An Operant Conditioning System to Test Auditory Perception of Captive Songbirds

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SYSTEM REQUIREMENTS

AUTOMATED RESEARCH TOOL

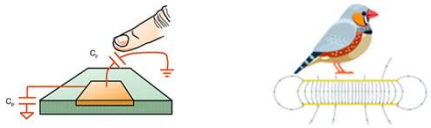
- Detects and logs data when songbird: 1) Lands on perch 2) Departs from perch
- Delivers stimuli (play bird song audio) based on songbird behavior
- Scale up to 12 units operating simultaneously
- Maintain system's low-cost and customizability

THE OPERANT CHAMBER

Operant conditioning systems often use sound-proof isolation chambers. Experiments with songbirds require meticulous observation and data collection to match data to behavior.

SENSING TECHNOLOGY

The perch sensor unit uses innovative capacitive touch technology for detecting when a songbird is perched.



A capacitive sensor is used to detect the presence of a conductive object (e.g. finger, bird's feet) in a small capacitive field that the sensor projects.

SYSTEM OPERATION

ARRIVES AT PERCH

- Song audio plays (auditory stimuli delivered)
- Duration measurement timer starts
- +1 — Hop noted for frequency measurement

DEPARTS FROM PERCH

- Data saved to a .txt file
- Song audio stops playing (auditory stimuli removed)
- Duration measurement timer stops

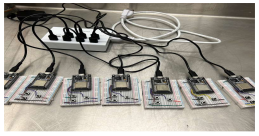
INITIAL PROTOYPE

Fully-functional, and designed to operate a single chamber:

Component Part List:
- ESP32
- Capacitive Sensor
- SD Card Module
- MP3 Player Module
- Real-Time Clock
- BluetoothTransceiver
- OLED Display
- Capacitive Button

Data are recorded on a small SD card within the device that can also be accessed via Wi-Fi server created by the microcontroller.

CURRENT PROTOTYPE



CAPABILITIES

1) Wireless multi-sensor communication using Bluetooth
2) Training Mode (non-contingent stimulus delivery)
3) Operation of multiple units from a single terminal, with audio delivered via an audio interface module (Behringer 1820 and wireless transceivers)
4) Reliable sensor detection and logging of duration-based data

FUTURE DIRECTIONS

Bug Fixes

Scaling Up

Continue Testing

Research Functions

Other Applications

ACKNOWLEDGMENTS

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