Supplementary Information for

A biologically accurate model of directional hearing in the parasitoid fly *Ormia ochracea*

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This PDF file includes:

Supplementary Information Text

Information regarding structure of data files produced

Other supplementary materials for this manuscript include the following:

- Sample function .m files used for simulation of system (script call file and function file)
- Multiple video files showing 3D reconstruction from Ormia scans
- Samples data from Miles, 1995 for 2kHz, 6kHz and 15kHz, both for IAD and ITD measurements on specimens.
- Simulated data using the Miles and q2D models for a range of frequencies.

Supplementary Information Text

The following parameters are those that were used for simulation using ODE45 and MATLAB.

Input Parameters:

incident sound frequency: 6000 hz
speed of sound in air: 344 m/s
Incident sound amplitude: 72 dB

Physiological Parameters:

mass (m): 6000 hz
distance between membranes (mm): 0.0012 mm
1995 spring stiffness coefficient ($k_{1,2}$): 0.576 N/m
1995 spring stiffness coefficient (k_3): 5.18 N/m
tympanal surface area (A): 0.288*10^-6 m^2
1995 damper coefficient ($c_{1,2}$): 1.15*10^-5 Ns/m
1995 damper stiffness coefficient (c_3): 2.88*10^-5 Ns/m
q2D model maximum stiffness (k_f): 3.5747*k_1N/m
q2D model maximum damper coefficient (c_f): 6.5*c_1Ns/m

Data File Parameters:

- FifteenKMeasuredIAD.mat
    - Contains a 223x2 vector of angles in degrees and IAD measurements in dB, respectively
- FifteenKMeasuredITD.mat
    - Contains a 373x2 vector of angles in degrees and ITD measurements in microseconds
- SixKMeasuredIAD.mat, respectively
    - Contains a vector named “LevelDiffsMeasured’, a 72x2 vector, containing angles in degrees and IAD measurements in dB, respectively
- SixKMeasuredITD.mat
    - Contains a vector named “SixKMeasured’, a 72x2 vector, containing angles in degrees and ITD measurements in microseconds, respectively
- TwoKMeasuredIAD.mat
    - Contains a vector named “TwoKMeasuredIAD’, a 104x2 vector, containing angles in degrees and IAD measurements in dB, respectively
- TwoKMeasuredITD.mat
    - Contains a vector named “TwoKMeasured’, a 171x2 vector, containing angles in degrees and ITD measurements in microseconds, respectively

- SysResponseDataFullMilesHighRes.mat
    - Simulation results using previous 1995 Miles model, for specifications defined previously.
    - Contains vectors:
        - AngleRange (1x37 vector of angles)
        - FreqRange (1x119 vector of frequencies)
        - ITDStorage (119x37 vector of ITD responses)
        - Response Storage (2x119x37 vector of system responses in meters for the left and right sides)

- SysResponseDataFullNewHighRes.mat
    - Simulation results using q2D model, for specifications defined previously.
    - Contains vectors:
        - AngleRange (1x37 vector of angles)
        - FreqRange (1x119 vector of frequencies)
        - ITDStorage (119x37 vector of ITD responses)
        - Response Storage (2x119x37 vector of system responses in meters for the left and right sides)

Mechanical coupling function (separate file). Sample function to perform mechanical coupling using ODE45 and MATLAB, CouplingFunction.m, available at Staples Lab GitHub page. Ancillary video and data files are also available here.