Introduction:

This assembly guide will serve to help you create the 3D printed rodent decision-making arena. The arena is assembled utilizing SLA 3D printing and custom electronics to allow for a taylormade task to be used in the study of decision-making and disorders in rodents. Such flexibility allows for on the fly changes and adaptations to the experimental environment and process, as well as animal behavior. Further, it enables the interchangeability and replacement of maze arenas and parts as they wear down over the course of thousands of behavioral trials. In this guide you will find the parts and materials, dimensions and measurements, along with links and assembly instructions, to our custom maze arenas and electronic system(s).

Directly below are links to finished versions of the drawings we used to 3D print the behavior testing maze, one link is for drawings in .stl format, read to print after download, and the second link is for .dwg files of the drawings, more convenient for editing:

Ready-to-print STL files

AutoCAD files for editing

How to print short guide:

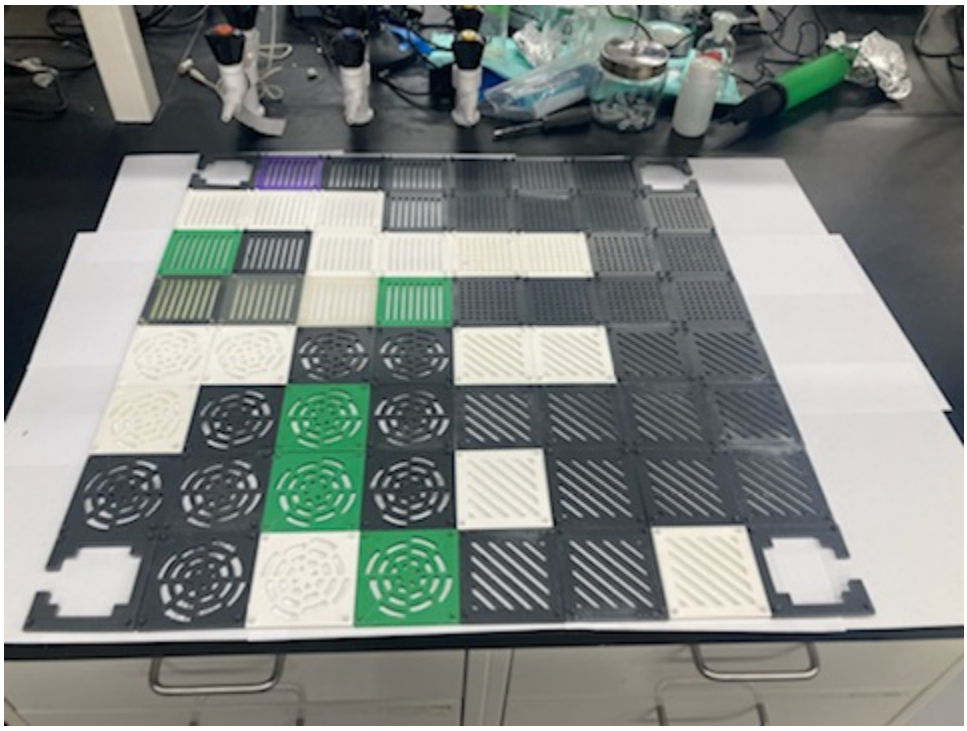
Materials needed: This goes in a table later plz (read-me would be instructions on how to print them)

- **Horizontal floor (x15 for rat maze) (3x for mice maze) (40~ mL of resin per piece)**
- **Diagonal floor x15 (40~ mL of resin per piece)**
- **Lattice floor x15 (40~ mL of resin per piece)**
- **Radial floor x15 (40~ mL of resin per piece)**
- **Wall support pillar x12 (741 mL~ of resin used x12)**
- **Feeder corner holder x4 (79 mL~ resin used x4)**
- **Cost/Reward dispenser feeder piece x4 (102 mL~ of resin used x4)**
- **Simple pillar (x65 for 8x8 rat maze)**
- **Tough 2000 resin for supports and pillars**
- **Plastic 3d print filament for floor pieces (optional) (any color)**
- **Superglue**
- **PVC walls and tools to cut them (4 walls per maze) (measurements below)**
- **Gray primer**
- **Neon green spray paint (to act as a greenscreen) → depends on experimental conditions (i.e. light, b/c color not important if using IR cameras in a dark room like we are).**
- **Blueprints for maze parts:**

Ready-to-print STL files

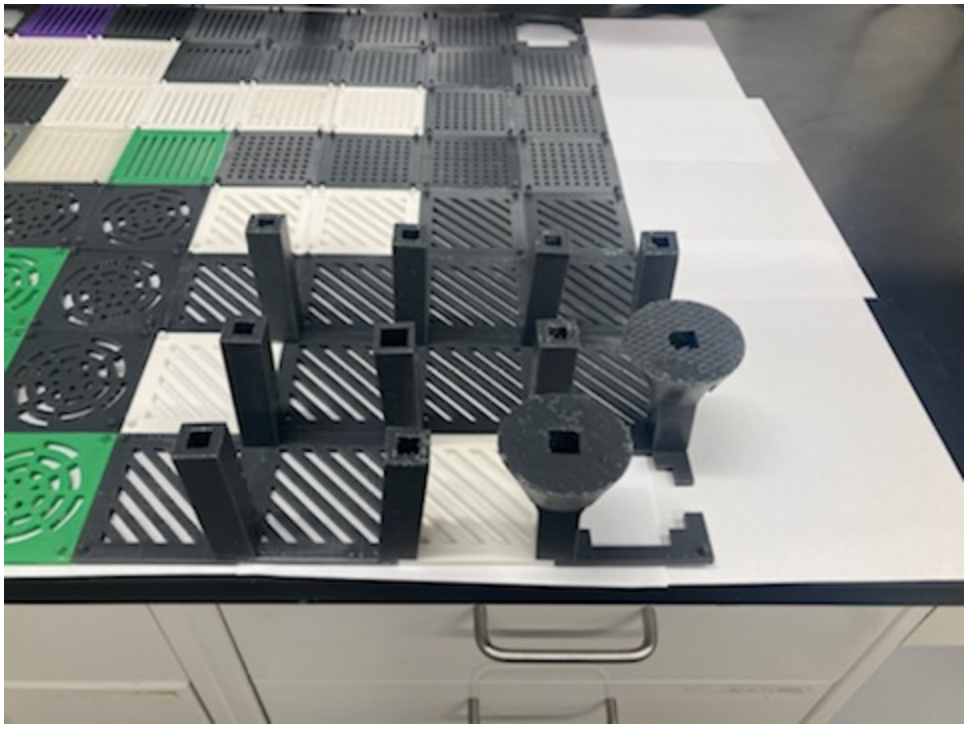
AutoCAD files for editing

Step 1: lay everything on the table (be careful with superglue)

- The base of the experiment was designed so it can be modified in scale to fit different size animal subjects, check if you need to modify for scale. For instructions on how to build 8x8 maze (65cm) print the pieces (see figure 1A)
- 
- **Additional details:** Assembly of floors can be in any direction as long as diagonal floors and horizontal floors are not side to side on the maze, they have to face each other diagonally. Type of resin is not critical for the floor pieces as they do not bear much weight, but the simple pillars and arena pillars require a tougher material for support of the arena.

Step 2: glueing wall pillar and simple pillars

Connect pillars (wall and simple) and begin to glue → use any sort of weight (textbook/devices etc.) to hold pillars in place while glue is drying, to ensure a straight, and solid, fit.

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TENTH EDITION
Endocrinology

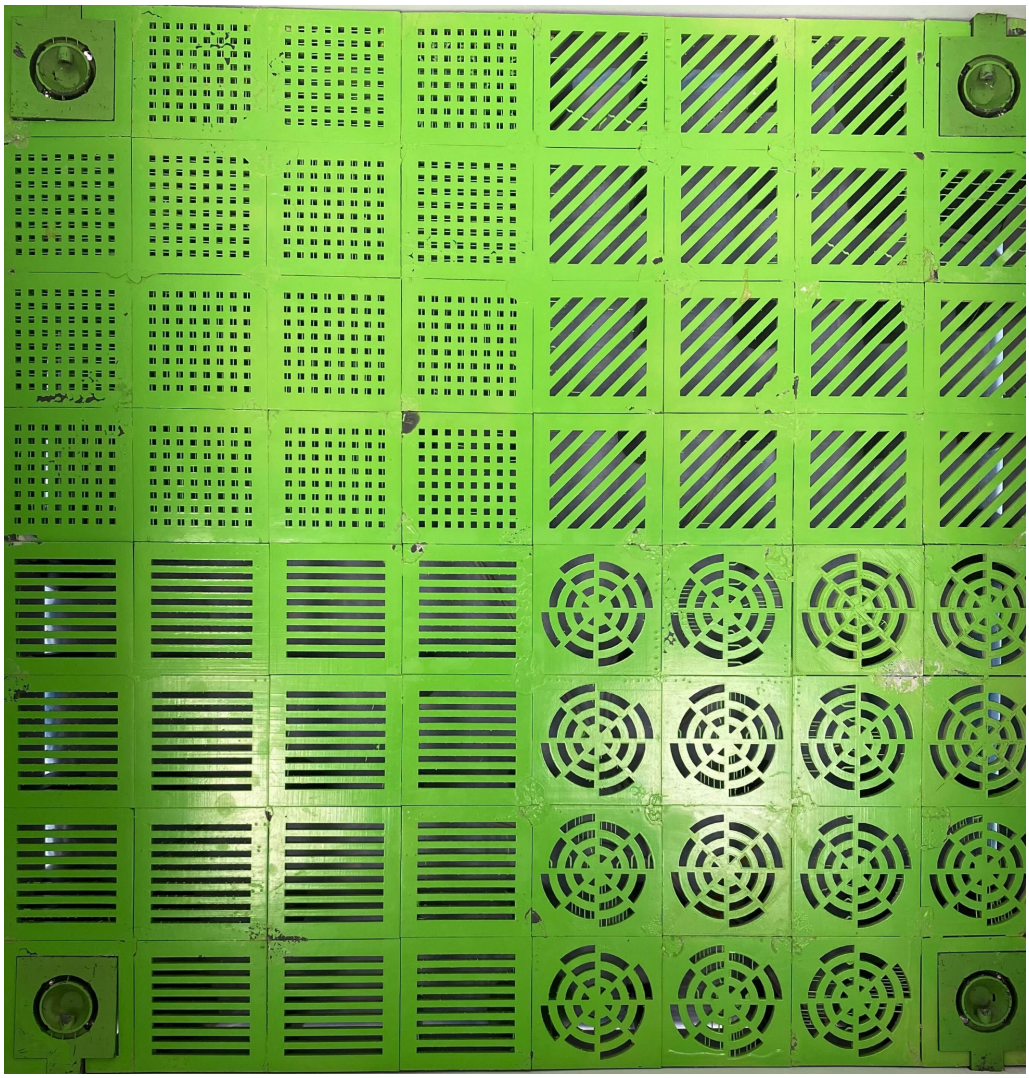
Step 3: Prime and paint maze

-Using Rust-Oleum 2x ULTRAcover primer, we prime the maze with 3-4 light coats to completely cover the maze.

-After-primer is dry, we use Rust-Oleum custom premium lacquer paint (Gloss Neon Green) and apply gentle coats 3-4 times to completely cover the maze.

-We found that this color of green produced the best green-screen effect (i.e. background for animal detection) with our Noldus cameras.

After the paint dries, mazes are moved to wall assembly.

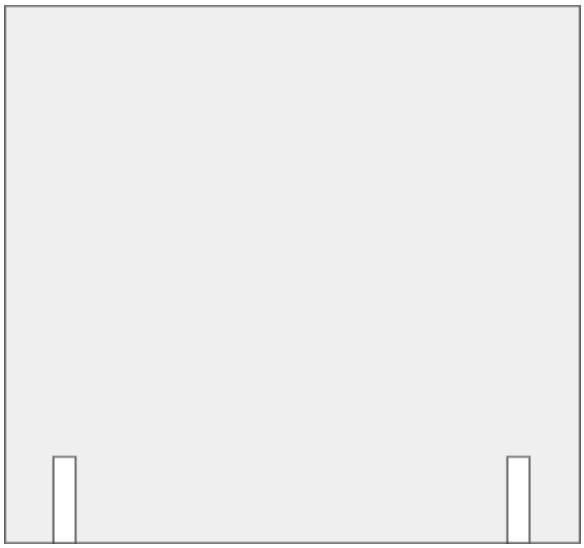


Step 4: Measure walls and cut; this requires:

- Cut PVC walls to be 64.5cm long (the length of 8 pieces, or one edge of the square arena). Height is not as important (it will depend on the specific PVC board you purchase) but should be around 50-60cm tall.
- Cut slots for feeders **(measurements below)**
- Due to the fact that walls are cut with a saw, it helps to sand the edges down for a better fit.
- Use basic corner braces (found at home depot, lowes, etc.) and screws to connect corners together.

For one maze you will need the following:

1. Plstcsht, Acrypvc, 24”x48”, 0.125”t, What, Opg (Item# 44ZT07)



2x Walls with slots for feeders

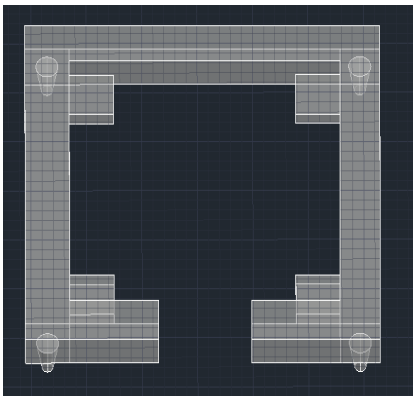
Height: 75cm

Width: 64.5cm

(4x walls per 8x8 arena)

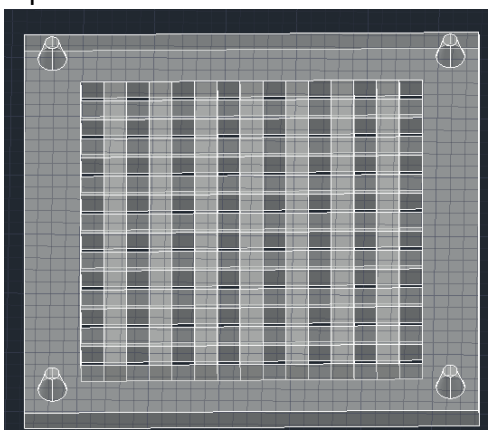
Slots are (8.25)cm tall and (2.3)cm wide. They are cut (3.3)cm from the corners/edges of the maze and are (54.61)cm apart from one another

Feeder base



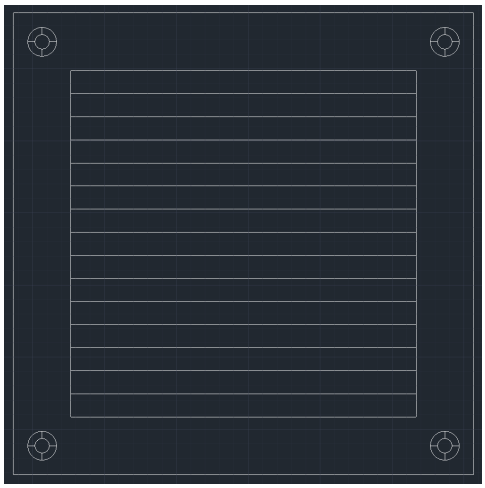
Feeder corner holder .dwg

Square floor

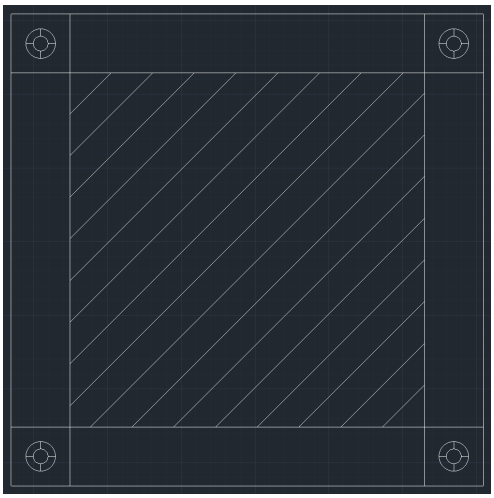


Lattice floor.dwg

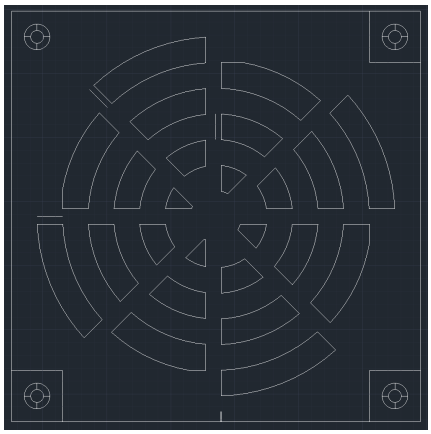
Horizontal floor.dwg



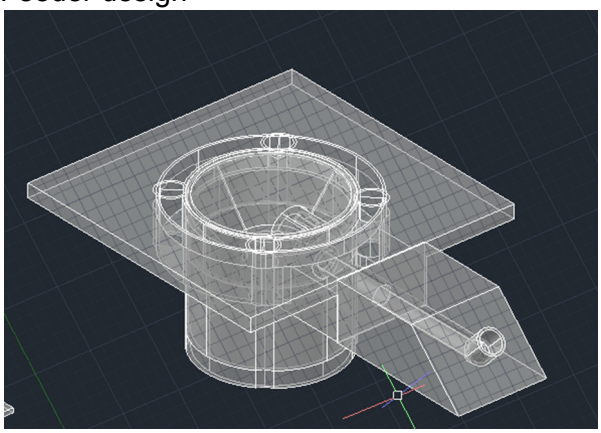
Diagonal floor.dwg



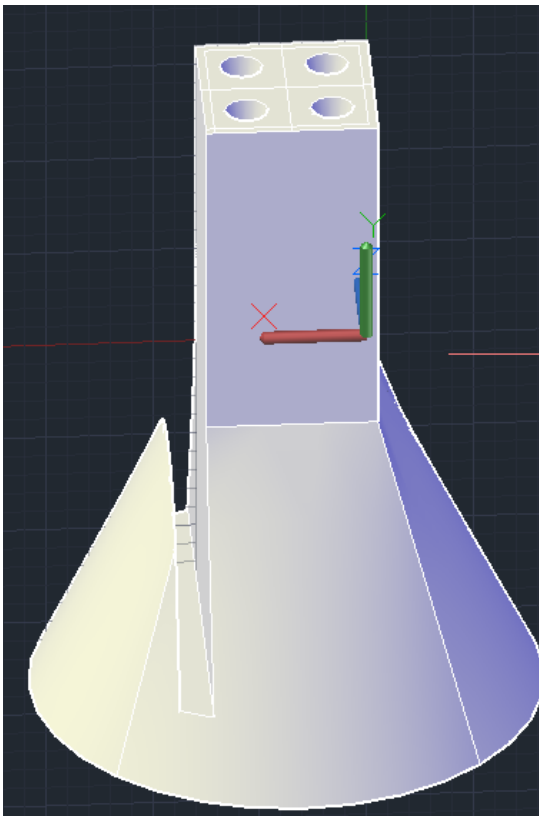
Radial Floor



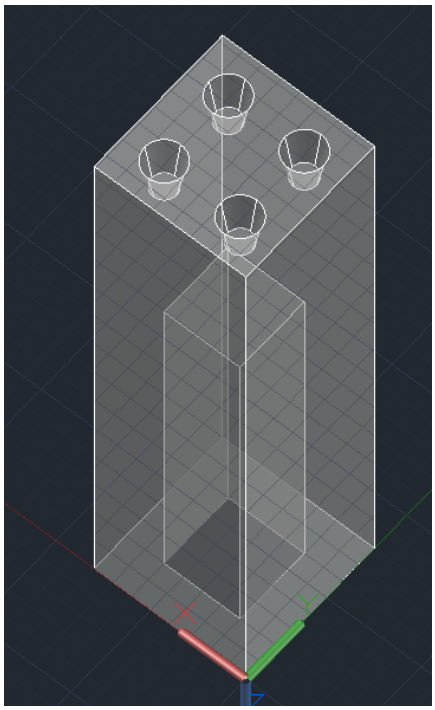
Feeder design



Feeder piece 1.9.6 . dwg



Wall support pillar .dwg



Arena simple pillar.dwg

-https://github.com/gusenrmargau/FriedmanBbehavior-Maze-ready-to-print.git (ready to print)

-https://github.com/gusenrmargau/dwg-designs-for-behavior-maze.git (drawings to edit)

- Equipment needed for printing:
    1. Form labs, Form 3 (SLA) printer (SN PrudentGnat) (P/N: E97754)
    2. Form labs, Form Cure (SN KhakiNarwhal)
    3. Form labs, Form Wash (SN ChampagnePuku)
    4. Form labs, Tough 2000 v.1 resin (P/N: RS-F2-T020-01)

Advantages of 3D printing and why we need it for natural behavior:

-The reason why we use 3d printing rather than store-bought or DIY platforms, is because the results are more useful than a static and bland platform. 3d printing is used to create more customized platforms that can act as a simulated habitat for the animal subjects. The pieces act as modifiable building blocks that can be reorganized to different shapes and sizes, if they are needed, in order to accommodate for different test subjects such as either rats or mice. They can also be printed in different sizes, or with different size connectors, for example, to provide further freedom in customization. Finally, the 3d printed feeder pieces are custom designed to fit the purpose of both cost and reward delivery, as well as the feeder shape taking advantage of natural behaviors such as foraging and threat avoidance. The corners of the maze are designed as a baseplate to hold any kind of variation on the cost/reward delivery system, such as improved designs, different levels of cost/reward, or any replacements to the feeder tray. There is also the possibility of having more than 4 feeders, or less than 4 feeders, through modifying maze structure and shape.