

Background/Motivation

- Communication amongst animals is incredibly valuable for us to observe and analyze. Research on these auditory behaviors and responses are unknown for birds and would be extremely valuable for the case of enhancing our current communication technologies.

What Constitutes Success/Objectives

- Create a functional "Bird Box" system where researchers can use and adjust to perform various trials for conditioning of Birds
- A working project would be able to sustain one full trial with the bird after receiving sound inputs from the researcher and at the end output an excel sheet and a sound file for future use

Functional Details

- The system will make record of 4 different responses from the bird.
 1. Target-response: The system will reward with food
 2. Target-miss: The system will record but not respond
 3. Sham-response: The system will punish with lights out
 4. Sham-miss: The system will record but not respond
- For the purpose of the conditioning process, sham audio sounds would be chosen periods in which the background sound is repeated and projected as if it were a target sound. This is to prevent the bird from repeating
- The system would record each individual instance and format it into an excel document/spreadsheet for the researcher to analyze.

Modular Design of Project -- Minimum Viable Product

Hardware Detailing

- Power System
 - AC/DC Power converter
 - Power supply for all hardware components
- Food Dispensing Mechanism
 - Design Requirements:
 - Silence (so no audio from trial is playing)
 - Consistent food distribution
 - Timed to allow the bird to eat the entire amount instead of having to gulp everything and return to the trial
 - Design follows form of 2 part process
 1. While the bird is trialing, the dispenser's main chamber fills up to the required quota to the second / output chamber. If the bird succeeds, the 2nd chamber releases the allocated food.
 2. Then the device re-allocates some volume of seed to the 2nd chamber before reclosing
 - Hardware specification
 - DC power
 - Clock cycle for time
- Bird Response Mechanism
 - Design Requirements

- Sensitive Buttons
 - Lightweight buttons, a beak can only do so much
 - Different color for Bird to distinguish the purpose
- Hardware requirements
 - Sends data to software interface
 - Has a timer installed to be able to alert for time-out feature (if the bird is idle for too long)
 - DC power
 - Wired to hub that sends data to software interface
- Audio Output/Speaker System
 - Adafruit speaker that Mike Suggested (<https://www.adafruit.com/product/1314>)
 - Receives .wav files to play from the software interface
 - DC power
- Camera for observation
 - Probably a camera add on for an arduino
 - Needs to be able to capture live footage so that the researcher can observe during the trial
- Light for Box/Punishment mechanic
 - Basic LED light
 - Driven by Arduino circuit
 - Has clock to time out

Software Detailing

- UI for Research/Parameter input
 - The interface would allow for researchers to submit .wav files for the audio sounds that they choose to use for the trials. This submission also will perform calculations for the researcher to hone specific time requirements for their test. To specify, because the general structure of a test consists of a repeated background sound. To perform conditioning, the sequence would deviate from the normal background, for a specific trial “interval”, the sequence would yield
- Outputs CSV/Excel data for Researcher

Extraneous

- Perch for Bird to sit on during experiment
- Water dispenser