

Electromechanical Cat Rotator

Abstract

A control experiment is required for research regarding possible stimulation of the vestibular system when cats localize sounds. This project will design and implement an electromechanical device for a behavioral experiment with cats that are actively localizing sound sources. The design will passively rotate the animal under computer control via a stepper motor.

Background

Client Research

- * Neural mechanisms behind binaural hearing – sound localization in cats
- * Possible audio-vestibular reflex
- * Passive rotation to trigger the vestibular system

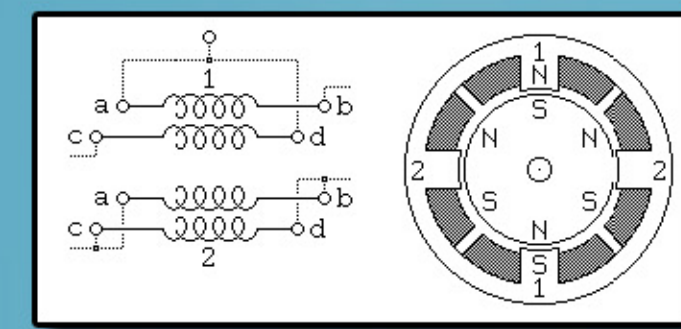
Lab Setup

- * Magnetic field and speaker array
- * Detect position of cat via sutured wires
- * Correct localization of sound = Treat!



Stepper Motors

- * Precise motion control
- * Interface with Computer



Prices

Table A: List of Materials and Costs

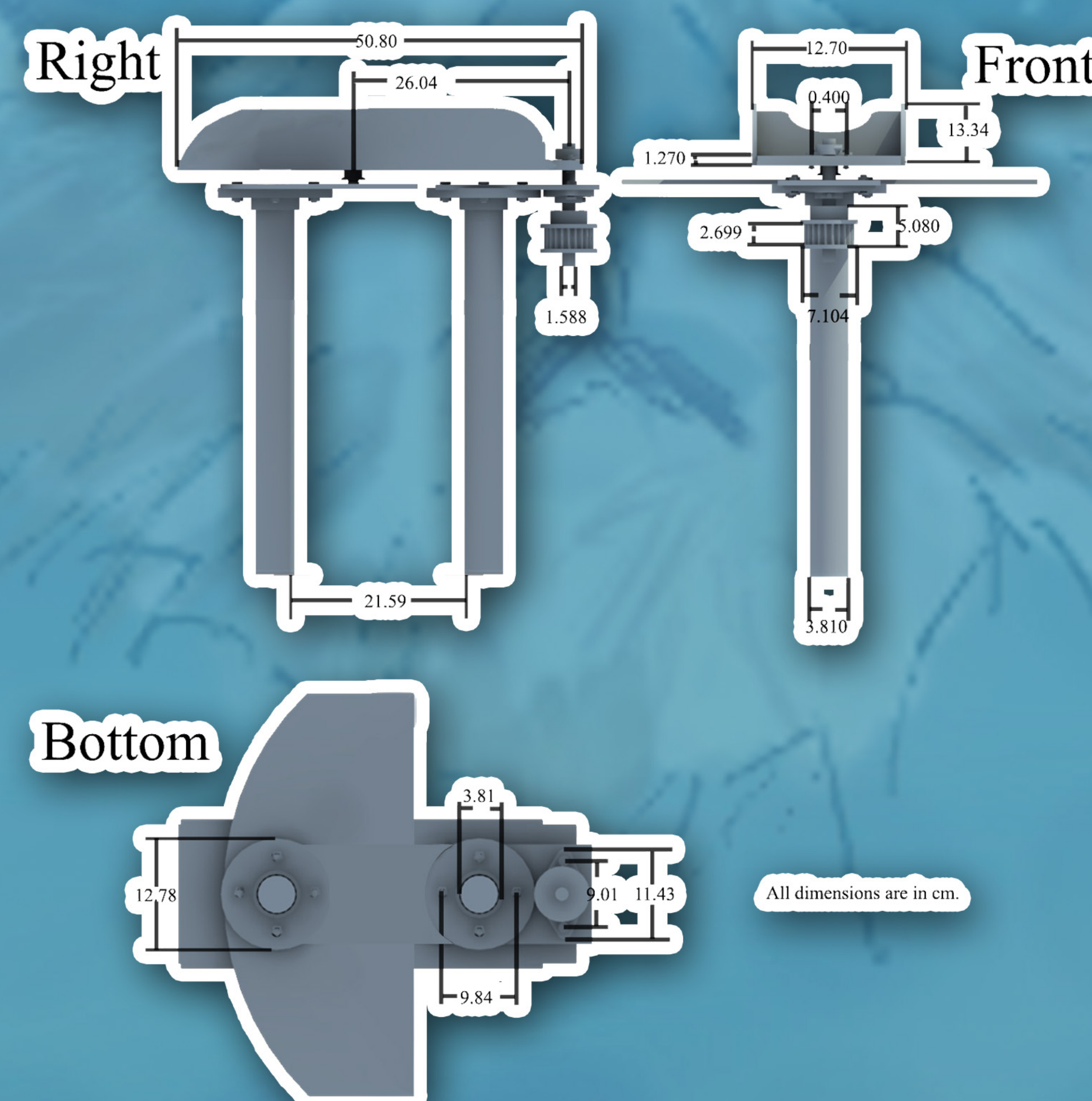
Description	Cost
UHMWPE Sheets	\$56.54
Ball mount transfer	\$27.20
Nylon screws	\$5.85
PVC pipe fittings	\$7.48
Stainless steel shaft & support system	\$62.59
Timing belt pulleys	\$81.19
Timing belt and connections	\$127.03
Mounting system	\$13.51
Nuts, Bolts, Screws	\$22.05
Stepper Motor and Controller	\$529.00
Total Cost	\$905.09

Design Matrix

Category	Pneumatic	Direct	Belt
Control/Accuracy (10)	7	10	9
EM Interference (10)	10	7	9
Safety (10)	6	8	8
Speed/Response (8)	6	8	7
Range of Motion (8)	4	8	8
Feasibility/ Practicality (6)	2	3	6
Cost (5)	2	5	4
Total	37	49	51

Design Criteria

- *Min. electromagnetic interference inside magnetic field (metal, electricity)
- *Center of rotation must be about the center of cat's head.
- *Stepper motor must be computer controlled
- *50° of rotation from the incident on each side
- *Minimize noise
- *Experimental box should be light, easily sterilized and can withstand repeated trials
- *Integrate two existing pegs as support
- *Able to move weight of cat (2-3kg)
- *Meet the requirements for IRB and IACUC



Future Work

- *Installation of design in the experimental room
- * Fit the experimental box on the pegs
- *Connect to the mounting system for the stepper motor on the wall
- *Attach timing belt to the motor of the experimental box.
- Testing under practical environment
- * Test for magnetic interference and accuracy
- Further testing by client under practical use

Progress and Results

The belt driven design adheres to the client requirements. The choice of stepper motor and driver should provide the desired experimental controls such as speed of rotation and accuracy. The design places the motor outside of the magnetic field and should therefore minimize interference on the magnetic field. The design team will install the rotator system in the Dr. Yin's lab. However, since this team is not versed in programming, integration of the design to the current computer system will be completed by the programmer in Dr. Yin's lab.



References

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