Feline Acoustic and Visual Orienting Arena
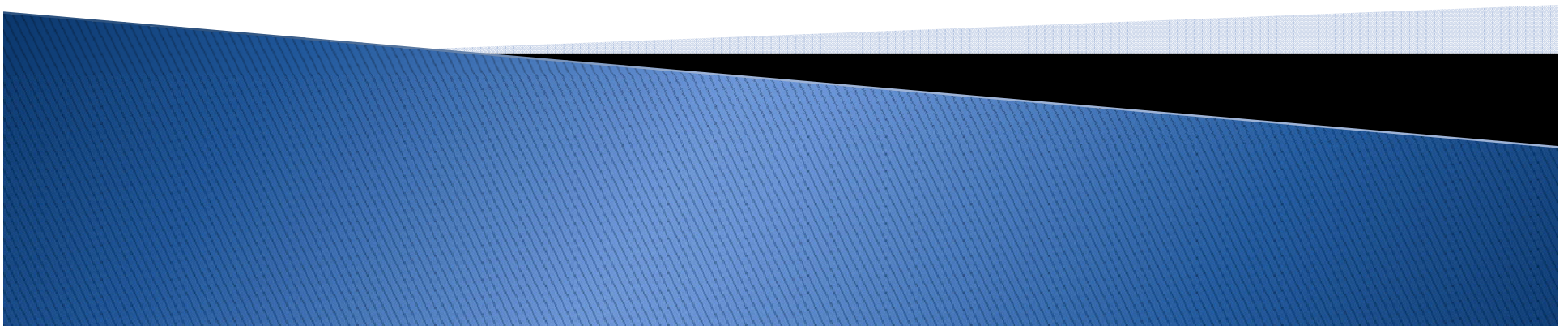
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Client: Dr. Tom Yin

Advisor: Prof. Chris Brace

Former Design Project

▸ *Cryoloop*
  ◦ Localized cooling and inactivation of the cortex
  ◦ Helpful in assessing importance of cortex in sound localization
  ◦ Used by Lomber in 1999
 ◦ After meeting with client no design enhancements were needed

New Design Project

- Feline acoustic and visual orienting arena
  - Recreate Lomber set-up as control to test against the client's findings
  - Demonstrate inability of cat's motor function after cortex has been cooled
 - Create speaker, sensor, and food dispensing set-up
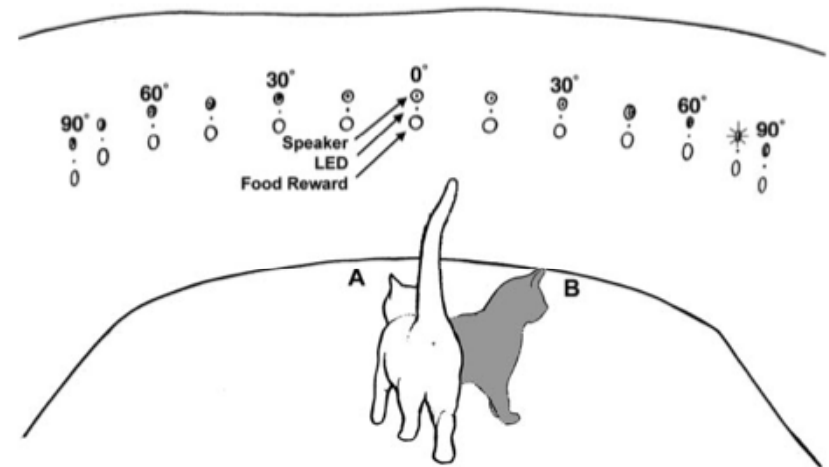
Problem Statement

The aim of this project is to develop a testing apparatus to aid in determining the effect of deactivation of the auditory cortex on feline sound localization. A previous testing apparatus has been developed by Lomber et al., but there is concern that this method introduces human bias. A key goal of this project is to eliminate any interaction between human and feline in the testing procedure.
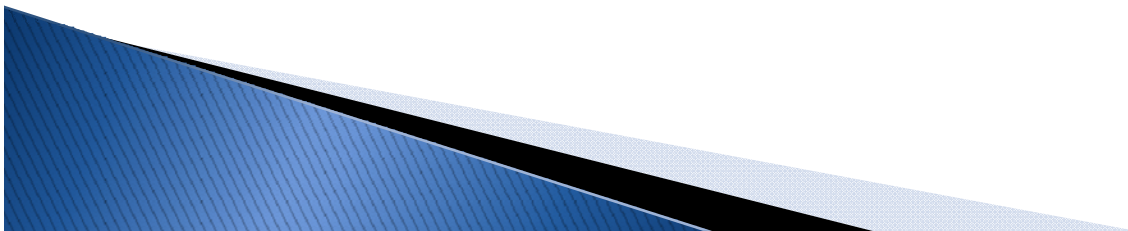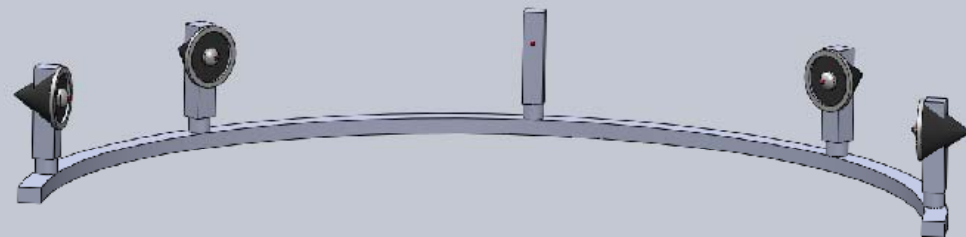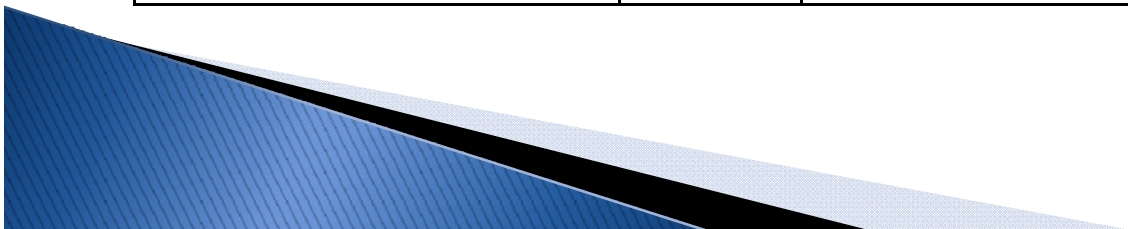
General Set-up
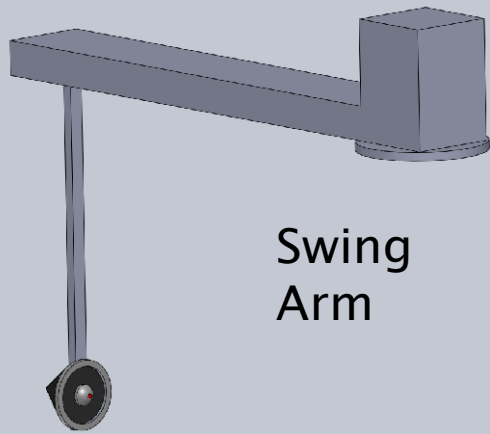
Swing
Arm
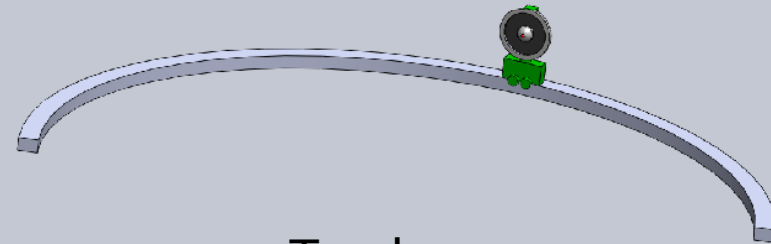
Track

4 Speakers

General Set-up

Factors	Weight	Rating (1 to 10)		
		Swing Arm	4 Speakers	Track
Mechanical Noise	0.35	3	7	5
Time to Set up	0.15	3	9	4
Cost	0.05	3	6	5
Ease of Use	0.25	2	8	4
Repeatability	0.20	8	7	6
Total	1.00	3.75	7.50	4.80

Type of Food Reward

Factor	Weight	Rating (1 to 10)			
		Dry Pellets	Wet Food (Ball Valves)	Wet Food (Pinch Valves)	Instantly Mixed
Client Preferences	0.40	1	8	8	5
Simplicity	0.10	9	3	6	1
Repeatability	0.30	3	8	7	2
Cost	0.05	8	2	5	2
Resistance to Error	0.10	2	8	8	2
Restock Requirement	0.05	8	3	3	8
Total	**1.00**	**3.20**	**6.95**	**7.10**	**3.40**
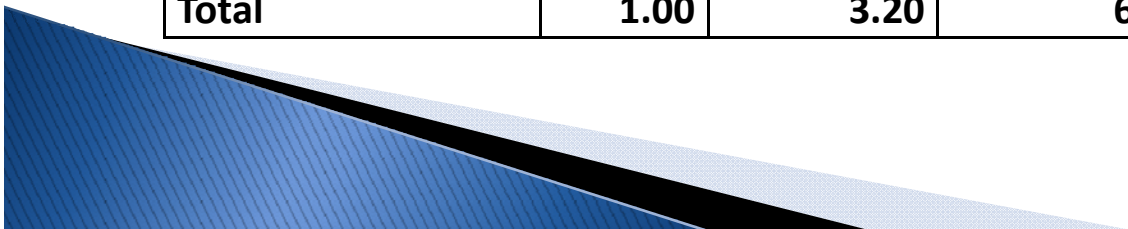
Pump and Valve Options

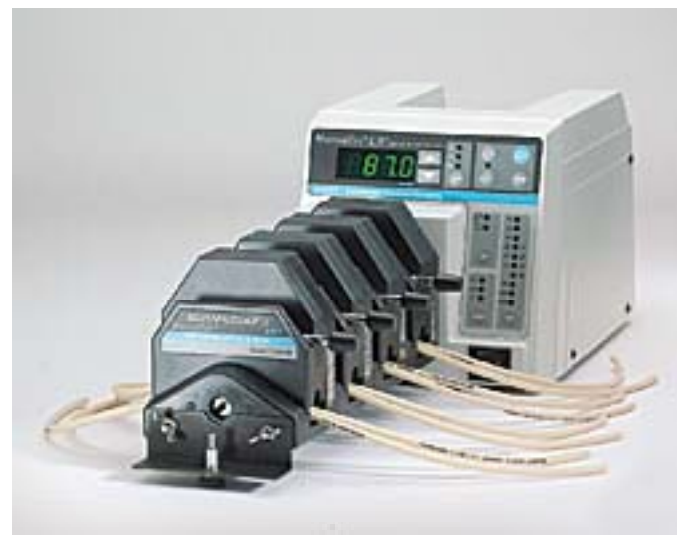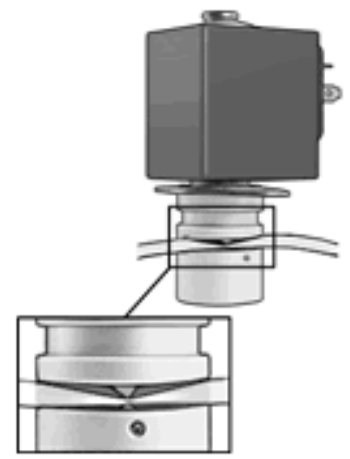L/S Masterflex Digital Drive

Pump head

Pinch Valve

Ball Valve

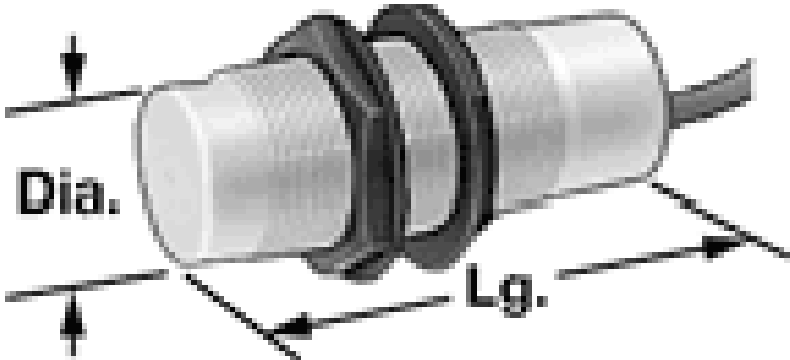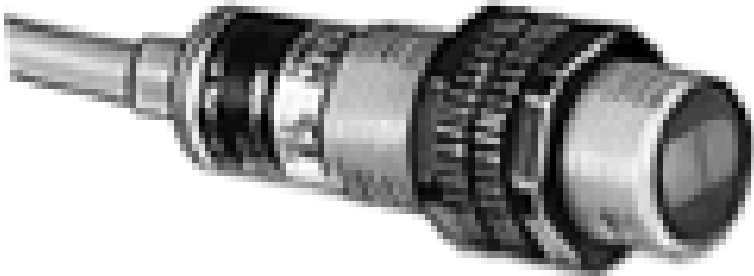# Pump and Valve Options

Factors	Weight	Rating (1 to 10)			
		4 Pumps, 4 Pinch Valves	1 Pump, 4 Pinch Valves	1 Pump, 4 Ball Valves	Compressed Air into Reservoir
Safety	0.25	8	8	8	4
Cost	0.05	4	7	3	5
Ease of Use	0.20	8	8	2	4
Clogging Probability	0.40	6	6	3	6
Ease of Repair	0.05	8	6	3	2
Size	0.05	5	7	7	2
Total	1.00	6.85	7.00	4.25	4.65
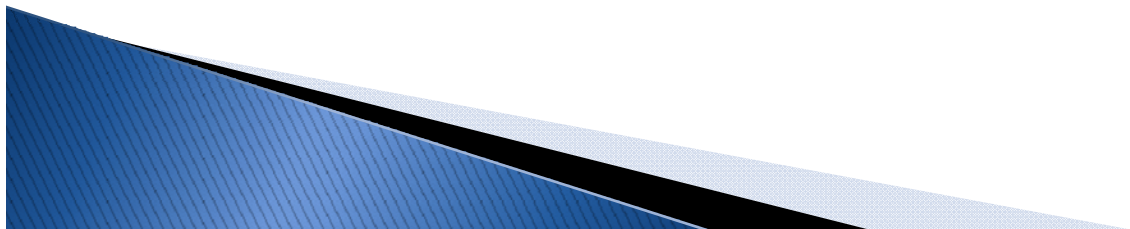
Switch Options

Light
Sensor

Proximity Sensor

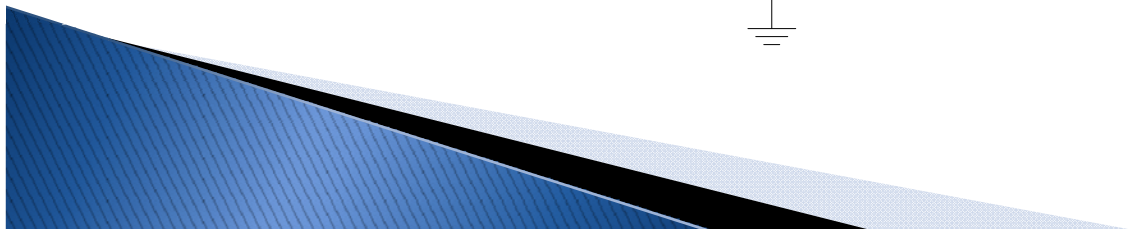0.36"
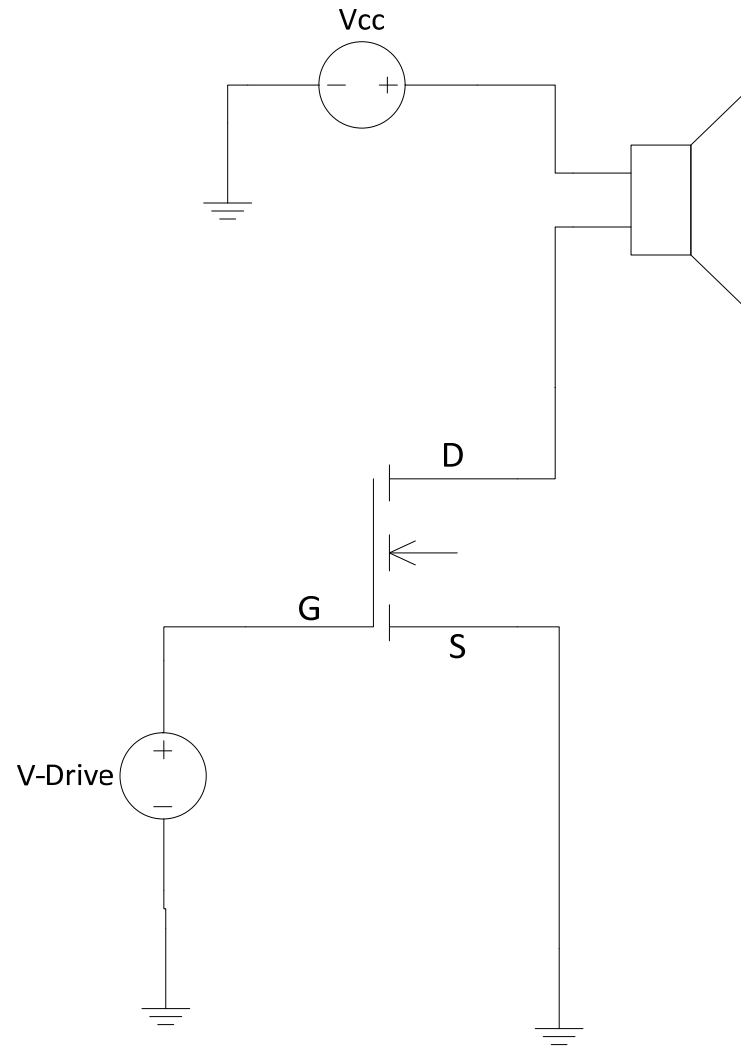
0.79"   0.26"

Load
Sensor

.8"

H
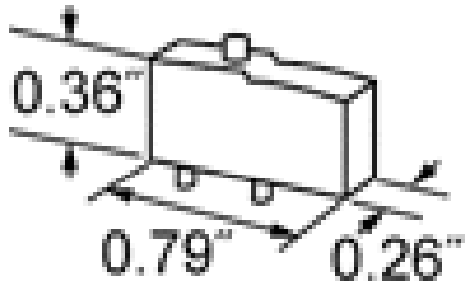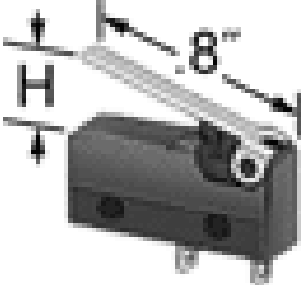
Switch Options

Factor	Weight	Rating (1 to 10)		
		Proximity Switch	Light Activated Switch	Load Sensing Switch
Force Exertion Needed	0.05	10	10	5
Cost	0.05	3	3	8
Minimize False Positive	0.35	4	2	9
Ease of Use for Cat	0.25	8	8	6
Lifetime	0.05	7	7	5
Repeatability/Reinforcement	0.25	5	5	8
Total	**1.00**	**5.65**	**4.95**	**7.55**

Speaker Driver

Vcc

D

G

S
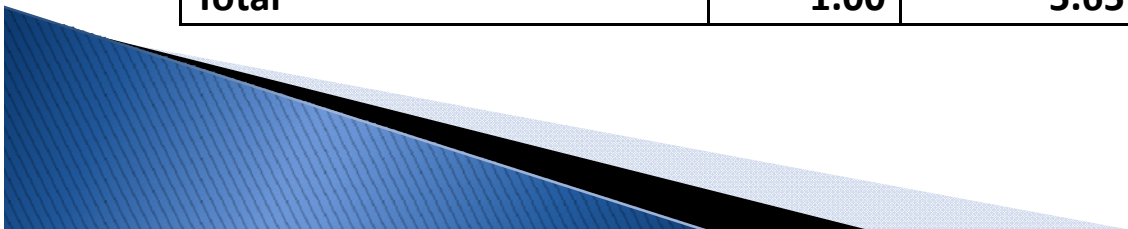
V-Drive

Solenoid Driver
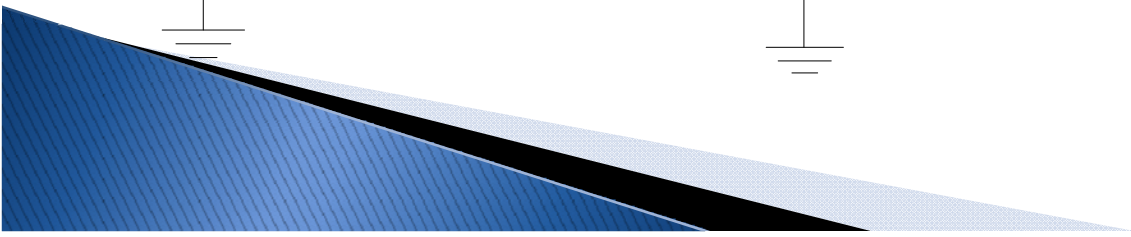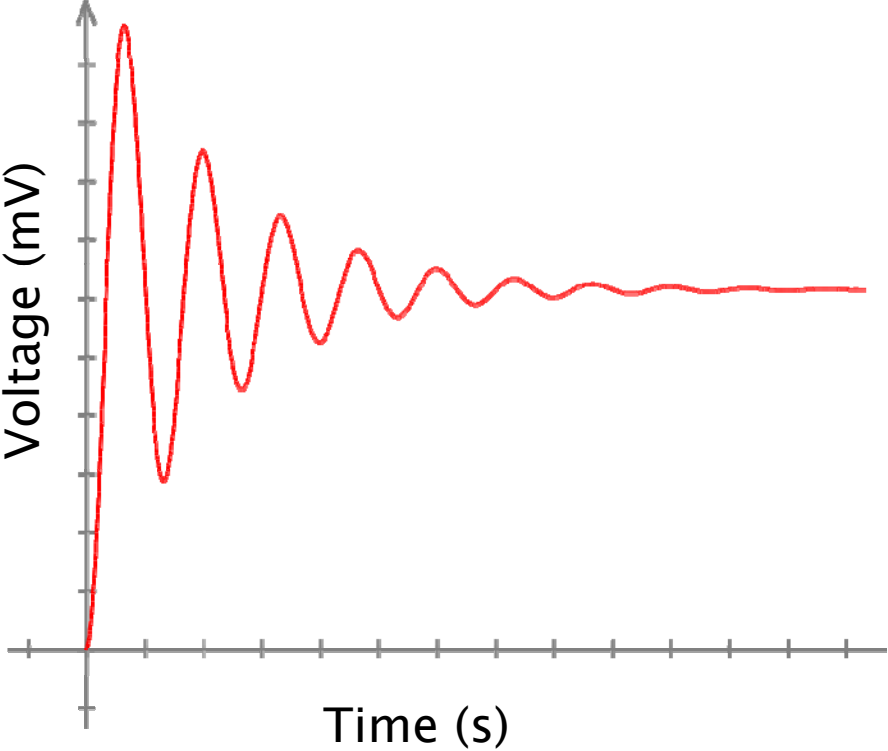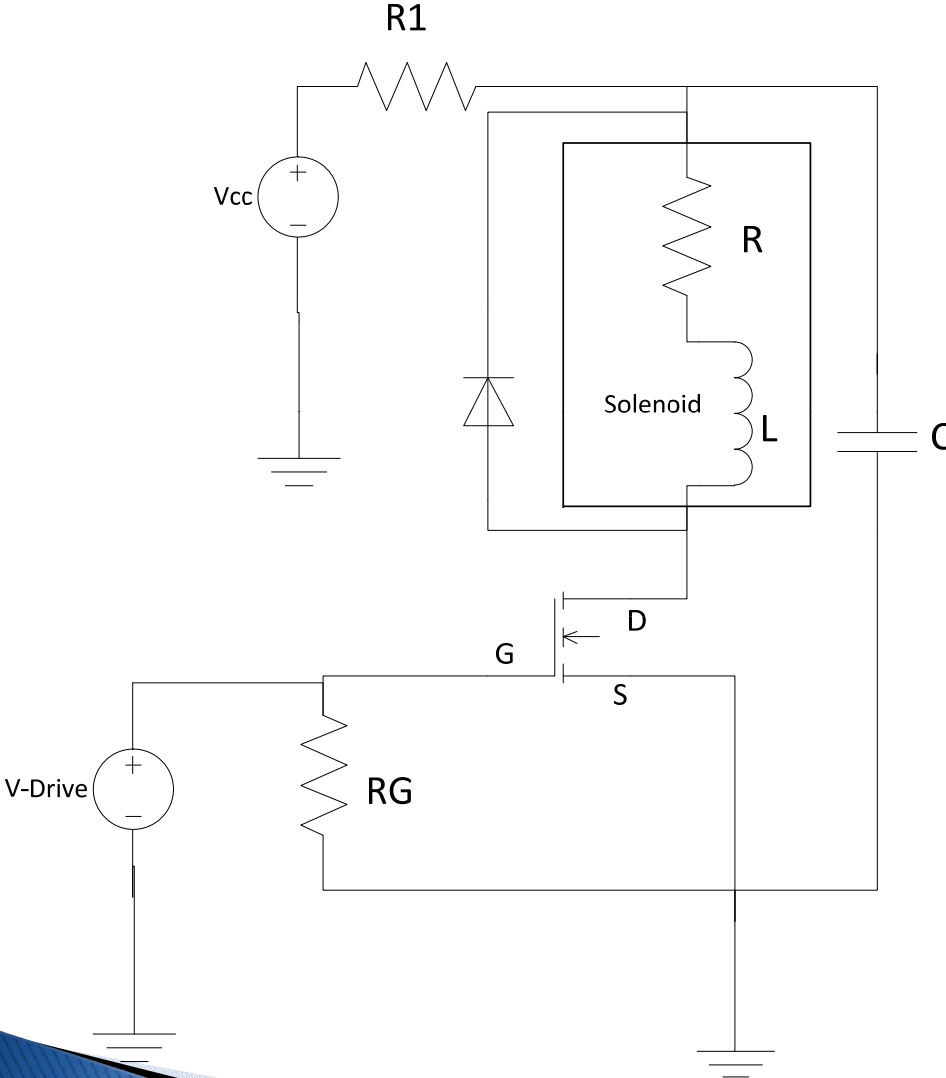
Design Specifications

- Placement of speakers around 4 x4 x4ft cube
- Shouldn't interfere with AC magnetic field
- Pumps must be able to accommodate viscous food slurry, density of 1.052 g/mL (water = 1.0 g/mL)
- Create 100 ms broadband noise for testing
- Less than 2.2241 Newtons to activate load switch
- Deliver 1-2 mL of cat food slurry per reward issued
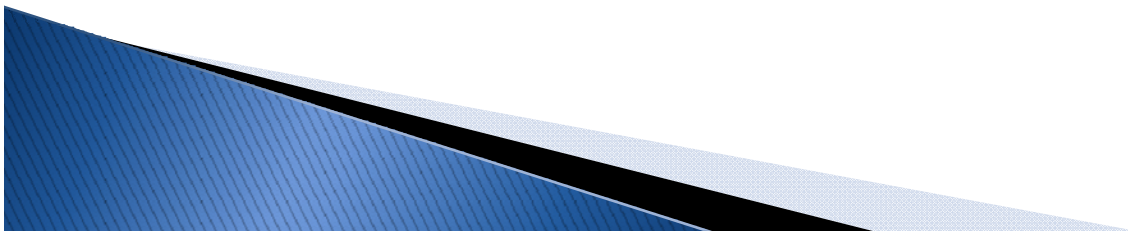- Pump must facilitate a flow rate of 1 mL / sec

Looking Ahead

- Choose specific parts to purchase
- Run general diagnostic tests on each individual aspect of design
- Test frequency response range of individual speakers
- Fabricate a single speaker station with working food delivery
- Test single speaker station and compare to design specifications
- Build final 3 speaker setups and install in sound proof booth
- Test 4 speaker setup, peristaltic pump, and load sensor compatibility with cat

Acknowledgements

- Dr. Tom Yin
- Prof. Chris Brace

Questions?