

Reconfigurable Pinball Machine

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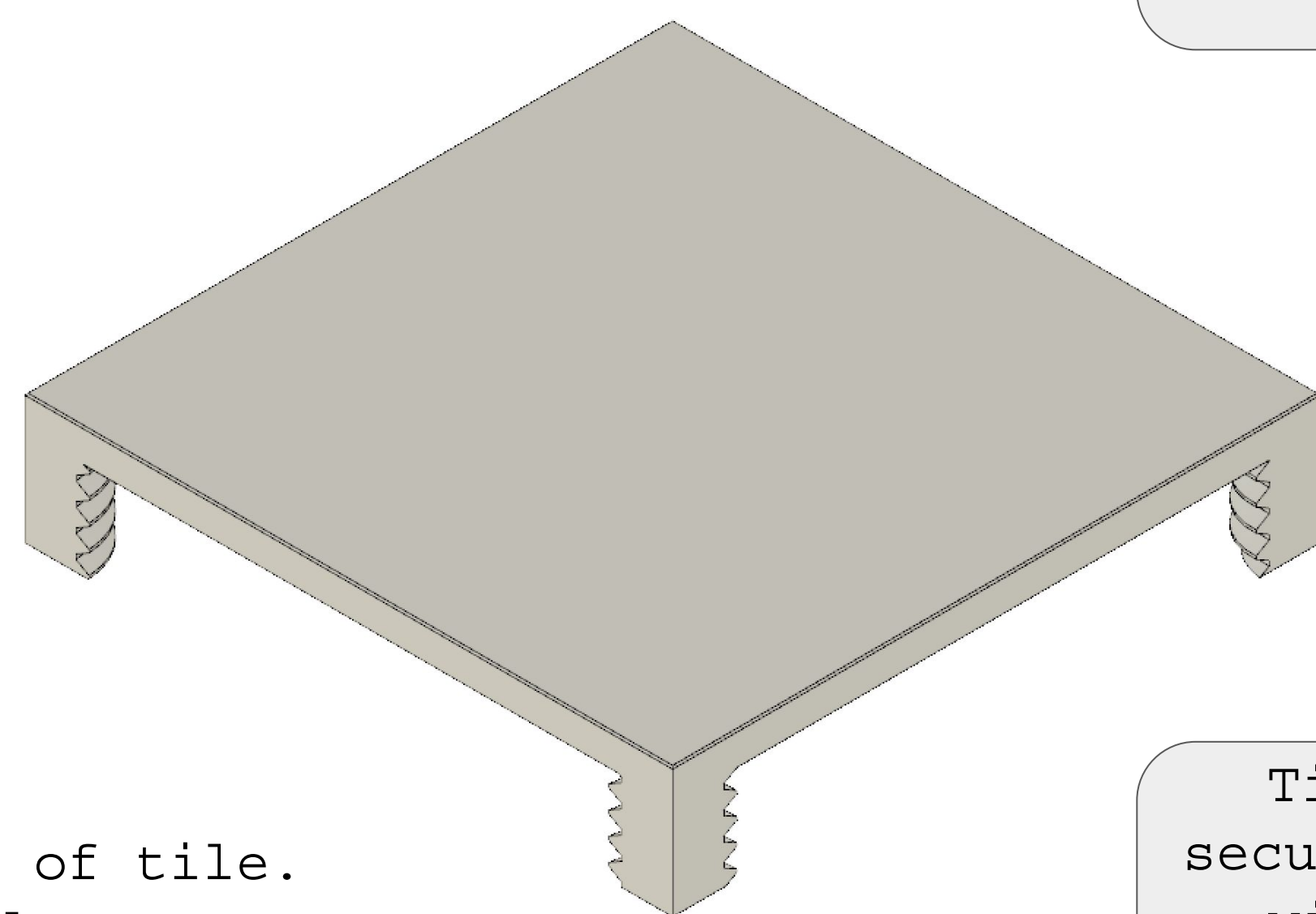
Introduction

The goal of this project was to create a reconfigurable pinball machine. Reconfigurability could be accomplished through changing hardware and/or software. Reconfigurability is desirable as it will allow for:

- Keep the game fresh by changing gameplay periodically
- Reduce machine downtime for repairs
- Change out tiles with brand new designs

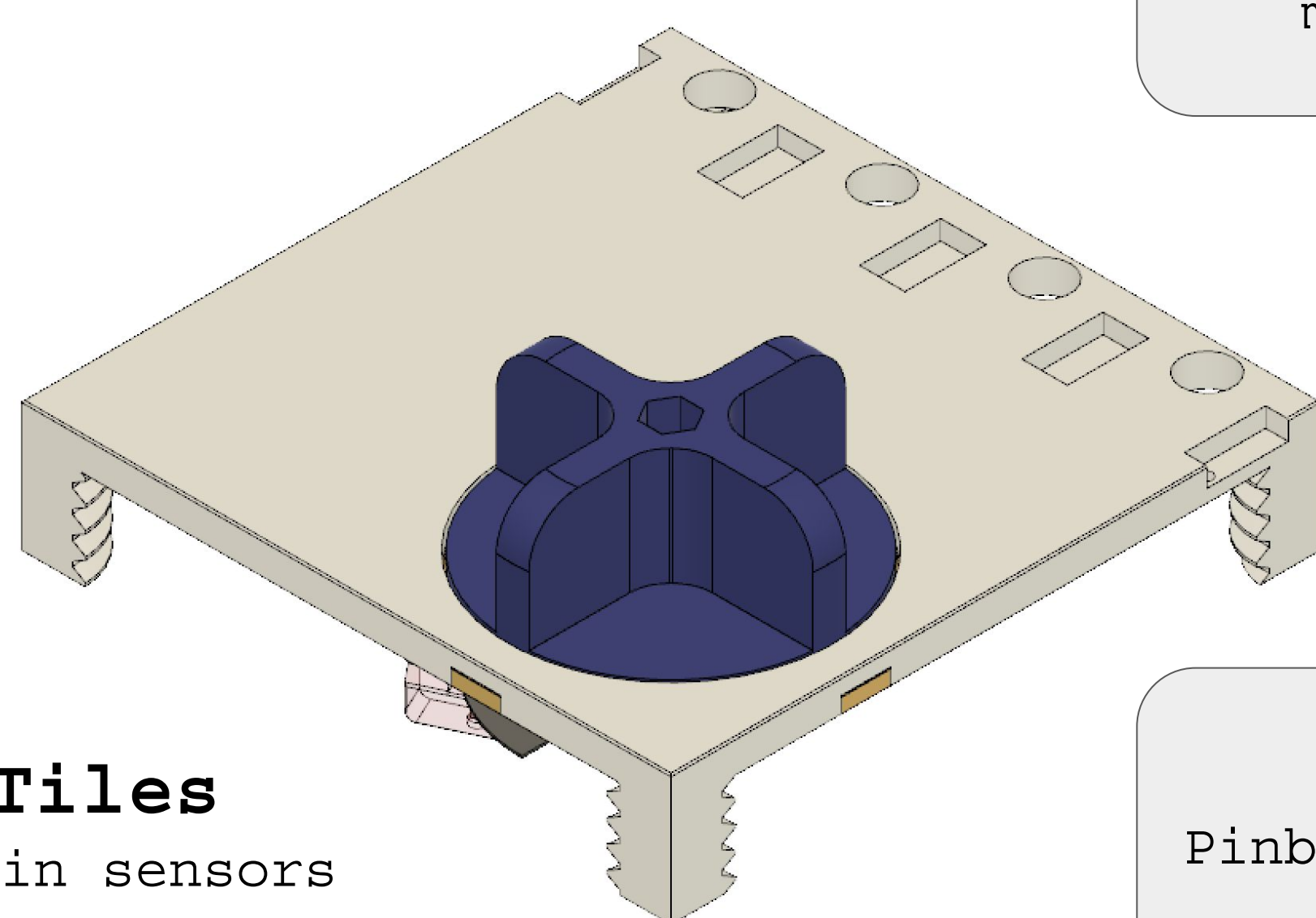
Grid-Based Tile System

The play area was broken up into interlocking, 20cm by 20cm tiles. Each tile would contain its own unique set of play elements. Depending on the types of play elements, tiles fit into one of three categories described below.



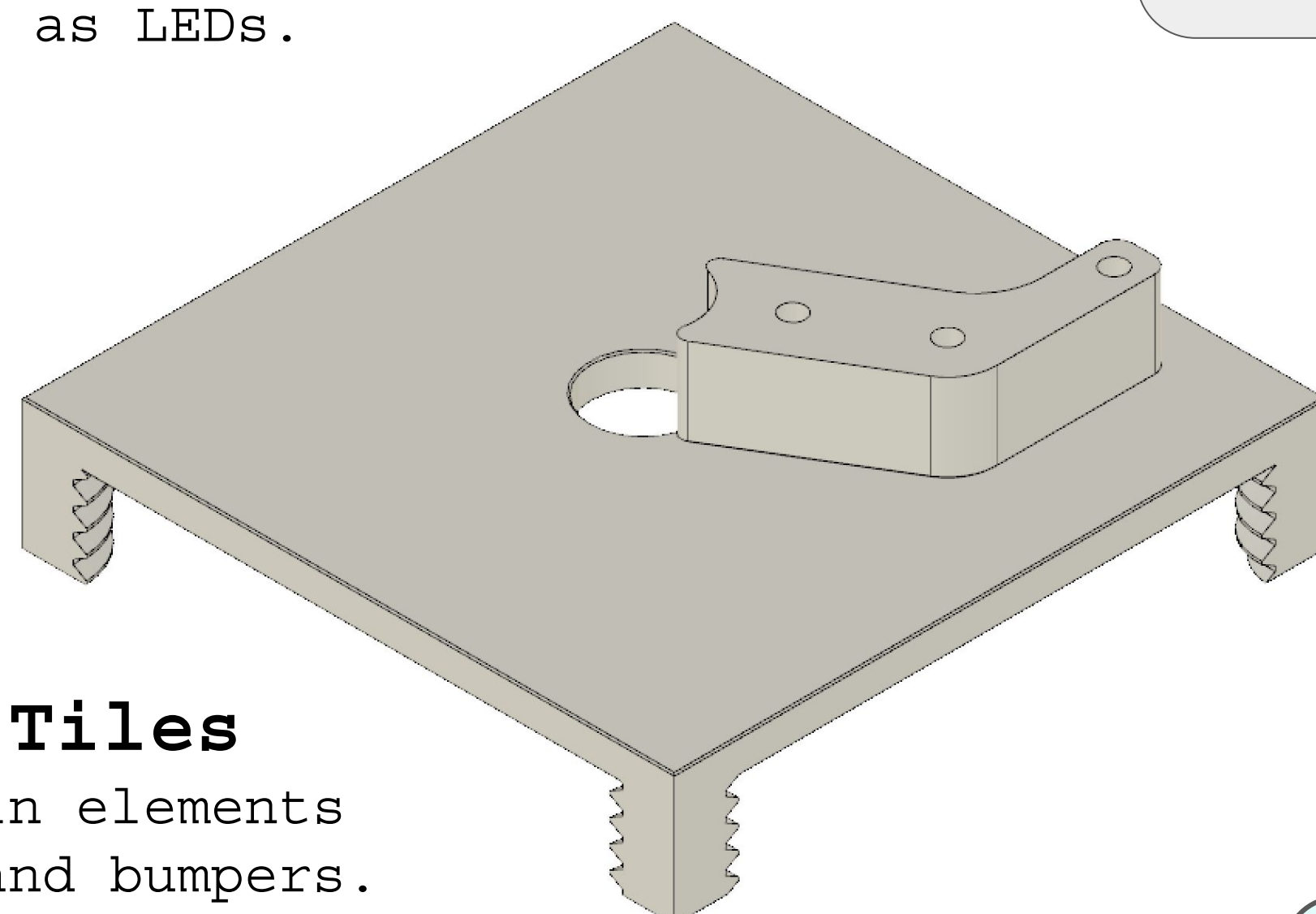
Blank Tiles

The simplest form of tile. They contain no elements.



Low-Voltage Tiles

These tiles contain sensors for scoring and other 5 volt devices such as LEDs.



High-Voltage Tiles

These tiles contain elements such as flippers and bumpers. Elements like these require 24 volts for operation.

Machine Overview

Scoring elements



Flipper button

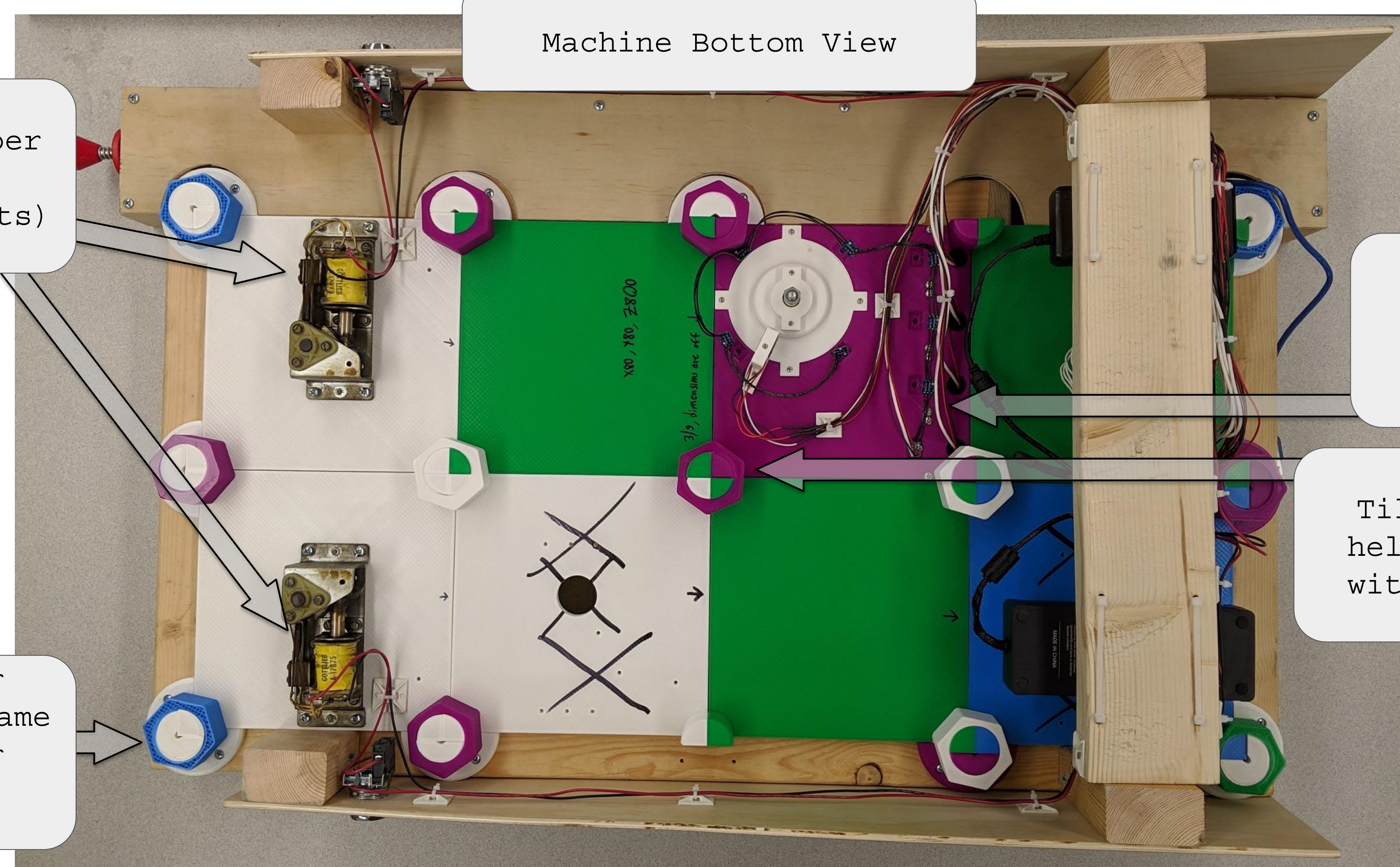
Machine Bottom View

Pinball flipper solenoids (electromagnets)

RGB LEDs

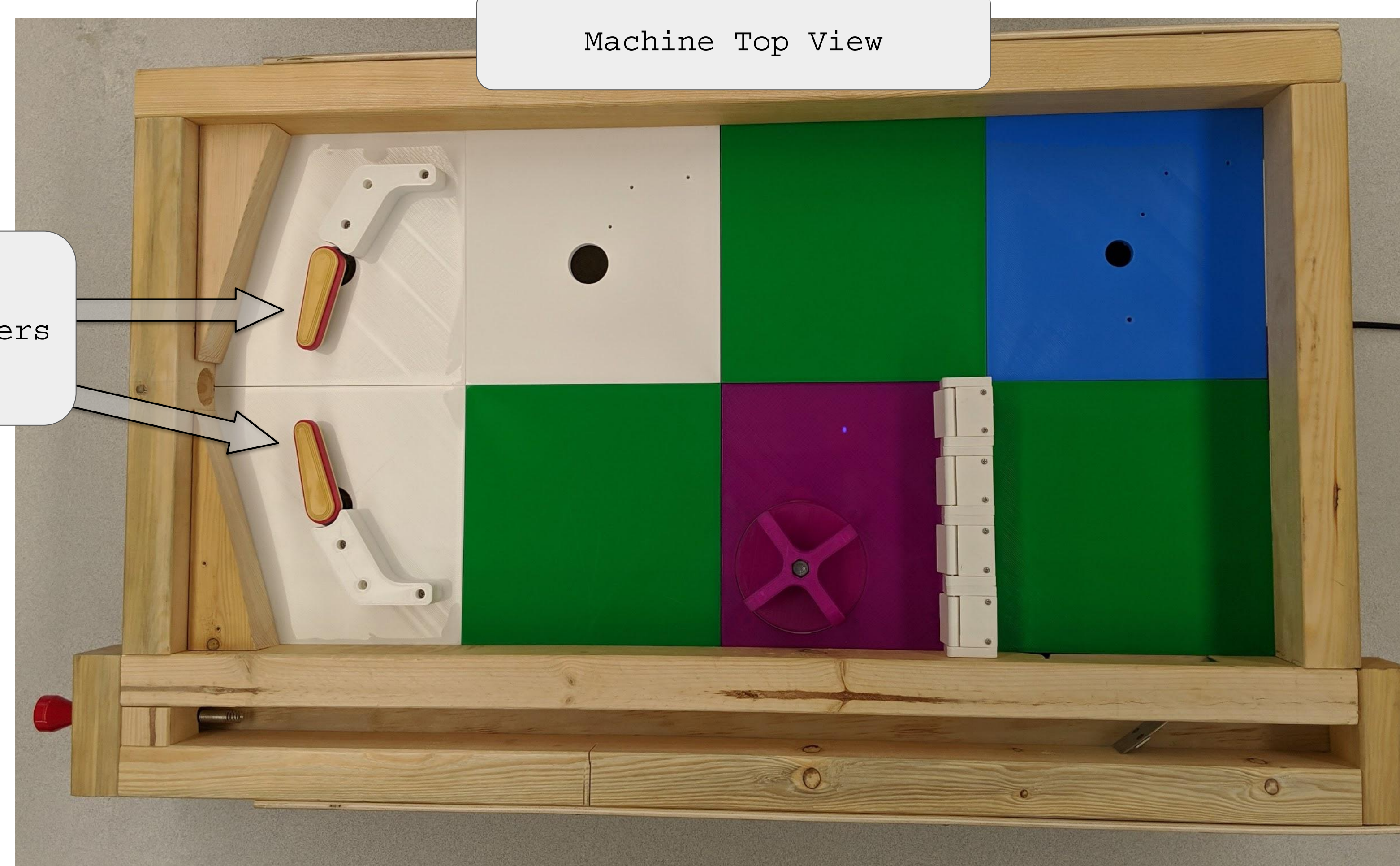
Tile corners held together with fastener

Tile corner secured to frame with corner mount and fastener



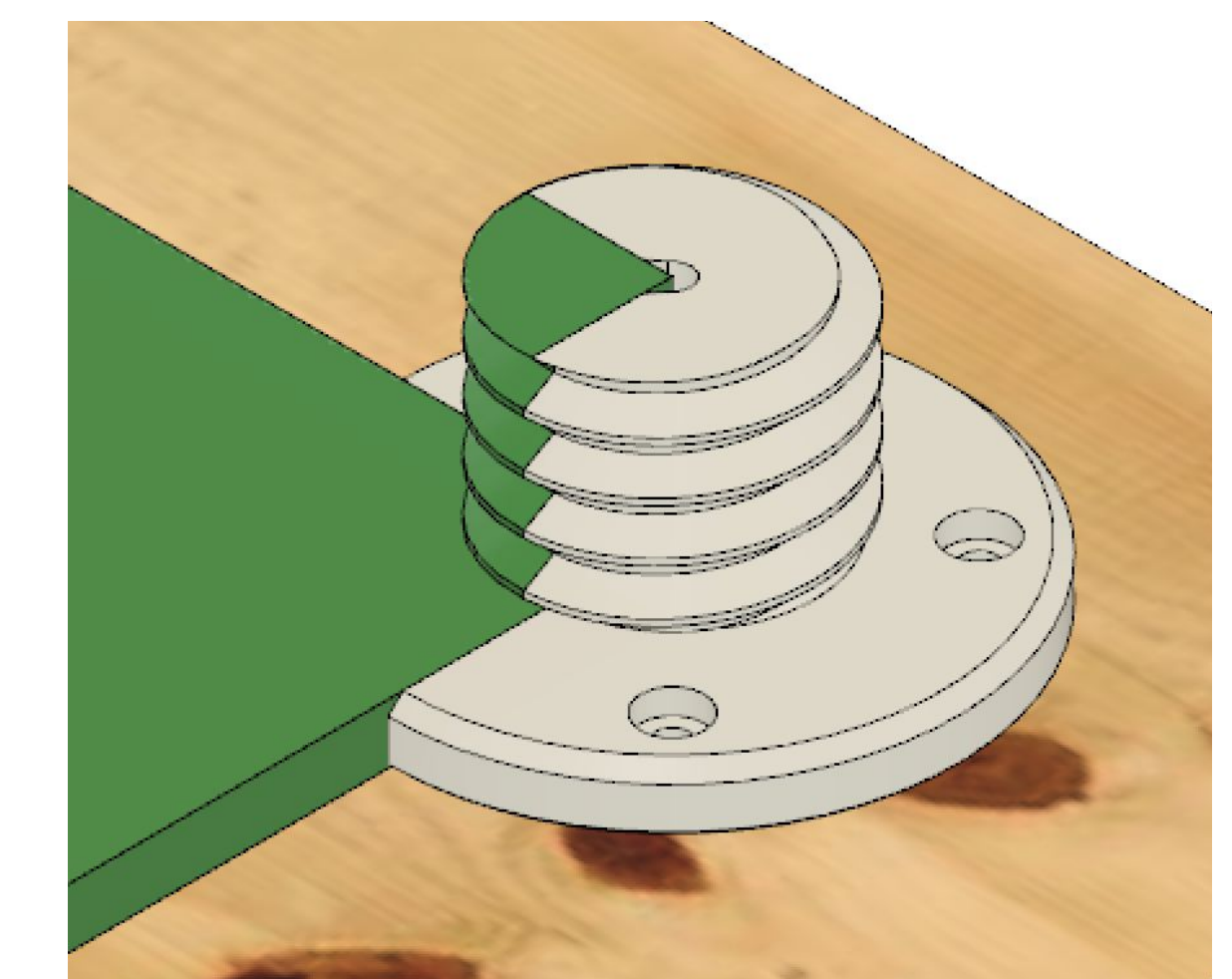
Machine Top View

Pinball flippers



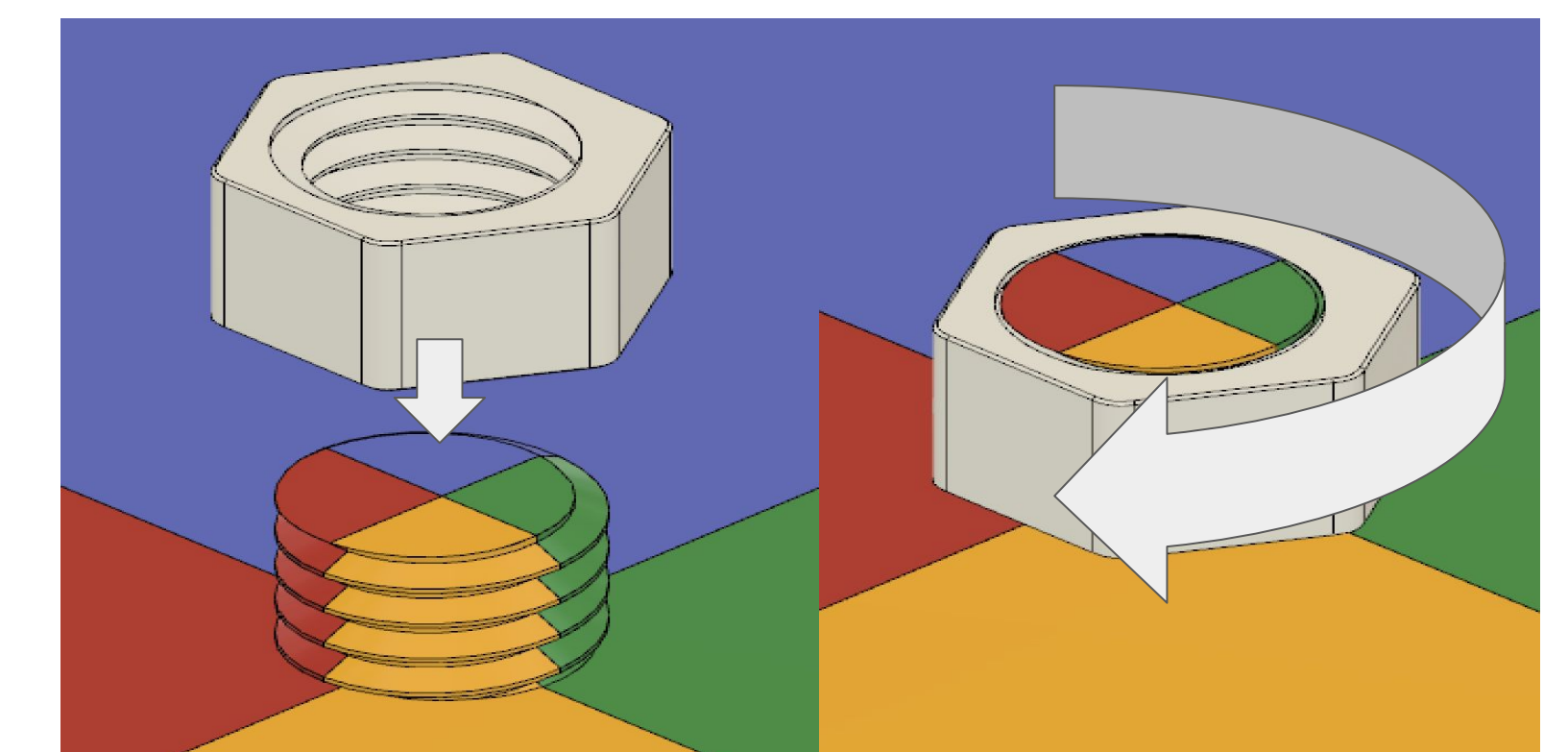
Tile to Machine Interlocking

Tiles are attached to the frame of the machine via the same interlocking system as described above. The grey section of the threaded post is permanently secured to the frame of the machine.



Tile to Tile Interlocking

Underneath a group of four tiles, the corners meet to form a threaded post. A fastener holds the corners together and also keeps tiles level with one another.



Design of Current Game Tiles

Addressable LEDs were implemented in order to conserve the Arduinos IO pins. The LEDs chosen are Adafruit's RGB smart Neopixels, which can be stranded together and controlled by a single IO pin.

Two power supplies are required to power the game tiles. A 24V 5A for the coils in the flippers and a 5V 6A for the LEDs and Arduino.

Future Work

The things we would do with more time:

1. Create a centralized system or make each tile "smart"
2. Design a full scale machine
3. Design an automated ball return
4. Program game objectives
 - a. Multi-ball and power ups
5. Better support for high-voltage components
 - a. Bumpers, extra flippers, electromagnets
6. Different tile designs

More Information at

<https://github.com/Reenforcements/ECE448-449>