1-1-2018

Modulation of the Navigational Strategy of Insects in Controlled Temperature Environments

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Recommended Citation

Shomar, Joseph; Ferrer, Anggie; Forer, Josh; Zhang, Tom; and Klein, Mason, "Modulation of the Navigational Strategy of Insects in Controlled Temperature Environments" (2018). 2018 Entries. 2.  
https://scholarlyrepository.miami.edu/ugr_rcif_2018/2

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**Background Information**

Why Drosophila Larvae?
- Simple model organism
- $10^4$ neurons with a central brain
- Complex but quantifiable behavior
- Optical transparency
- Biological tools

**Objectives**

- Understand modulation of fundamental components of motion in variable temperature environment
- Decouple causes of behavioral changes

**Hypothesis**

- Drosophila will exhibit quantifiably different locomotion when experiencing different temperature stimuli
- Modulation of locomotion should depend on a (possibly linear) combination of physical changes and sensory inputs

**Method**

- Control temperature stimulus with one of the below metal platforms
- Allow larvae to freely navigate platforms and record trajectories
- Segment trajectories into components using computer vision and extract metrics using MATLAB

**Setup**

- Camera above gel in blackout box
- 3 different temperature controlling metal platforms
- Red light used for illumination
- 15 minute experiments of 20 larvae

**Results**

**Temperature Insensitive Mutants**

- Faster with increasing temperature and older age
- Speed independent of temperature sensing
- Turn rate mostly independent of temperature sensing
- Feedback input ties together speed and turn rate

**Conclusion**

- Incorporate moat design into all platforms
- Use spatially invariant experiments for function modeling
- Use temporally invariant experiments to analyze $\frac{dT}{dt}$
- Use different temperature insensitive mutants

**Future Work**

- Develops methodology for decoupling previously unseparated factors that cause behavioral changes
- Can potentially be scaled up to more complex organisms
- Method by which more can be learned about brain function

**Significance & Application**

- Develops methodology for decoupling previously unseparated factors that cause behavioral changes
- Can potentially be scaled up to more complex organisms
- Method by which more can be learned about brain function

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