Slithering Snake Switch Adaptation

Design Rationale

Version: 1.00 Date: 06/22/2021

Background on Device Conceptualization:

The purpose of this project is to adapt the slithering snake toy to be useable with switches. The snake is remote controlled and there are buttons on the remote for “forward,” “left,” and “right.” This device was switch adapted in a Tinkered Toy Box video, however, only the “left” button was switch adapted.

Existing Similar designs:

Existing toy:

https://www.mastermindtoys.com/products/black-remote-controlled-snake?variant=39342584594565&currency=CAD&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag_organic&gclid=Cj0KCQjwlMaGBhD3ARIsAPvWd6hC3qxFJlHCPsFYmhoKjvyCmAArNMqn2ue9xZ4P9MzGM7CuQ2e0OgsaAleHEALw_wcB

Tinkered Toy Box video provided toy adaption concept and basic wiring tutorial:
https://www.youtube.com/watch?v=ZQzStC5GnnY&list=PLqXc2oqdc5jDcFlYttTzFnOQKCHOn_w0y&index=1&t=750s&ab_channel=AnnArborDistrictLibraryAnnArborDistrictLibrary

Objective of Device:

The objective of the device is to allow a user with limited motor skills to control a remote controlled snake toy. The adaption allows the user to plug three switches into the remote to have control of the “forward,” “left,” and “right” movements of the snake.

Ideation of components:

Component 1: Mono Jack Box

The mono jack box was designed to hold and protect the mono jacks. This component was added because there is not enough room inside the egg remote for three mono jacks and due to the curvature, it is difficult to mount them to the egg.

Component 2: Mono Jack Box Lid

The mono jack box lid was designed to allow wires to enter the box while keeping the mono jacks protected. The lid is held with screws and the idea of a snap fit lid was explored.

Prototyping:

When it was found that the existing egg could not hold three mono jacks, a number of designs were considered including sourcing different mono jacks, creating an entirely new remote, and creating a new top for the remote. Considering ease of sourcing components, the building process, and user needs, it was determined that sending the wires out of the egg remote and into another 3D-printed component, would be the best solution given the constraints.

First Iteration

The first iteration of the design used a snap fit lid. Half spheres were created along the upper edge of the box and half sphere shapes were taken away from the inner edge of the lid.

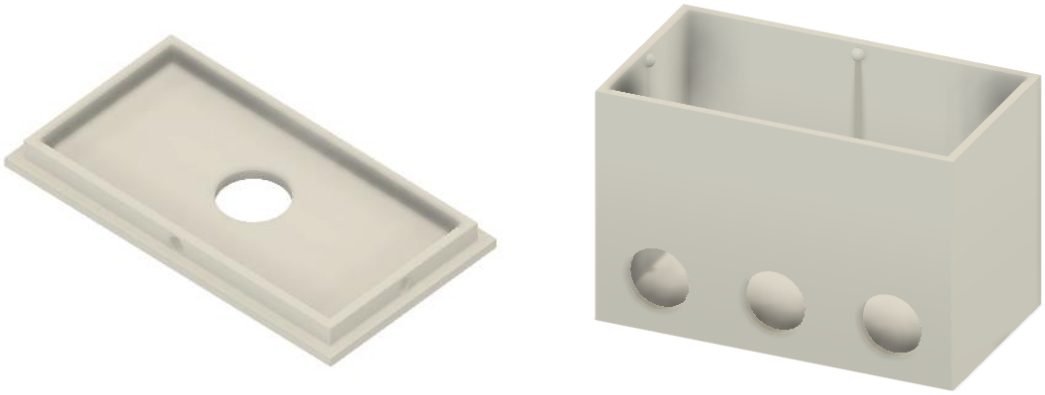

Figure 1: CAD Model of First Iteration

The first iteration design was 3D printed in order to create a working prototype as shown in Figure 1. It was found that the electrical components of the overall design worked. The test 3D print was done at low quality so the snap fit lid did not fit well and tape was used to keep the lid on for the working prototype.

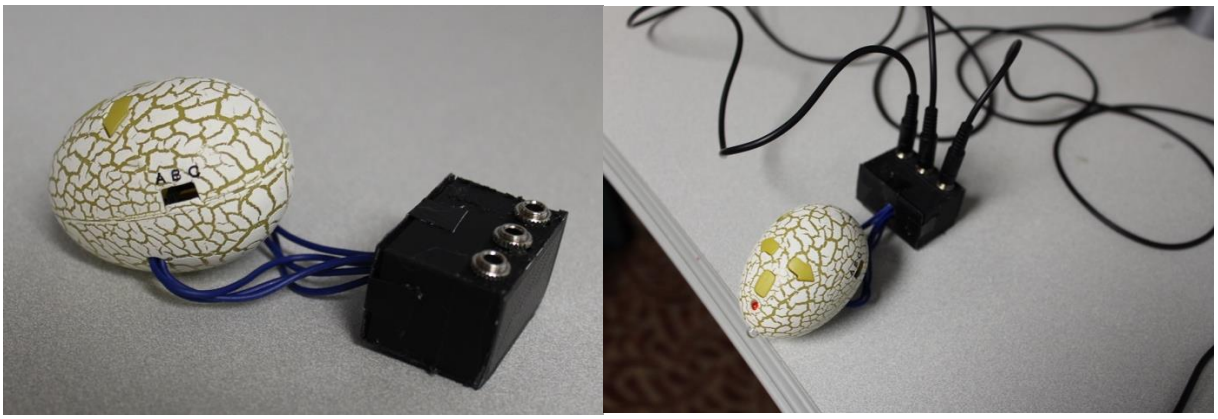

Figure 2: Working Prototype of First Iteration

Second Iteration

The second iteration was developed so that the lid would fit onto the box even with a poor quality print. Arrows were also added onto the box so that the user will easily know which switch controls which direction of movement.

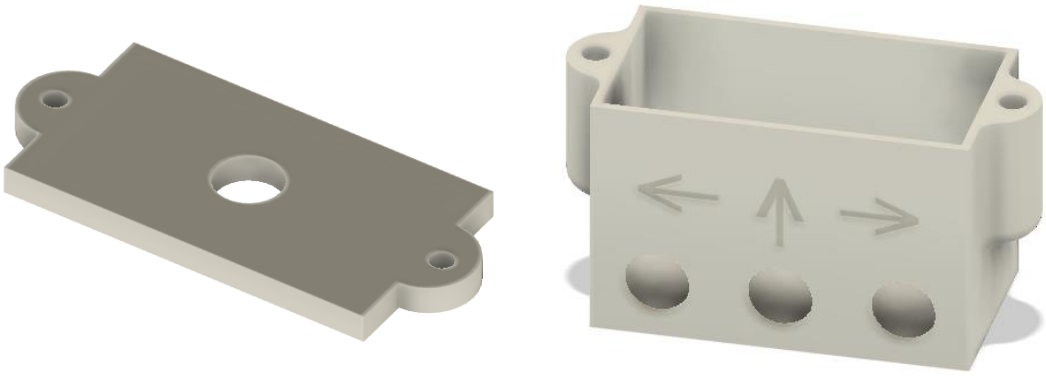

Figure 3: CAD Model of Second Iteration

The second iteration was printed at a higher quality to better test the lid's fit. In order to have more wire stability and a cleaner looking end product, heat shrink wire wrap was also added to enclose the wires. Longer wires were also used so it would be easier to put together.

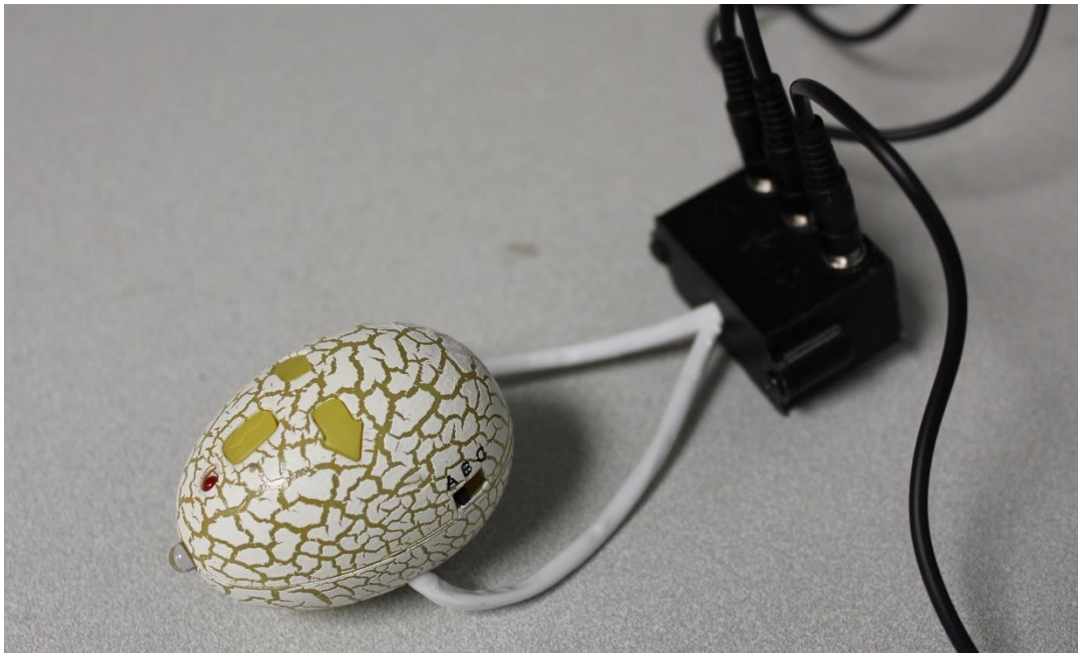

Figure 4: Final Design

Final Design Rationale:

The final design was chosen based on its ease of use and ease of building for unexperienced makers.

Existing Egg Remote

The existing egg remote serves as a housing for the circuit board, led light, buttons, arrow button covers, frequency switch, and batteries. Two holes are drilled into the remote so that additional wires can exit the egg.

3D Printed Mono Jack Box

The 3D printed mono jack box was designed so that the mono jacks could be slid inside, in their correct orientation, then pushed through a hole and secured with a nut. There is ample clearance to complete this instillation. Arrows were added to the outside of the box, over each of the mono jack holes. These arrows indicate which direction the switch plugged into it will control. There is a cylindrical screw hole on either side of the box. This hole has no threads, but the metal screw installed in it will easily be able to create its own threads when screwed into place.

3D Printed Mono Jack Box Lid

The 3D printed mono jack box lid was designed to cover the mono jack box and protect the components inside. It has a lip on one side that fits inside the mono jack box. This serves as a guide for the lid placement before the screws are installed. This lip is shown in Figure 5. There are holes on either side of the lid that the screws go through. The large hole in the centre is the hole that the wires enter the box through.

Figure 5: Underside of mono jack box lid

Opportunities for Improvement:

-Wires are tight inside of egg, could still consider 3D printing an entirely new case (downsides are uninstalling battery connections from existing case and reinstalling may be difficult for some makers, ensuring original buttons will still be accessible, ensuring led light still visible, ensuring frequency switch still accessible, remote no longer snake themed)

-Could add glue around wire connections to the plastic pieces if these connections feel unstable. Wires in the prototype were tight enough to the hole that this did not seem necessary.

Credited Resources Used In Development:

[1] Tinkered Toy Box: Slithering Snake, uploaded by Ann Arbour District Library Channel

https://www.youtube.com/watch?v=ZQzStC5GnnY&list=PLqXc2oqdc5jDcFlYttTzFnOQKCHOn_w0y&index=1&t=750s&ab_channel=AnnArborDistrictLibraryAnnArborDistrictLibrary