



Infant Therapy Device for Cerebral Palsy

Kevin Felt | Thomas Fork | Pedro Dominguez | Bryan Contreras
Bryan Luippold | Benjamin Flores | Akhil Kamarajugadda

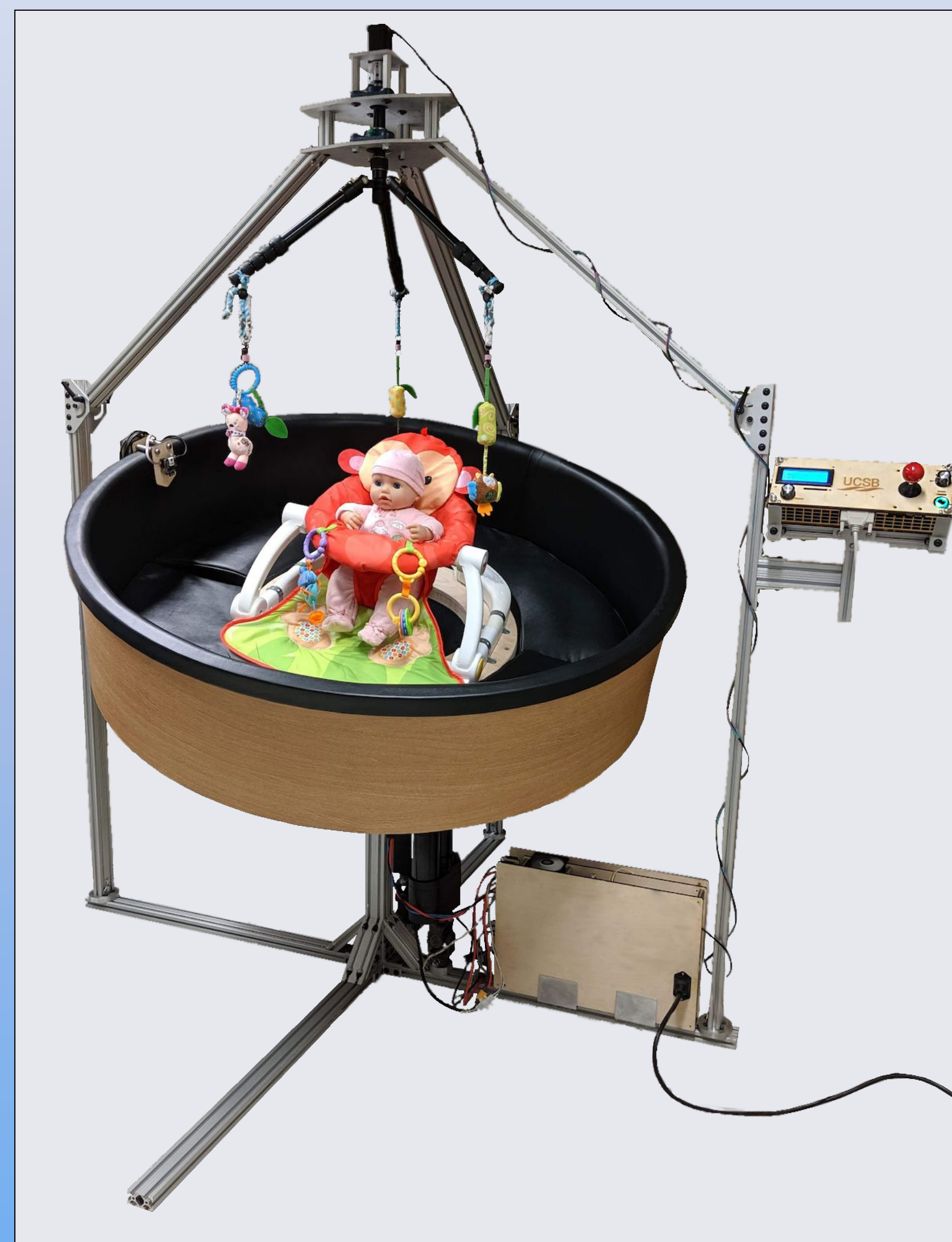
Overview

FitNest is a revolutionary, in-home system that provides physical therapy to infants at risk of developing cerebral palsy. Due to insurance limitations, therapy is usually only provided for 30 minutes a week. This system uses a motorized tilting platform and a half exercise ball to replicate “tummy-time ball therapy” which stimulates critical muscle engagement and postural development. FitNest also features a rotating overhead toy mobile and a capacitive touch button box to encourage muscle activation and stimulate interest.

Background

- Cerebral palsy (CP) is a muscle impairment disorder that affects motor function, muscle tone, and posture
- Increasing regular exposure to physical therapy has shown promising results in rehabilitation.
- Neuroplasticity, which peaks during infancy, is the brain’s ability to develop and learn. Providing infants with early therapy strengthens this ability.

Final Design



FitNest Testing



Therapy Session	Test 1	Test 2	Test 3
Reaches for toys	1	4	50
Tummy Time (w/out crying)	2:21	6:32	21:04

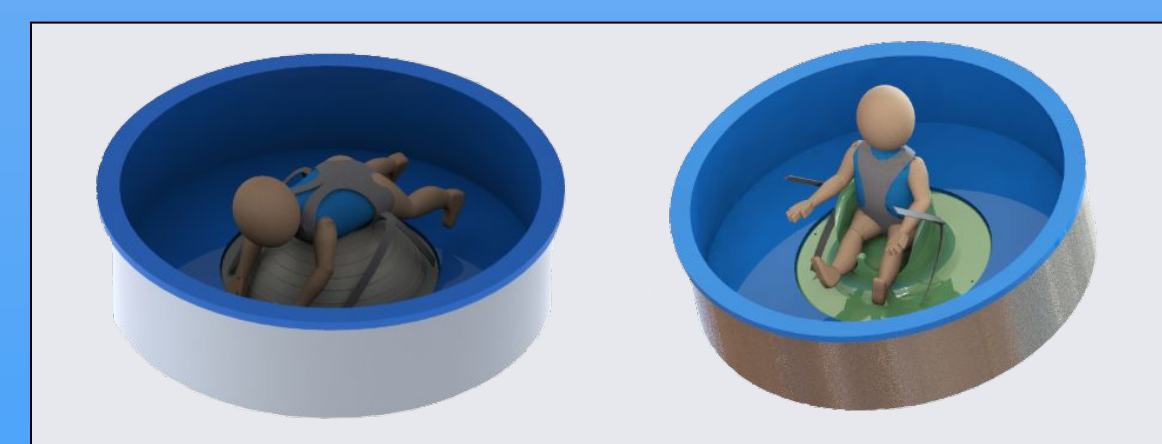
- Improved time spent in prone without crying after 3 tests
- Physical therapists confirmed helpful engagement of key postural muscles during therapy

Systems Breakdown



Safety Harness Load Testing

Test	Failure Load	Failure Mode
Strap to Strap	424 lbs	Stitching
Steel Ring	491 lbs	Webbing
Sewn Buckle	72 lbs	Buckle



Cylindrical Tilt Platform

- Padded aluminum platform for prone or seated infant
- Clip-on safety harness
 - Button box toy inside
 - Removable / washable cushions

Interactive Button Box

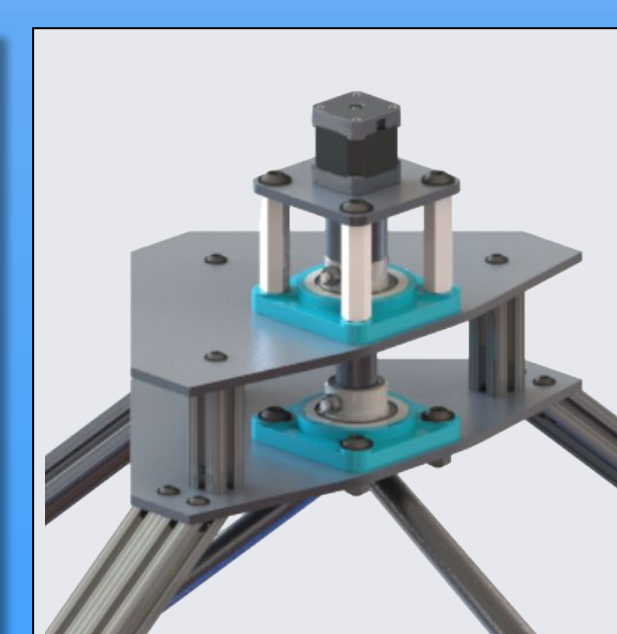
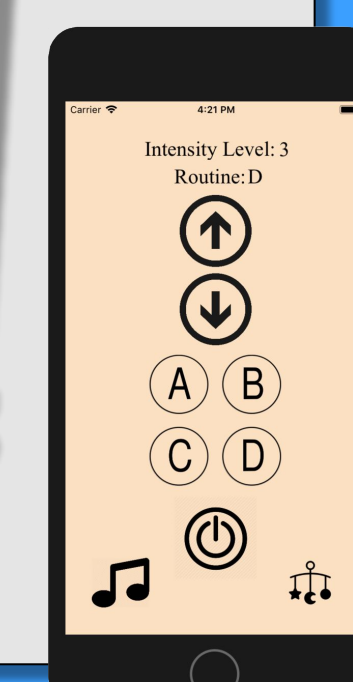
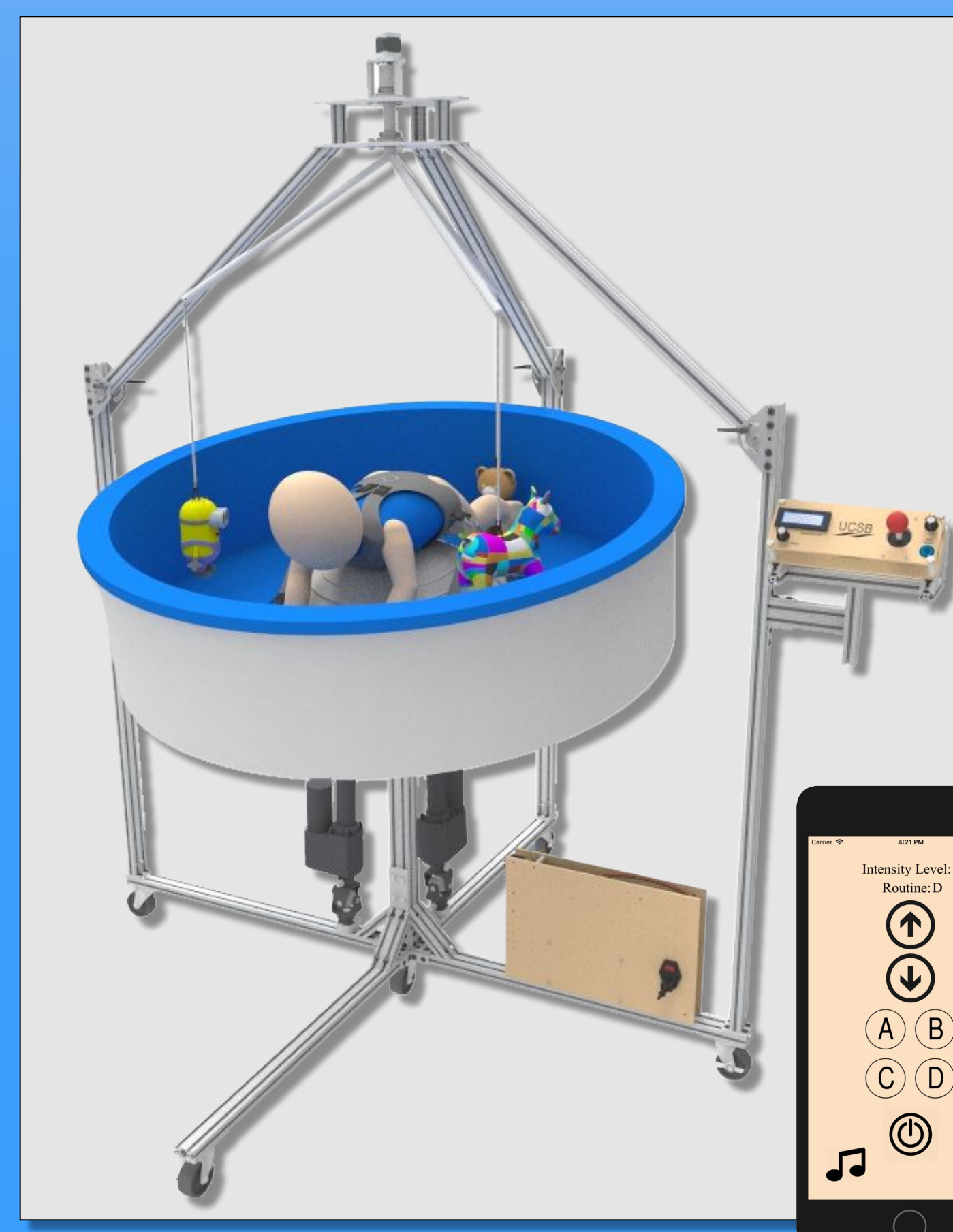
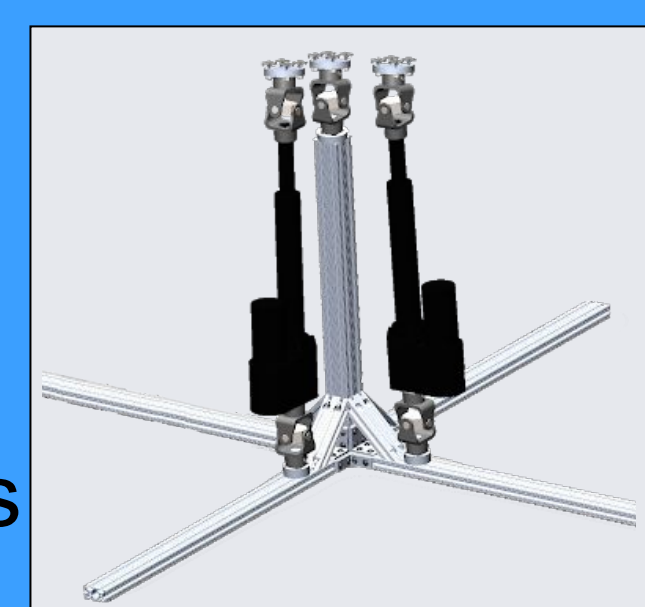
Custom toy for babies at risk

- Capacitive touch
- Customized sounds, lights, and graphics



Tilt Mechanism

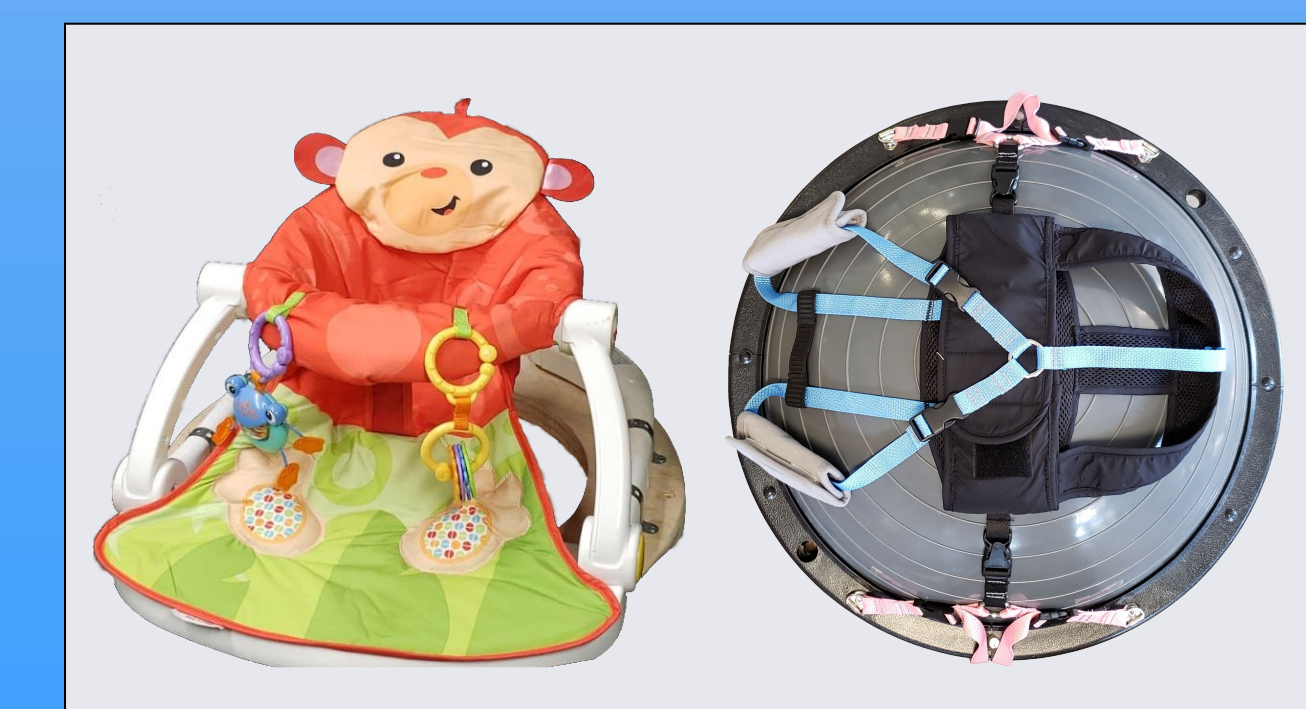
- Two DC linear actuators coupled with u-joints
- Max Speed: 26 deg/sec
 - Thrust Capacity: 560 lbs
 - Max Tilt Angle: 30 deg



Overhead Structure

Designed to rotate a mobile overhead with hanging toys

- Manual or continuous rotation with speed control



Controls

Control panel and electronics box allow user to control the tilt with a joystick

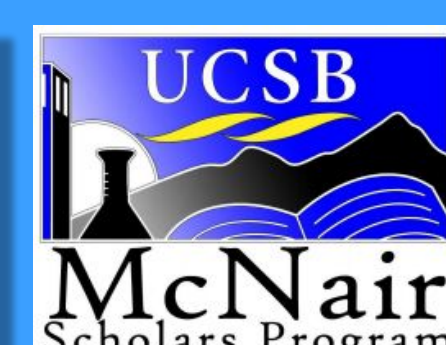
- Bluetooth connected app allows user to control device from their phone



Custom Harness and Chair

Interchangeable bosu ball and chair for prone and seated positions

- Harness safety factor of 3.6
- Adjustable for 6mo - 2yr olds



Acknowledgements:

Jane Harpster, Brittany Roberts, Rebecca Fretz, Mindy Nelson, Bob’s Auto Salon, Andy Weinberg, Sean Linley, Michael Matheson, Dave Bothman, Dr. Trevor Marks, Dr. Tyler Susko, Gwen Susko