



Fluorophotometer Monkey Board



Danny Tighe, Jay Kler, Laura Platner, Taylor Powers
Advisor: Professor Mitch Tyler
Client: Galen Heyne

Abstract

Over three million Americans are affected by glaucoma, yet only half of them know they actually have the disease [1]. Researchers at the University of Wisconsin-Madison hospital are currently using fluorophotometry to help understand how to treat glaucoma. Their test subjects are cynomolgus monkeys. The testing consists of dropping fluid into the anesthetized monkeys' eyes. Then, the florescence of the liquid is measured in order to analyze the condition of the eye. The team's objective was to make a device that would allow the researchers to move the monkey in the X-direction (horizontal), Z-direction(verticle), and have it spin 90 degrees in order to line the monkey's eye with the fluorophotometer. The team accomplished this task by using a scissor jack, turn table, and X-directional slider.

Motivation

- Glaucoma is an eye condition where the optic nerve is damaged due to a steady increase in the intraocular pressure [2]
- Common treatments of glaucoma include various medications, laser treatment and surgery[4]
- Our client studies glaucoma on cynomolgus monkeys and needs a device to make his research more efficient

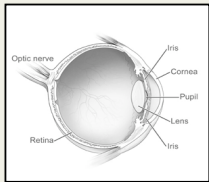


Figure 1: Eye anatomy affected by Glaucoma. [2]

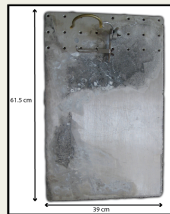


Figure 2: Current Monkey Board.

Goal: Galen Heyne has requested a device to allow a monkey board to adjust in the Cartesian XZ plane (move in X-direction, move in Z-direction, and be able to rotate at a minimum of 90 degrees) in order to make his research on glaucoma more efficient.

References

[1] All about vision. Narrow Angle Glaucoma. 2010. <http://www.allaboutvision.com/conditions/narrow-angle-glaucoma.htm>
 [2] Glaucoma Research Foundation. Glaucoma facts and stats. January 12, 2009. http://www.glaucoma.org/learn/glaucoma_facts.php
 [3] Balin, H., & Israel, S. (1963). Rhesus monkey restraint chair for the experimental study of ovulation. *J Appl Physiol* ; 18 (6), 1270-1271.
 [4] Glaucoma Research Foundation. Funding an innovated solution to glaucoma. 2008. <http://www.glaucoma.org/research/>

Final Design

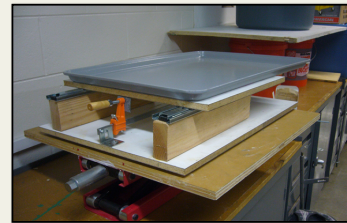


Figure 3: Final Design of Device.

Components

- Monkey Board
- Fiberglass pan
- Cabinet Sliders
- Bar Clamp
- Turn Table
- Scissor Jack
- Wood

Component Attachment

- Boards and pans attached with epoxy
- Screws secure sliders, turn table, and cabinet sliders

Cost Analysis

Item	Price
Ball bearing slide	\$15.00
Clamp	\$10.00
Turn Table	\$21.95
Scissor Jack	\$84.95
Pan	\$25.31
Epoxy	\$10.11
Bolts and Screws	\$13.97
Wood Boards	\$10.00
Total Cost	\$180.93

Table 7: Cost Analysis

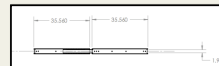


Figure 4: Cabinet Slider

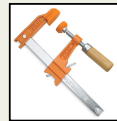


Figure 6: Cross sectional view of the mechanism. www.adjustableclamp.com

Fabrication Procedure

- Cut Formica plywood and 2x4's
- Mount sliders onto 2x4's
- Notched end of angle iron
- Mounted turn table to plywood
- Epoxyed surfaces together

Dimensions (in cm)			
Part of Device	length	width	height
base	60.8	61	1.8
bottom formica	60.8	47	1.5
top formica	38	47	1.5
2x4 (2)	35.5	3.7	8.5
base-pan	42	63	20

Table 5: Dimensions of Monkey Board

Specifications

- Device can hold 1100 lbs
- X Direction
- 1.25 inches fine
- 11 inches rough
- Z Direction
- 12 inches
- Weighs 73 lbs

Testing

Previous Method

- 10 minutes per monkey
- No locking mechanism
- No rotation device

Method using device

- On average it took 2 minutes and 36 seconds to position the first monkey
- On average it took 1 minute and 3 seconds to position each successive monkey

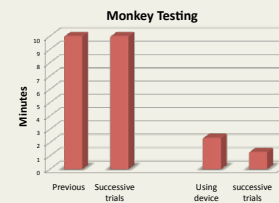


Figure 8: Amount of time it takes for different trials of positioning the monkey board

Competition

Unique Design Requested

- A customized design was requested so there are not many competitors

Ovulation Study Restrain Chair^[3]

- This monkey restraint chair can move in the z-direction, but is unable to translate in the horizontal direction
- Uses wood, leather and metal to restrain monkey

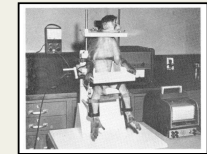


Figure 9: Past monkey restraining device used for studying ovulation (Balin & Israel, 1963) [3]

Design Criteria

- Move 8 in. in the X direction
- Move 12 in. in the Z direction
- Rotate 90 degrees
- locking mechanism
- fully mechanical
- 1 cm or less of precision
- Hold 10-25 lb monkeys
- Easily sterilized
- \$ 200 budget

Future Work

Further testing of the Monkey Board

- Test how easy it is to wash and sterilize the board
- Complete live testing

Product enhancement

- Look into hydraulics to make the Z-direction faster
- Improve the monkeys comfort by adding a pad/heating pad for the monkey
- Design a hand crank for z-direction
- Design a base to improve stability



Figure 10: Heating Pad

Material Changes

- Make the device lighter in weight
- Use bolts instead of epoxy
- Secure cabinet sliders with more screws

Acknowledgements

-Galen Heyne, UW School of Medicine and Public Health

-Professor Mitch Tyler- Department of Biomedical Engineering
-Tim Powers