Background

Cowbirds are “brood parasites”; they lay their eggs in the nests of other bird species and do not raise their own young. Once the young cowbirds are old enough, they instinctively flock to other cowbirds and learn their courtship behavior. Some cowbirds do not find a flock quickly enough to accurately learn the timing between the moves and the sounds of this mating dance. Dr. Goller of the Biology Department is studying how well male brown-headed cowbirds communicate with their courtship behavior, which is suspected to be tied to the timing between the sounds and the motion.

Specifications

- An animatronic cowbird that mimics the courtship behavior of a real cowbird with a range of motions that would be expected from a real cowbird
- An audio system that can reproduce a wide range of frequencies to mimic the vocalizations of the male cowbird during courtship
- A software program that will allow the customers to change various aspects of the patterns of the courtship behavior

Sound

The sound output must meet the cowbird song range of about 0.5 kHz to 12 kHz and a decibel level of about 80 dB.
- Speaker frequency range is ~200Hz to ~15000Hz
- Decibel range goes up to 90dB

Analysis

- Parts were evaluated through Finite Element Analysis using operational constraints
- Numerical Analysis was performed using MATLAB to determine the range of motion for each joint in the animatronic bird

Software

MATLAB, a GUI, and Arduino software functions combine to make the bird work:
- Using an existing video of a brown headed cowbird courtship ritual, a CSV file of joint angles is created using MATLAB and stored in a folder
- The user selects a folder consisting of the CSV files and WAV files that describe the actions of the bird
- The user chooses combinations of song and dance to execute and can also set a delay to test the effects of disconnected song and dance
- The GUI then sends the joint angles line by line to the Arduino which then splits the angles into their designated joints, converts them into a PWM signal and sends them to the servos

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