Raindrop Switch
DESIGN RATIONALE

Makers Making Change
A Neil Squire Program

Overview

The Design Rationale is intended to provide designers and maker information about the design process and design decisions behind the development of the Raindrop Switch, a small, cost-effective, 3D-printed assistive switch.

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Introduction

The Raindrop switch originated as an open source equivalent of the Mini Cup switch from AbleNet

An adaptive switch is an input-output device that allows an individual with a physical disability or limitation to independently activate assistive technology devices and switch-enabled devices.

The proposed switch uses push/press as activation method to activate other assistive technologies. The commercial small push/press AT switches cost roughly $75. The proposed switch intends to lower the cost down without losing necessary functionalities.

Requirements

The goals and requirements outlined here can be used to assess if a device would meet the needs of a user, and determine when a design is sufficient for release.

Goals

G01	The mini cup switch shall work as well as other commercially available assistive switches.
G02	The switch shall be activated when a user applies force to the top of the switch.

Functional Requirements

F01	The switch shall be activated by applying an activation force.
F02	The activation force shall be no larger than 140 gf (1.37 N).
F03	The activation travel shall be no larger than 4 mm.
F04	The activation surface shall have a contact area no larger than 25 mm diameter.
F05	The switch shall operate in any orientation.
F06	The switch shall activate when the activation force is applied at any point on the activation surface.

Non-functional Requirement

NF01	The switch must be able to be assembled by a maker.
NF02	No specialized tools shall be required to assemble the switch.
NF03	The user contact surface shall be cleanable with a damp cloth.
NF04	The user contact surface should be cleanable with alcohol.

Constraints

C01	The total material cost of the switch shall not exceed $10.

Commercially Available Options

Options that can be purchased but not made by a maker.

AbleNet Mini Cup Switch

Title / Name of device	Mini Cup Switch
Link	https://www.ablenetinc.com/mini-cup-switch/
Author	AbleNet
Cost	$85.00 USD

The AbleNet Mini Cup Switch is a small, durable accessible switch that works with any 3.5mm compatible device.

Requirements Met	Requirements Unmet
G01, G02, F01, F02, F03, F04, F05, F06, NF03, NF04	C01, NF01, NF02

Useful Design Features

- Waterproof

Detailed Design

The final design for the raindrop switch is a 3D printed enclosure around a standard tactile button. A monocable is soldered to the button, and hot glue is used to attach the cap to the button, the button to the base, and for strain relief on the cable.

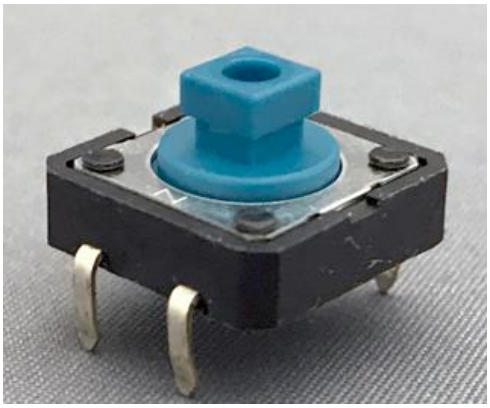
Physical Component / Enclosure

The base and cap of the switch are 3D printed, with the electronics held in place with hot glue.




Electrical Components

The final electronic components are a tactile switch, and a 3.5mm mono cable.



Opportunities for Improvement

Physical Component / Enclosure

Use of hot glue could be eliminated, with a captured switch cap that is resistant to bumps and falling apart.