Tracking the Drosophila's movement when faced with a chasm

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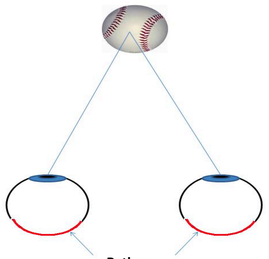
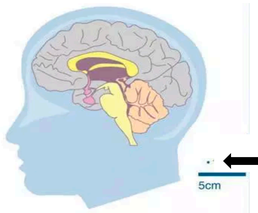
Introduction

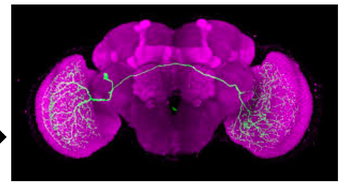


Humans are able to perceive depth through stimuli received in both eyes. However, flies are able to perform this task with only one compounded eye. Due to the relative numerical simplicity of the fly's brain and powerful genetic tools available, the Drosophila is an ideal subject to examine the neural networks responsible for these tasks. To further our understanding of these associated neural networks, we decided to examine the gap-crossing behavior of these flies.

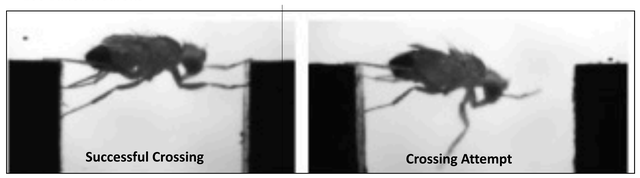


Human Brain
100 Billion Neurons

Vs.



Drosophila Brain (CelExlporer)
100 Thousand Neurons



- Niven, Jeremy et al.

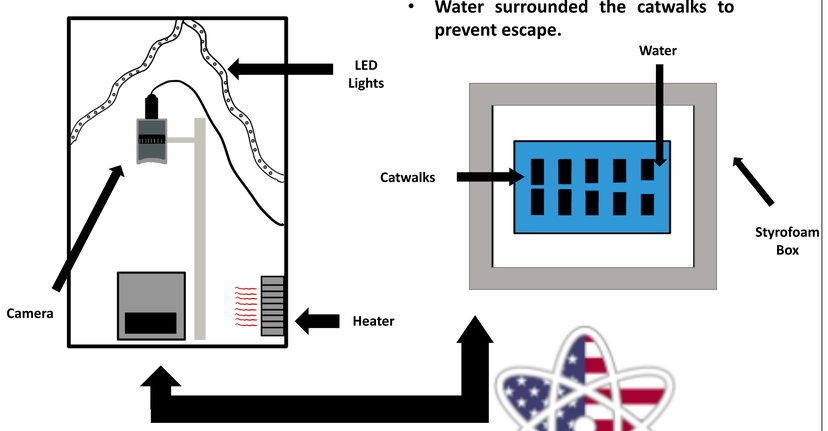
Methods

The Fly

- **Wings were either cut or glued to prevent escape.**
- **Flies had access to water but were deprived of food to promote movement across the gaps.**

The Arena

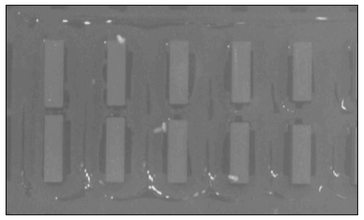
- **Consisted of an enclosed arena that was heated to 34°C and lit by LED lights**
- **A polycarbonate block with 6 catwalks was placed in the center of a smaller Styrofoam box to block outside stimuli.**
- **Water surrounded the catwalks to prevent escape.**



Research Experience for Veteran Undergraduates

Results

Image Analysis



Raw Image

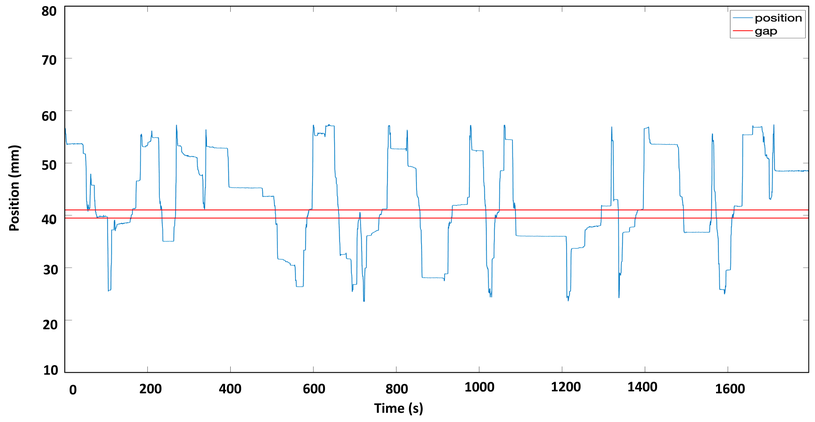
Background Image

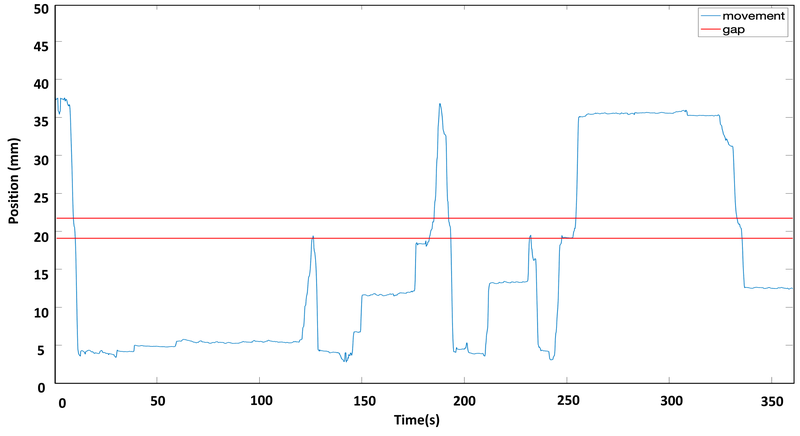
Final Image

MATLAB provided a medium to track and analyze fly movements.

- **Started by finding a background image that was found by taking the median image throughout the video.**
- **This background image was then subtracted from every frame and thresholded to isolate the fly's coordinates.**
- **Coordinates are plotted over time below.**

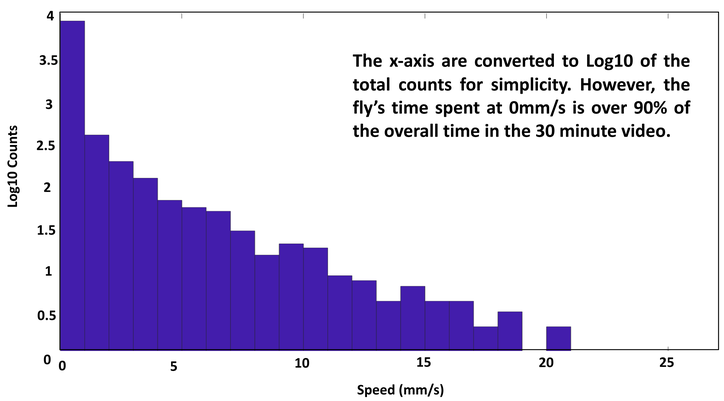
Fly Behavior





The Clark Lab

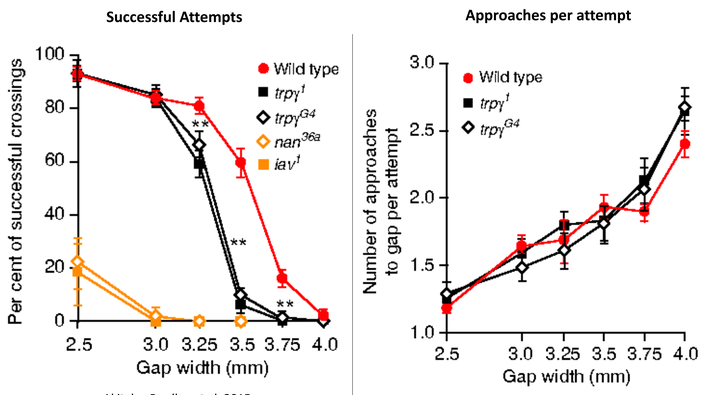
Challenges



The x-axis are converted to Log10 of the total counts for simplicity. However, the fly's time spent at 0mm/s is over 90% of the overall time in the 30 minute video.

- **Biggest Challenge: Promoting fly movement to attempt gap crossings**
- **Flies spend the majority of their time stationary or grooming themselves.**
- **The grooming can be likely attributed to their wings being clipped. We have began to experiment with wings glued together instead to avoid this behavior**
- **Over a 30 minute period, our flies averages less than one crossing per minute**
- **Other researchers have been able to accomplish several gap crossing attempts per minute**

Future Directions



- Akitake, Bradley et al. 2015

- Akitake, Bradley et al 2015.

To validate our methods, we expect to reach a point where our data replicates the data from past papers. However, rather than testing different strains of flies, we plan on using the powerful genetic tools available to silence select groups of neurons to pinpoint the groups responsible for this behavior

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