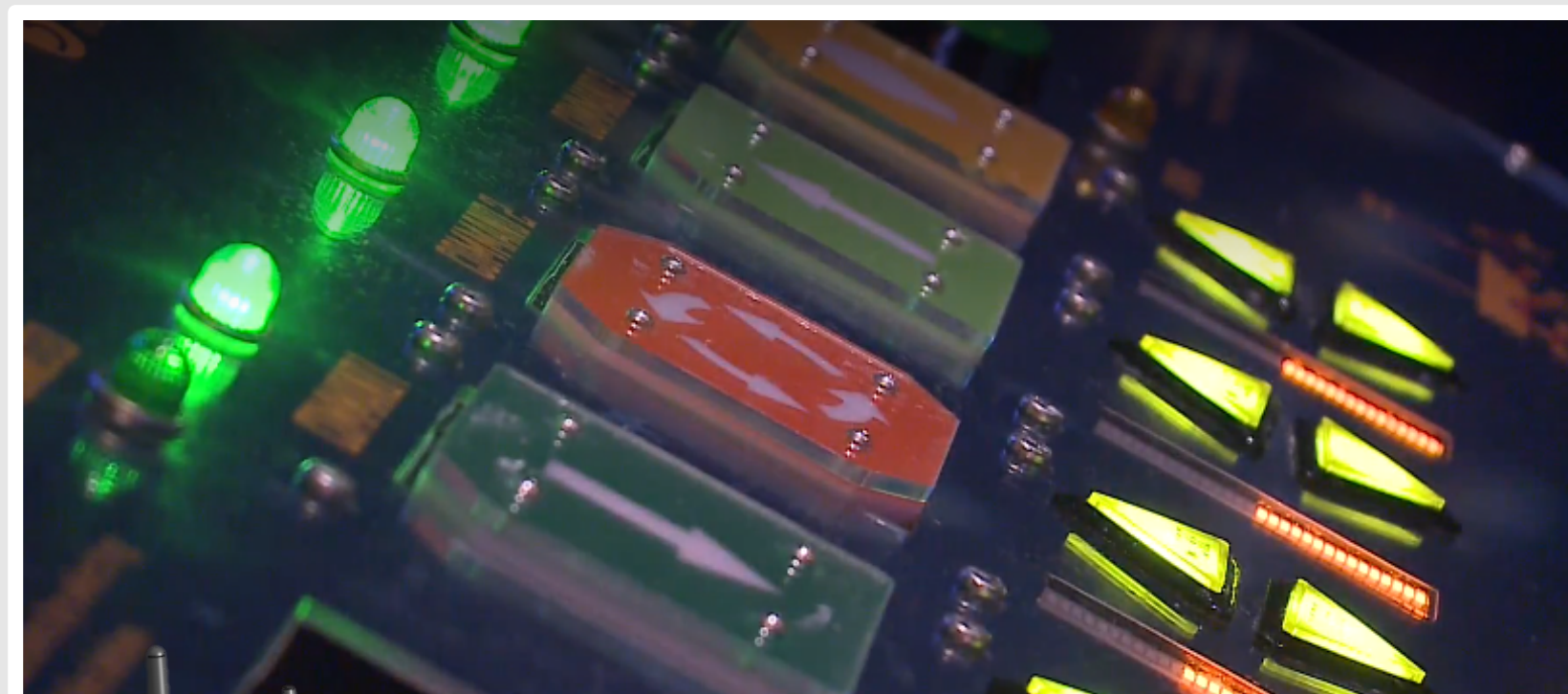
This project will document the design and construction of the interactive console.

Objective

Design a console easily understood and accessible by all ages

Methods

- Review exhibit literature and previous accessibility studies
- Prototype testing to assess understanding and usability of the exhibit



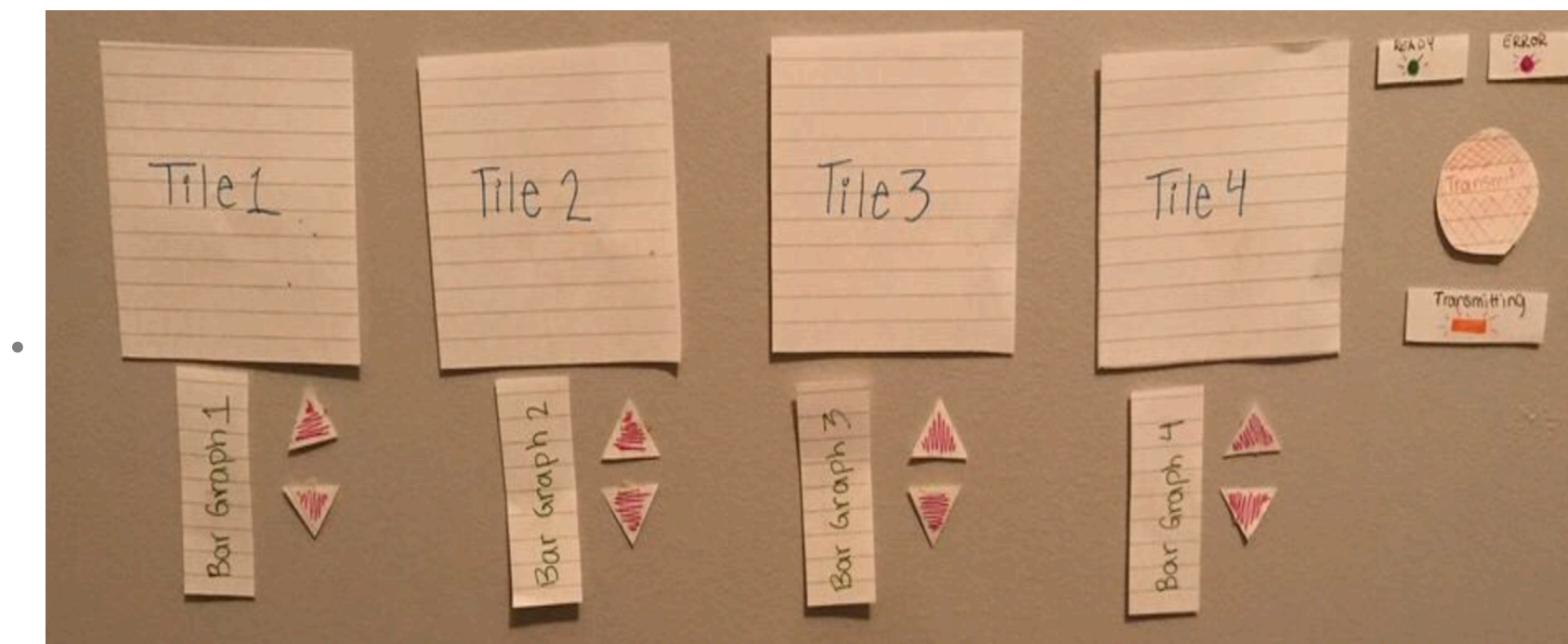
Above: Close-up of final console installed at SCI as shown on Who13.com

Left: Rover Design

Design Process

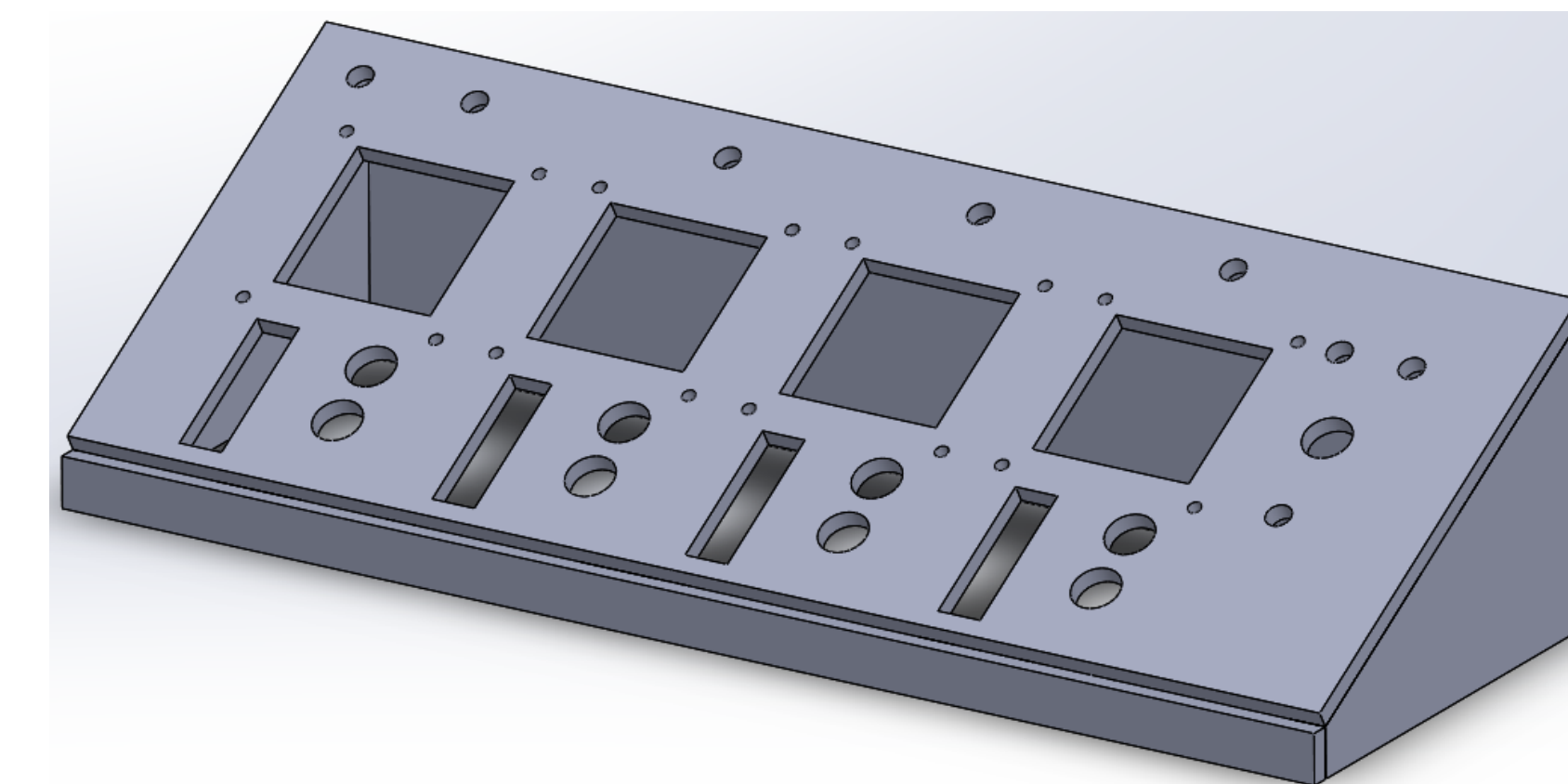
1. Layout mapping with paper cutouts

Layout was chosen to maximize flow and minimize space.



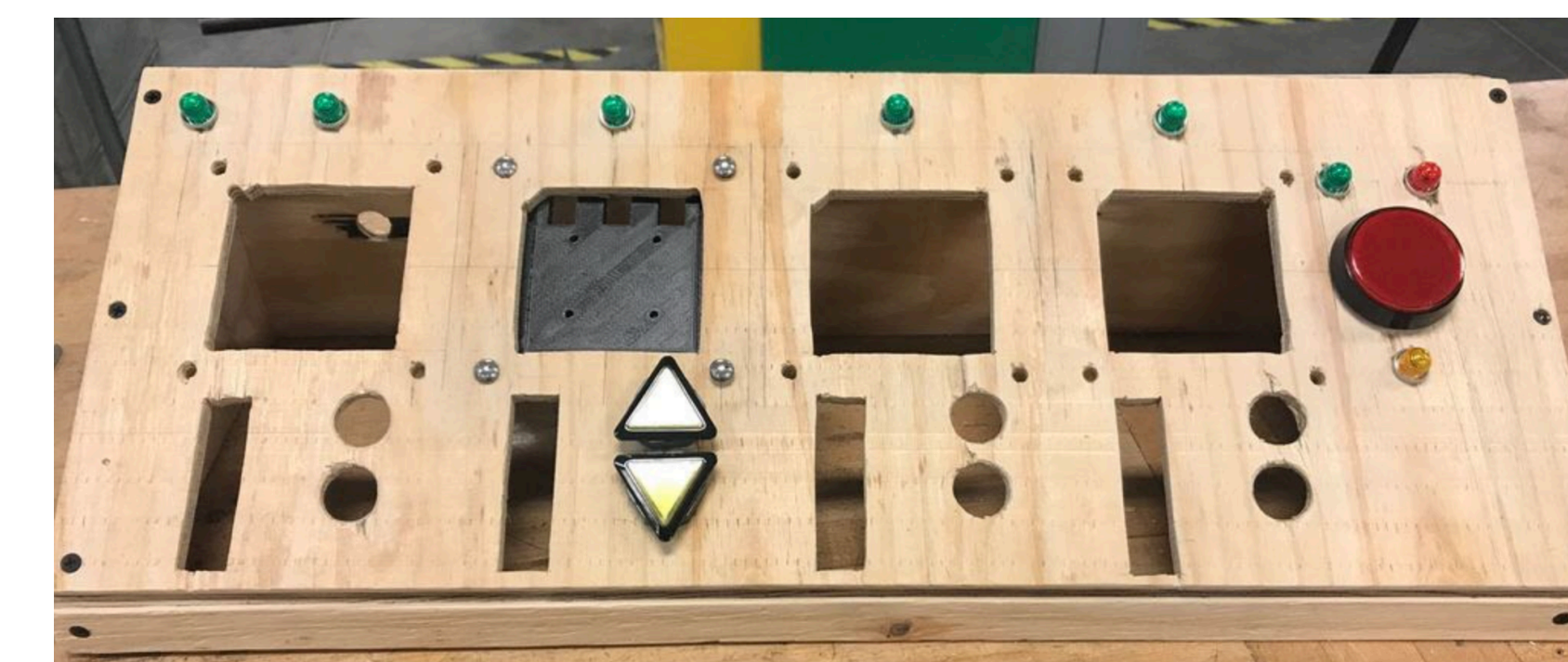
2. Initial SolidWorks assembly

Features like slant angle and display height were determined based on exhibit literature.



3. Hand-cut plywood prototype

Hand-cutting took hours and was prone to error. A CNC would be used for the final console.



4. Completed prototype testing setup at SCI

The colored tiles are placed in the console. Mechanical switches differentiate between the tiles. Arrow buttons are used to adjust magnitude of the instruction labeled on the tile. LED indicators are used to show when tiles are inserted, the rover is ready, the code is transmitting, or there are errors.



5. Final console body without polycarbonate layer

The final console is made of 3/4" high density polyethylene (HDPE). HDPE is known for its high strength-to-density ratio. The LED and button components are mounted to the HDPE and a layer of transparent polycarbonate is layered on top.



Results

In evaluating the prototype, it's suggested that all future consoles use RFID components rather than mechanical switches. Mechanical components tended to stick or break, making them unreliable.

A double-layer design also resulted to improve durability, improve component mounting, and distinguish interactive components from display components. A top layer of polycarbonate protects light displays while the second layer of HDPE will allow for rigid structure with secure and flush mounting.

Conclusion

The prototype was successfully tested at SCI and improvements were made before design, build, and installation of the final exhibit. There is currently one console and rover located in the "Why the Sky" exhibit at SCI. Another console, along with another round of improvements, will be built and installed in December 2020.

Collaboration

Allison Schwanebek Director of Exhibits, SCI
Bridgett Harvey Exhibit Coordinator, SCI
Dagny Paskach..... Industrial Engineering
Nathan PaskachComputer Engineering

