

# Data Analysis for Acuity Testing in Rodents with use of Ratcave

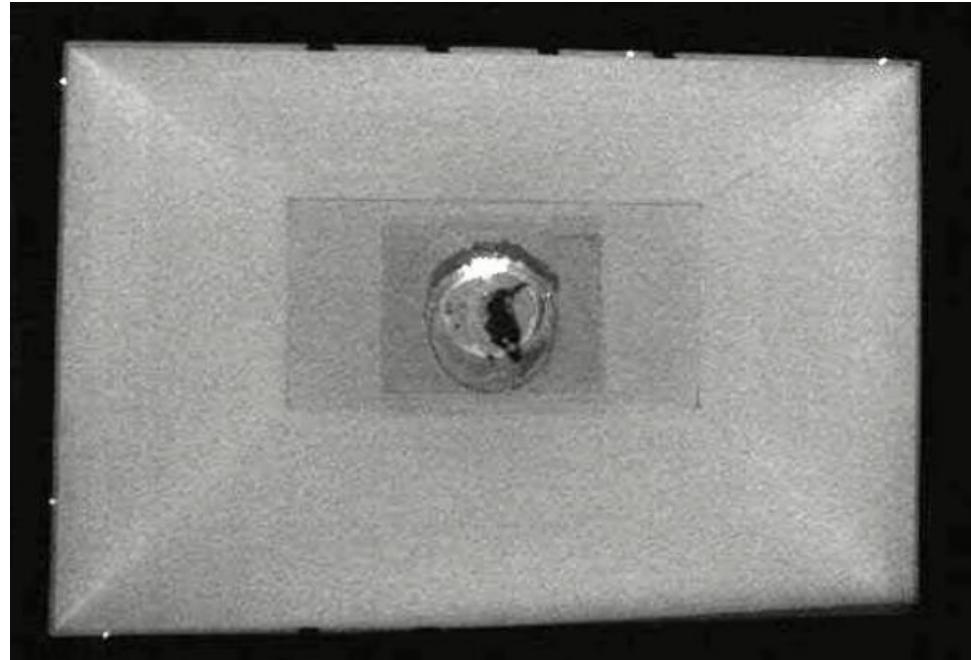
MSNE Research Project

Aleksandra Teska



# Experiment

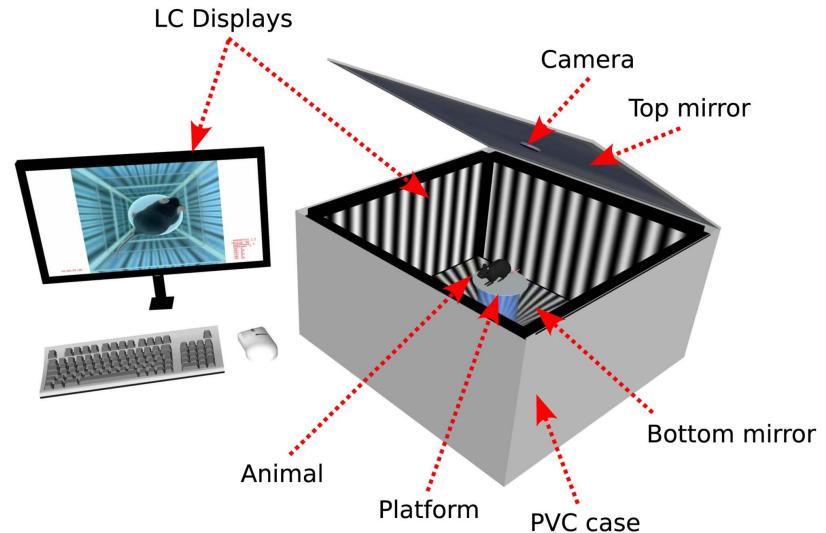
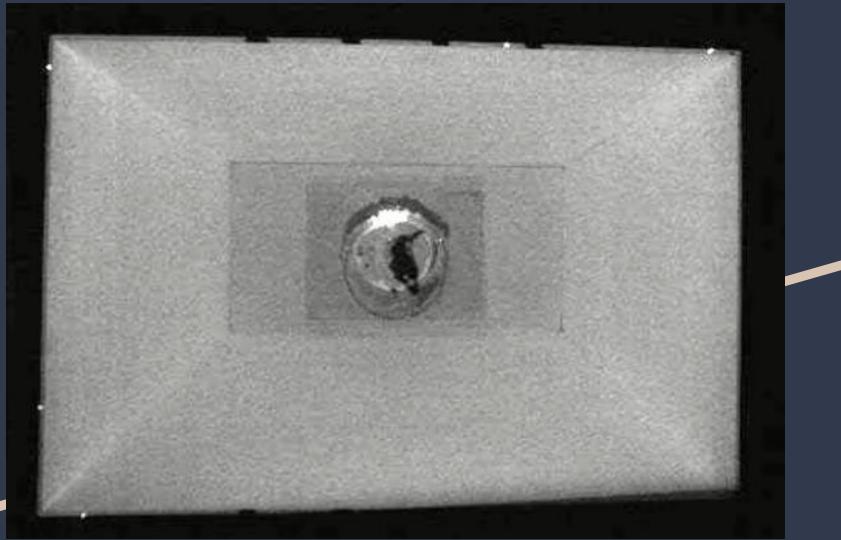
- 8 recorded experiments
- 7 rats
- 2 days in July 2017
- Duration: 11 minutes
- 4 stimulus velocities
  - 0, 7, 14, 28



Goal: Find Optomotor Response

# Background

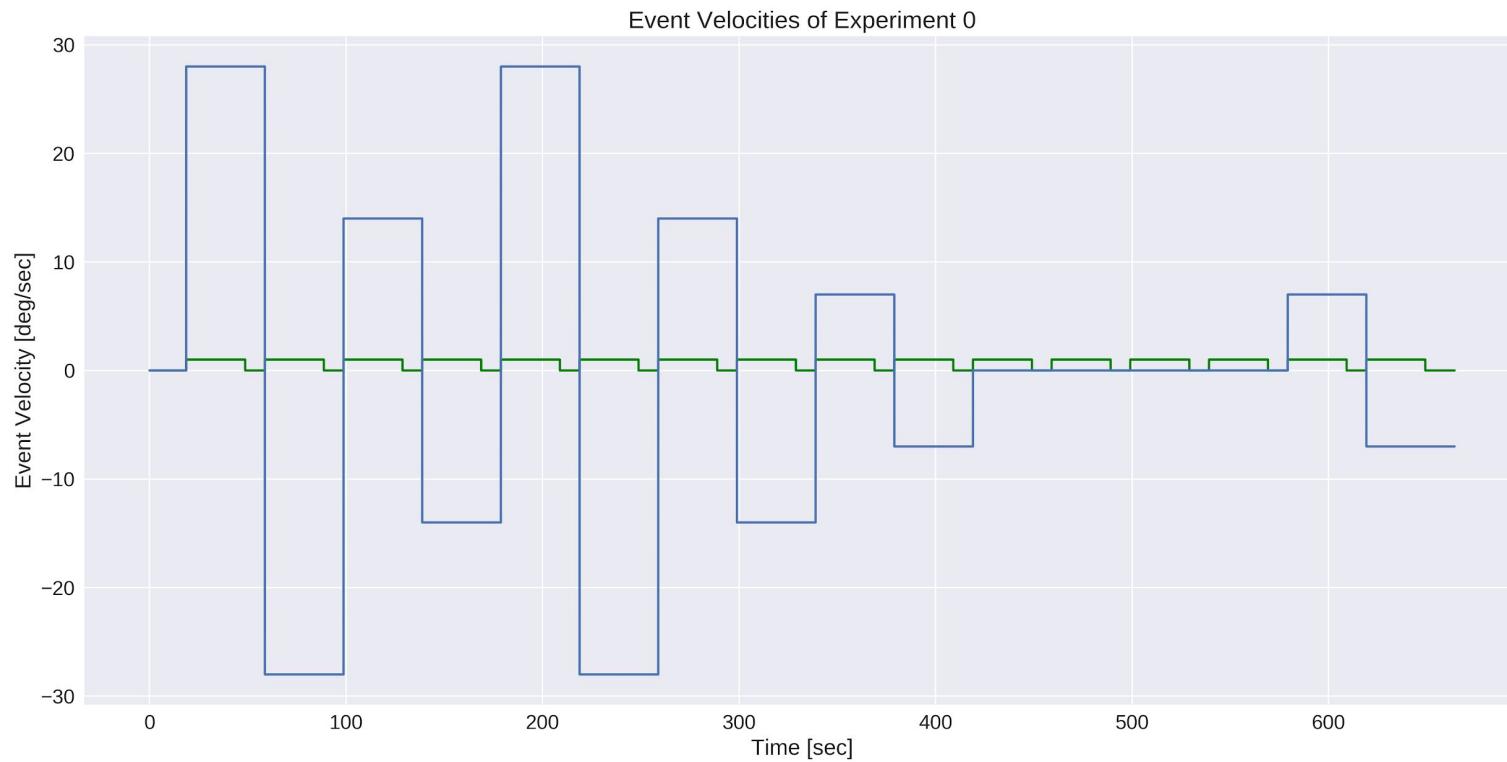
Other experiment examples



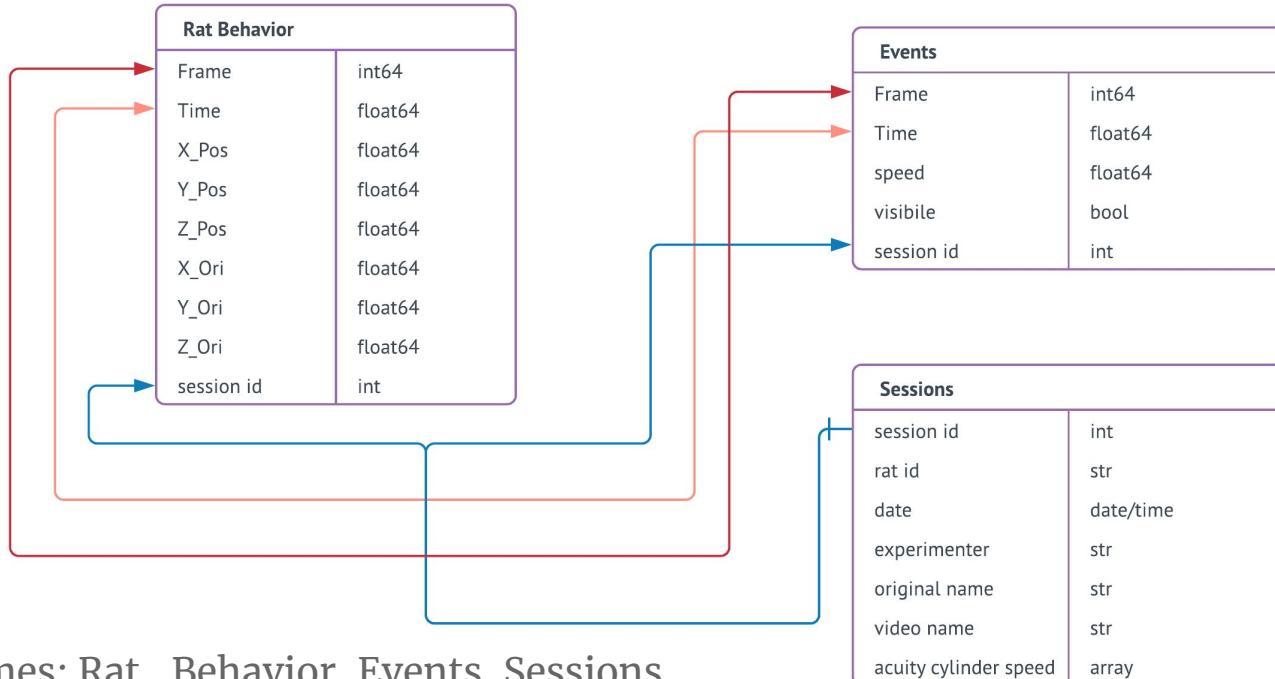
# Outline:

1. Data Source
2. Data Processing
3. Stimuli Related Behavior Analysis
4. Results
5. Simulation

# Experiment



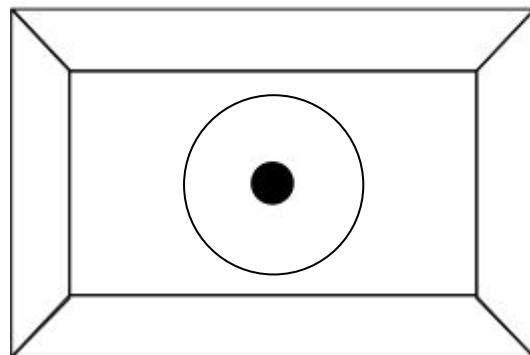
# Dataset



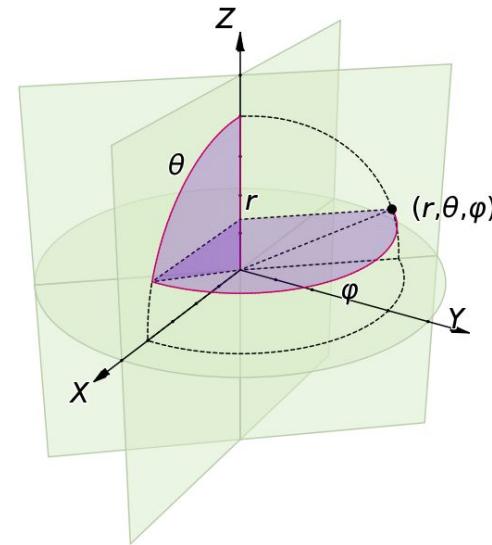
3 DataFrames: Rat\_Behavior, Events, Sessions

# Dataset - Sources

Position - 3D coordinates of rat's position

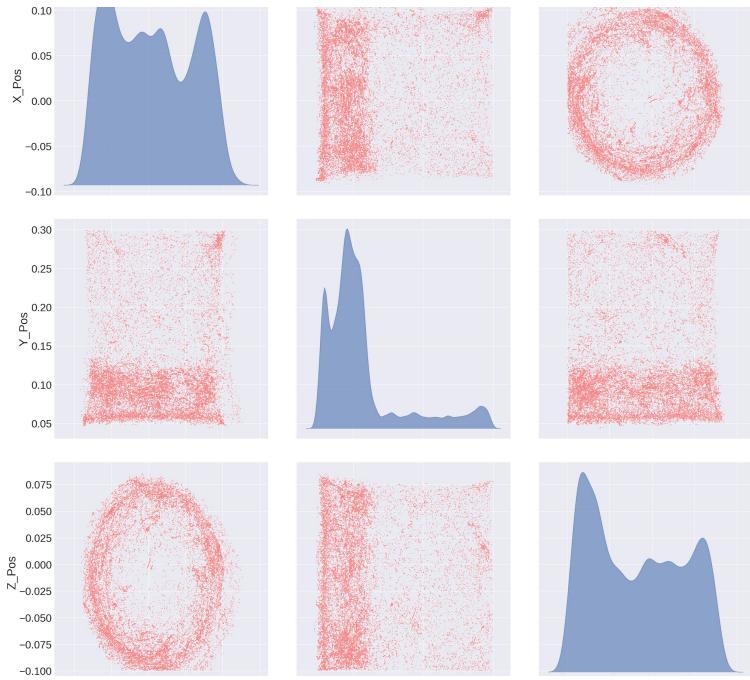


Orientation - Unit Vector in 3D: X, Y, Z

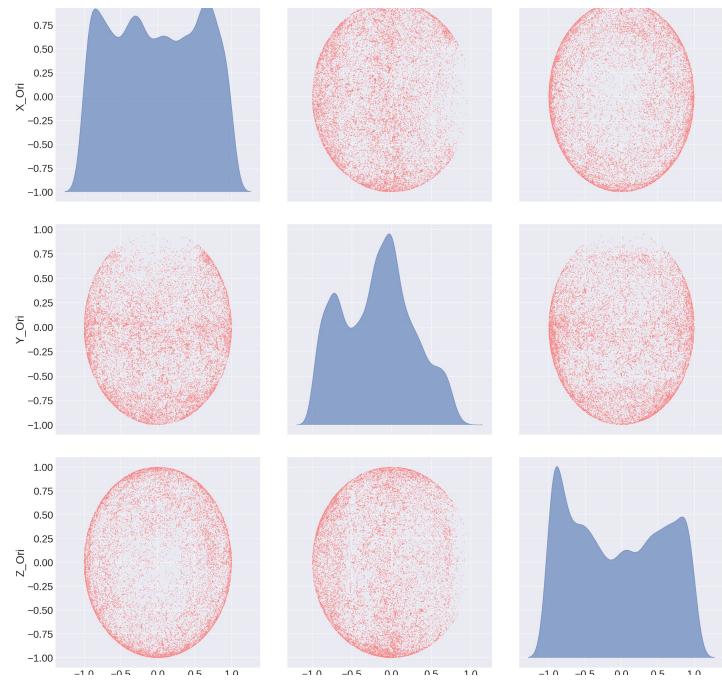


# Dataset - Sources

Position - 3D coordinates of rat's position

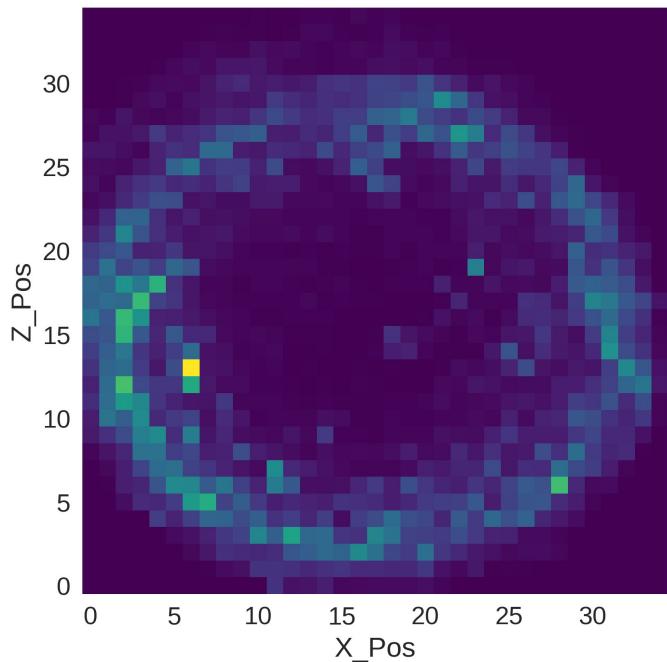


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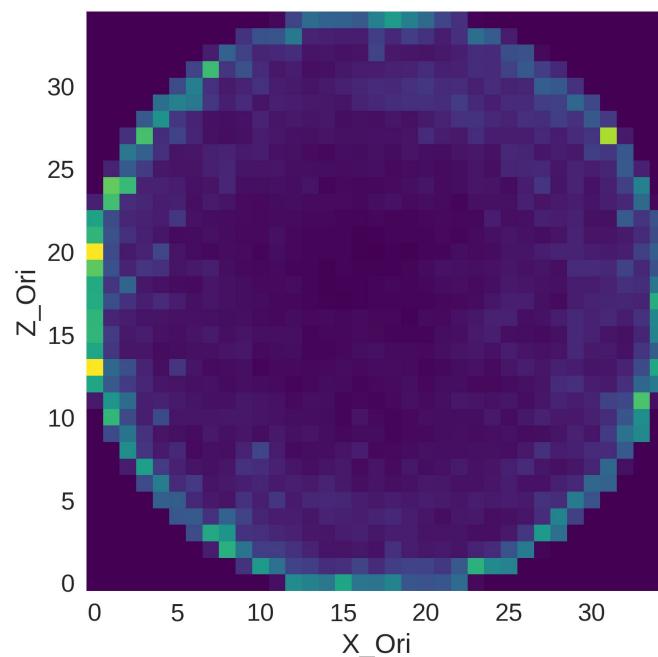


# Dataset - Sources

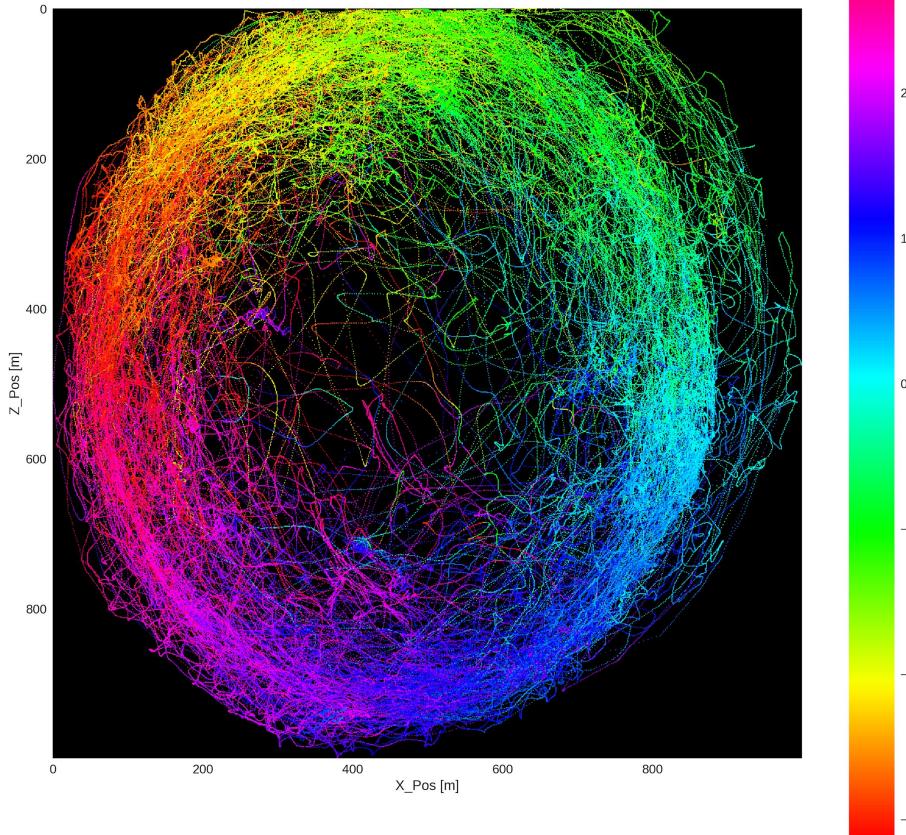
Position - 3D coordinates of rat's position



Orientation - Unit Vector in 3D: X, Y, Z



# Dataset

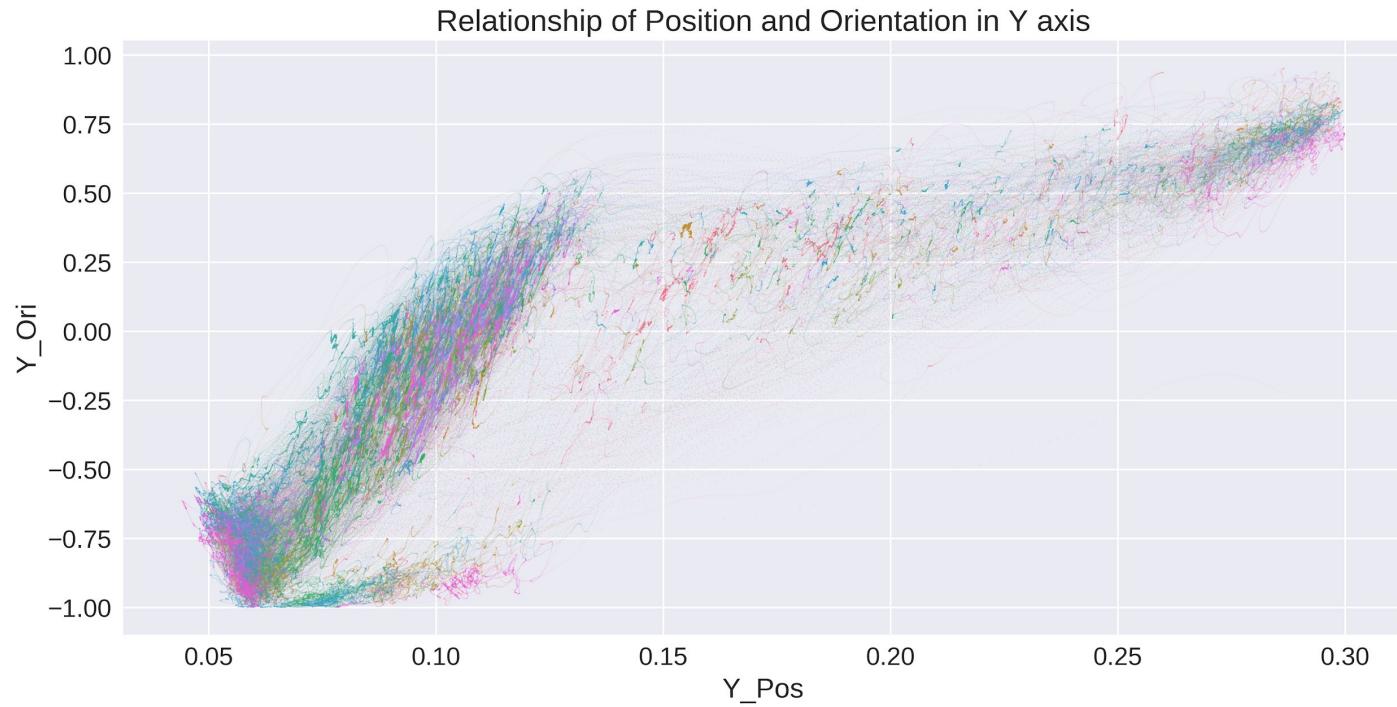


Combined

# Dataset - Filtering

Animal Behaviors:

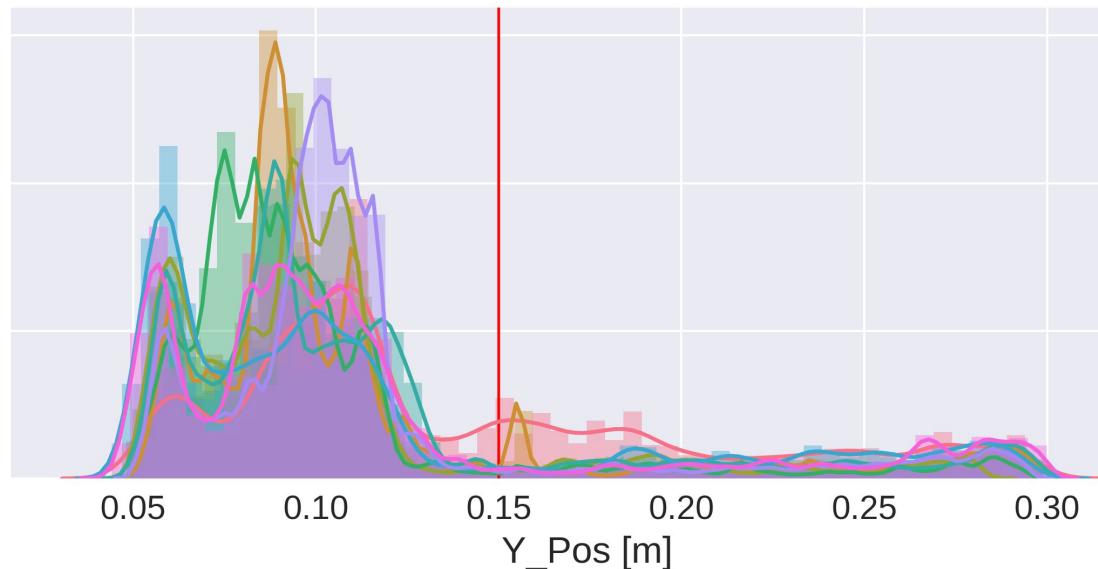
- Tracking
- Free movement
- Rearing
- Cleaning



# Dataset - Filtering

Animal Behaviors:

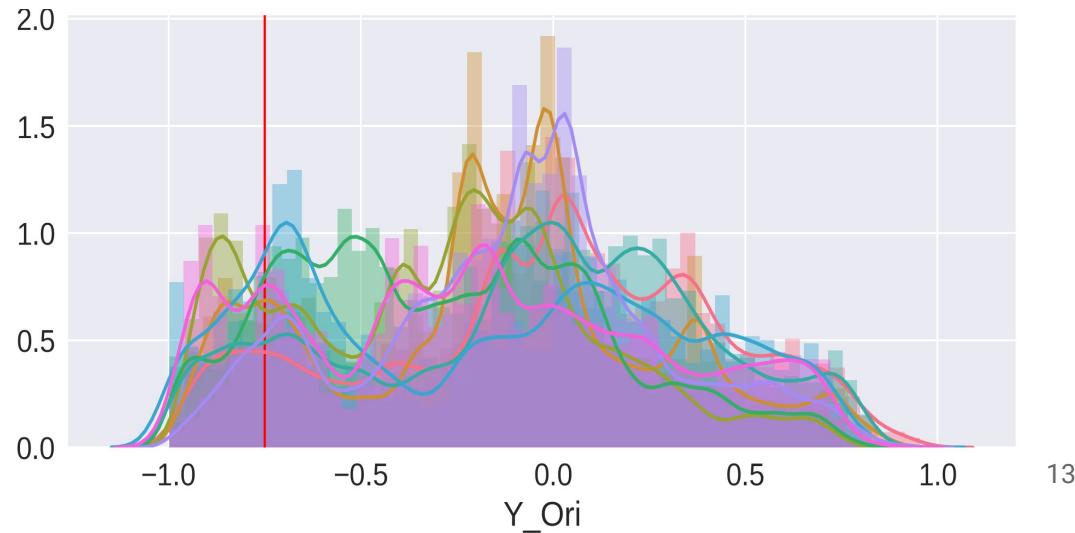
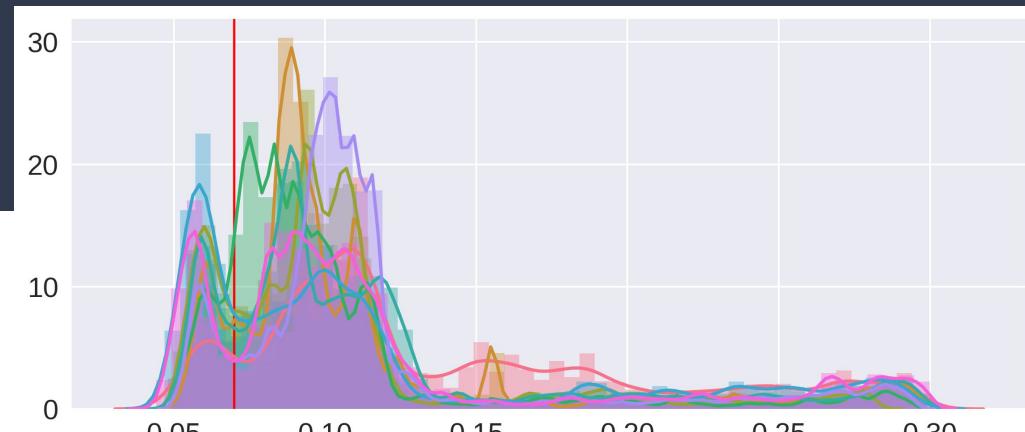
- Tracking
- Free movement
- **Rearing**
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# Dataset - Filtering

Animal Behaviors:

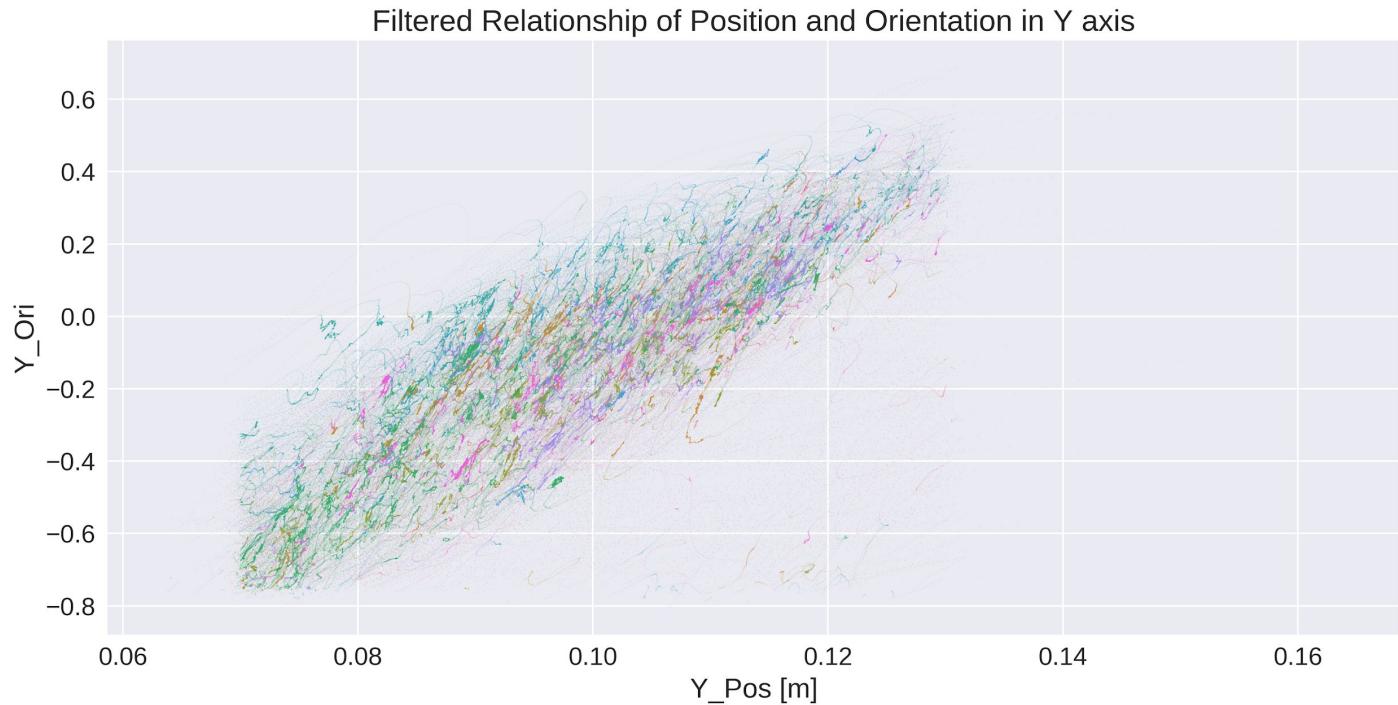
- Tracking
- Free movement
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- **Cleaning**



# Dataset - Filtering

Animal Behaviors:

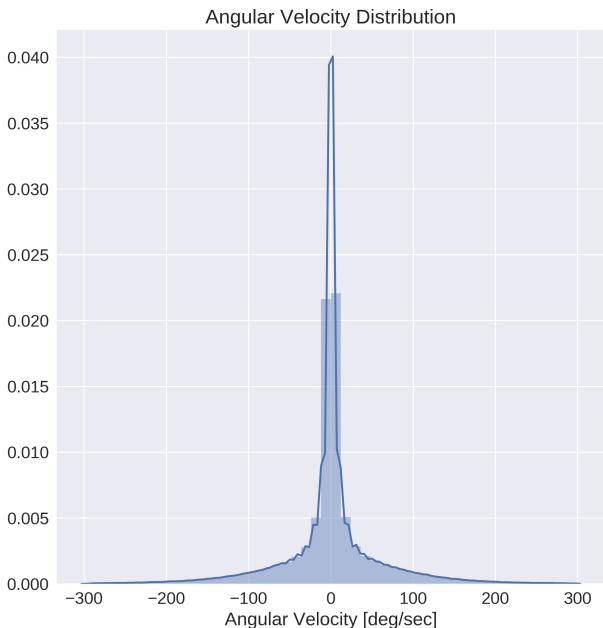
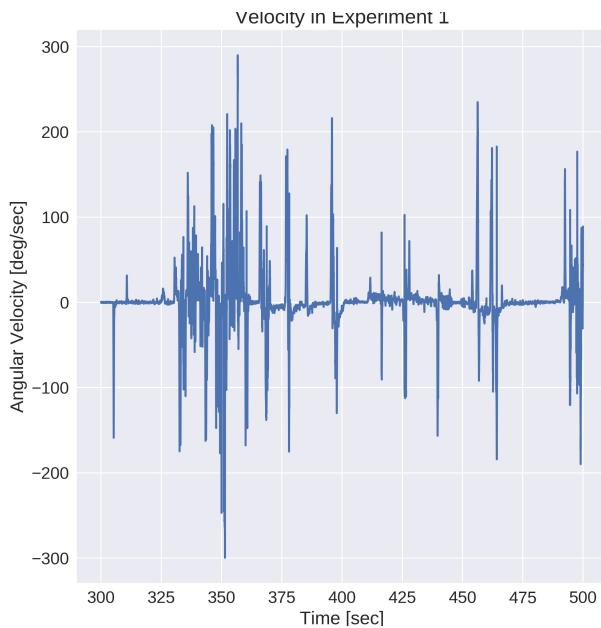
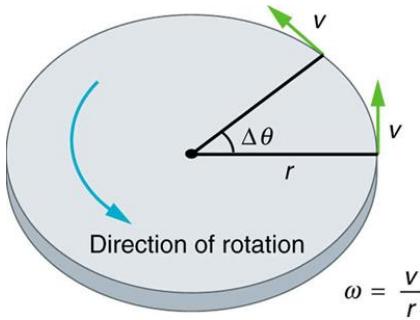
- Tracking
- Free movement
- **Rearing**
- Cleaning



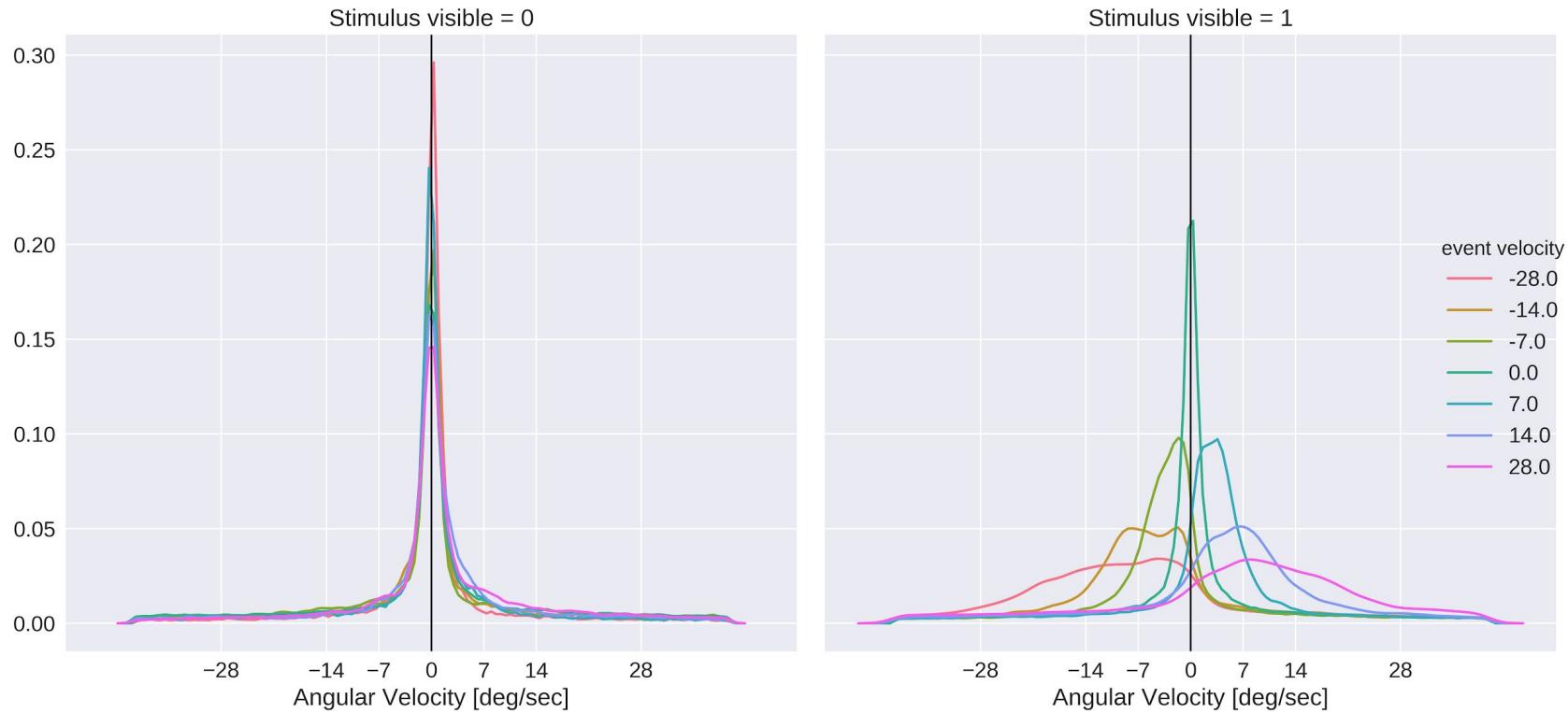
# Analysis

## Angular Velocity

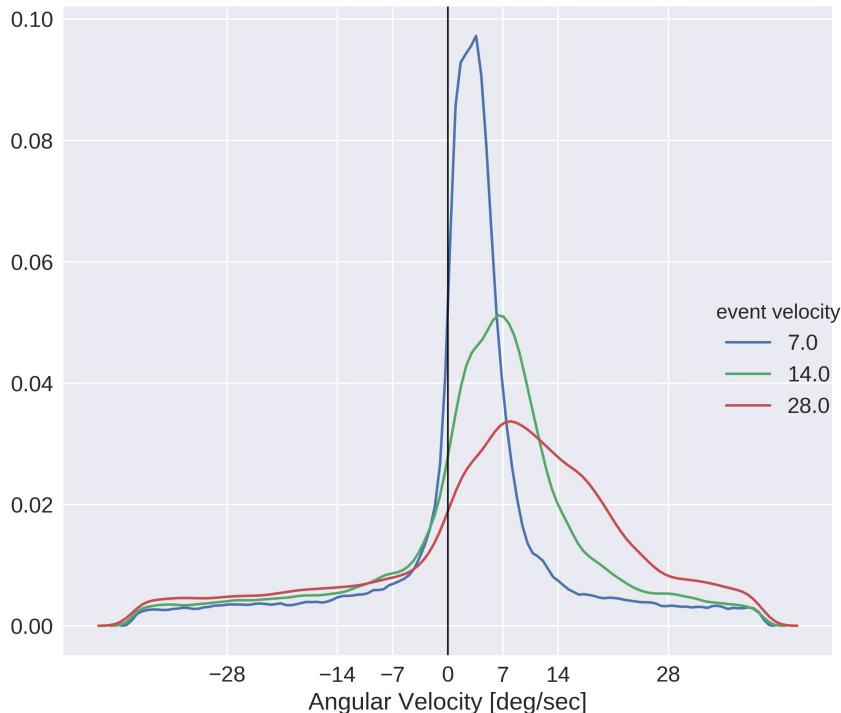
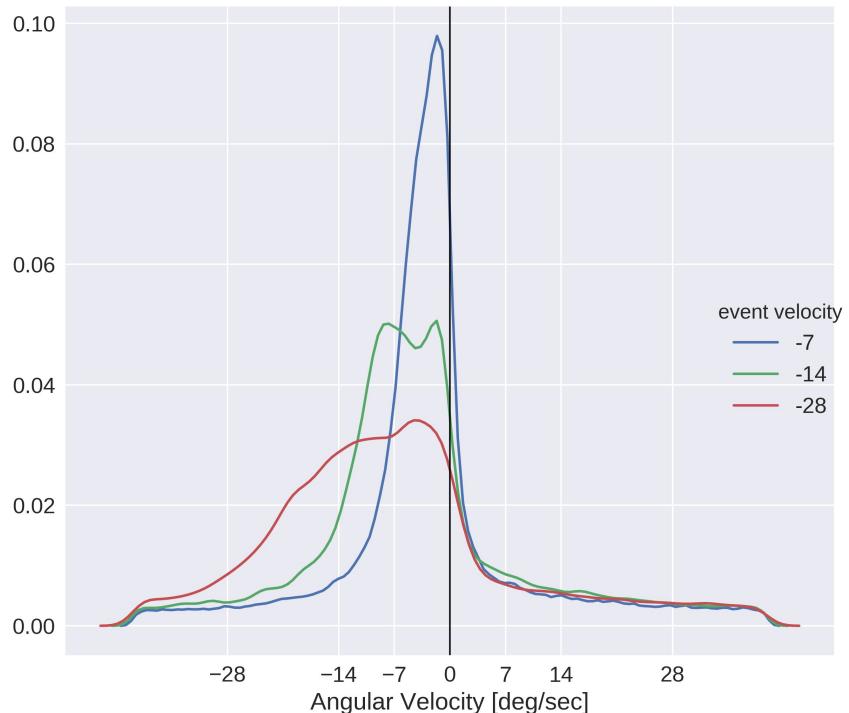
- X, Z axis



# Results I



# Results I



# Goal

Looking for:

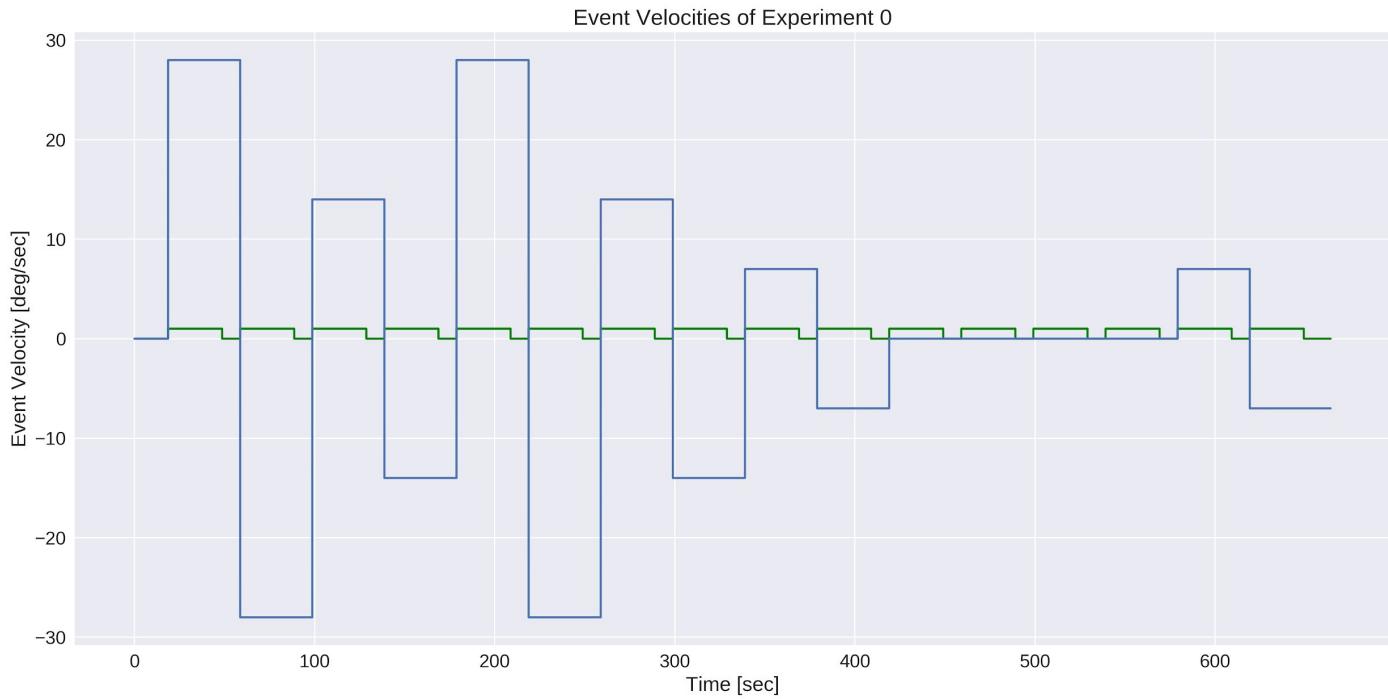
**Stimulus related behavior**  
moments when animal is  
tracking the stimulus



# Stimuli Related Behavior

Example Experiment:

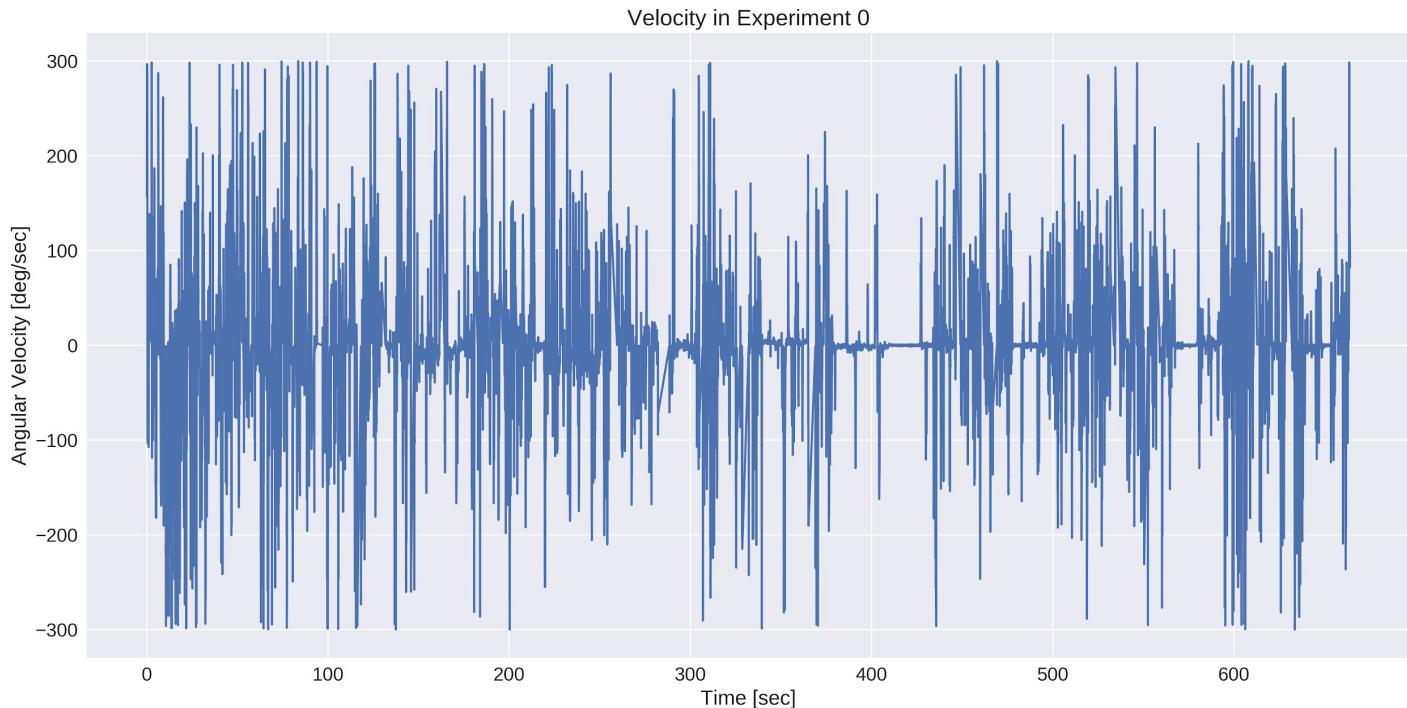
## 1. Experiment velocities



# Stimuli Related Behavior

## Example Experiment:

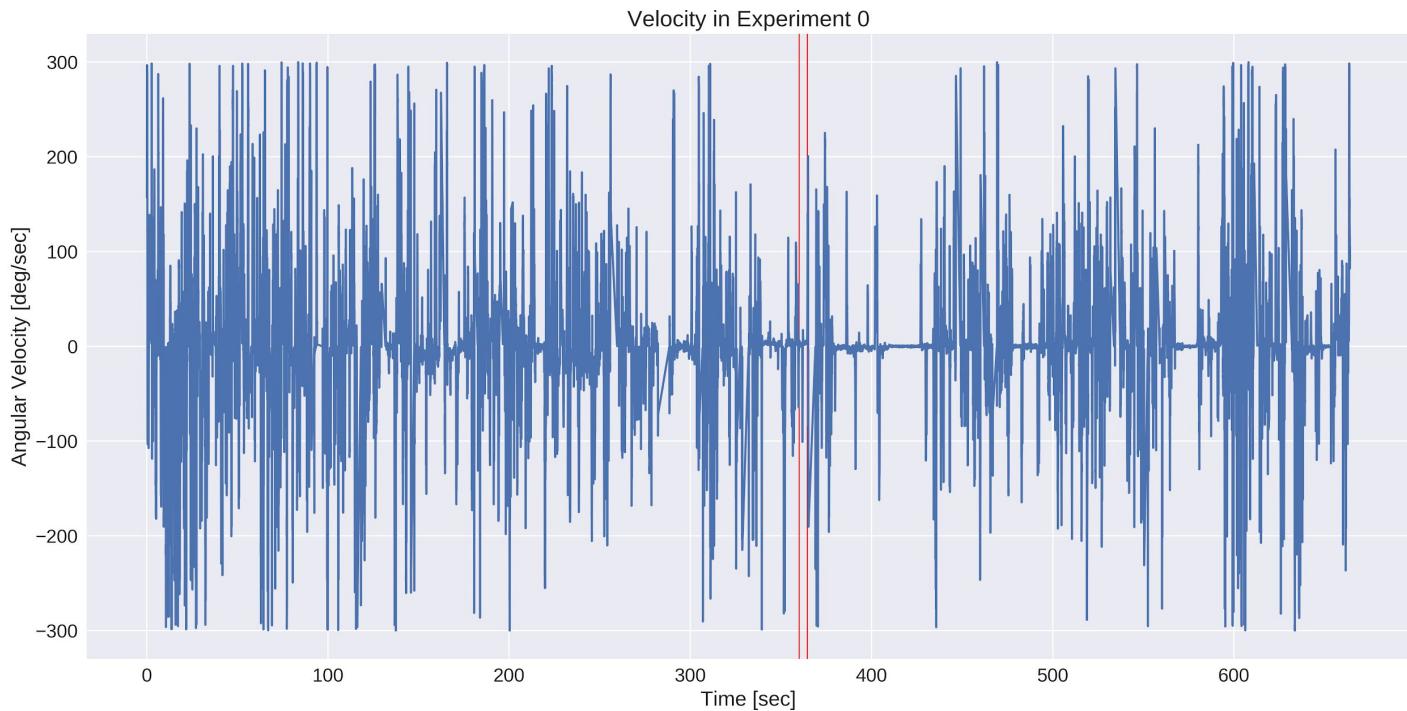
1. Experiment velocities
2. Angular velocity of rats head



# Stimuli Related Behavior

## Example Experiment:

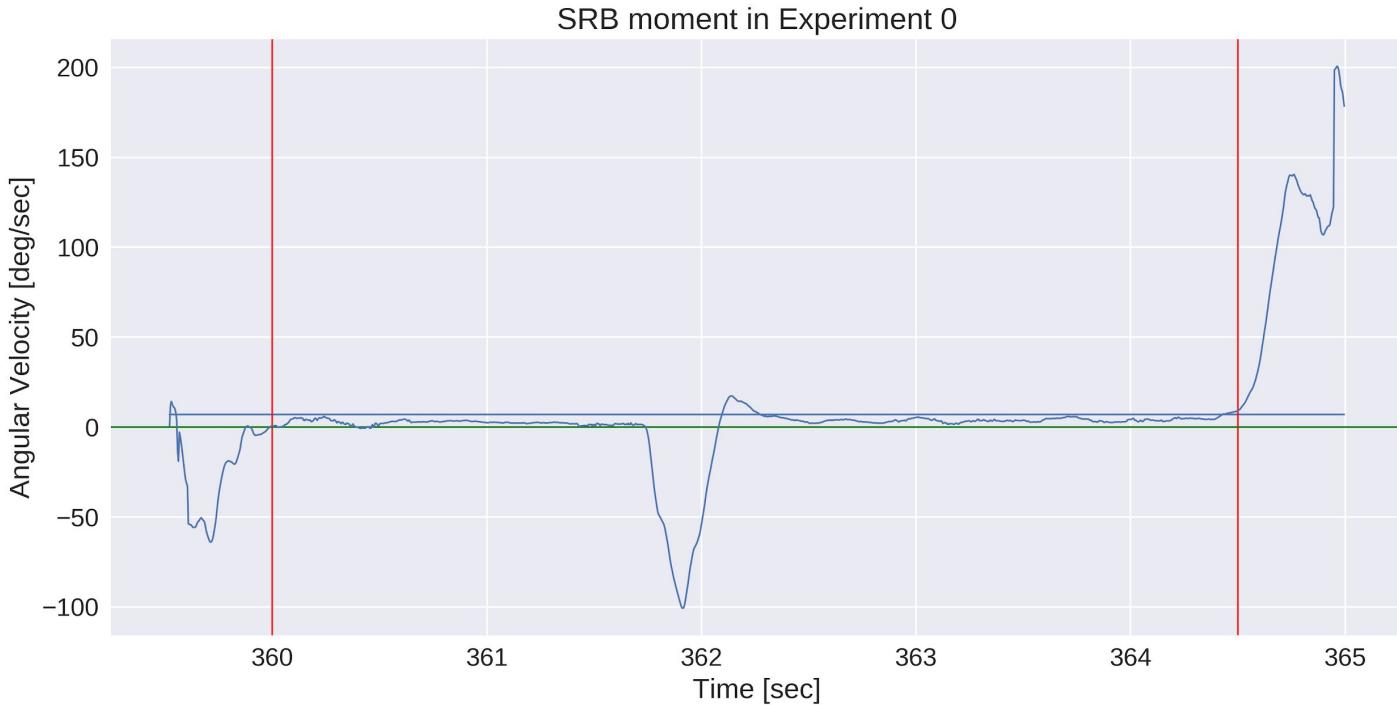
1. Experiment velocities
  2. Angular velocity of rats head
- +SRB



# Stimuli Related Behavior

## Example Experiment:

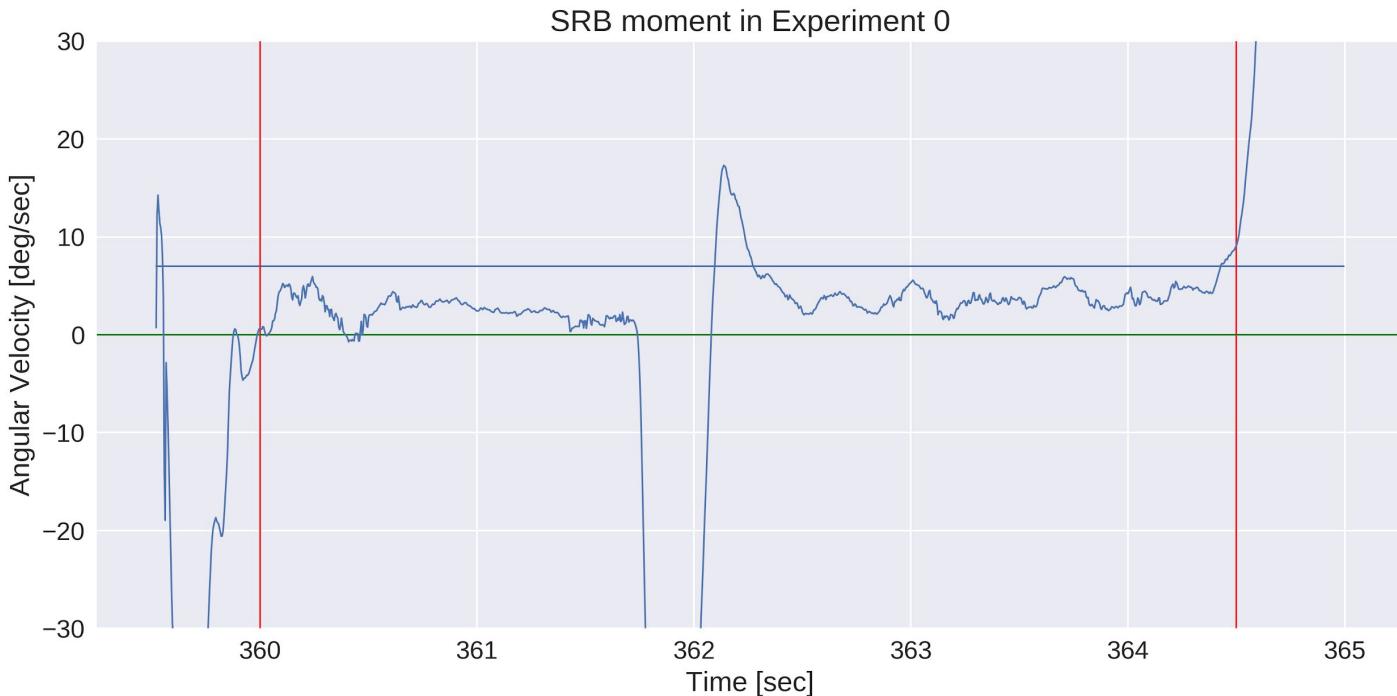
1. Experiment velocities
2. Angular velocity of rats head
3. Extracted example of SRB



# Stimuli Related Behavior

Example Experiment:

1. Experiment velocities
2. Angular velocity of rats head
3. Extracted example of SRB



# Stimuli Related Behavior - Automatic Detection

Features:

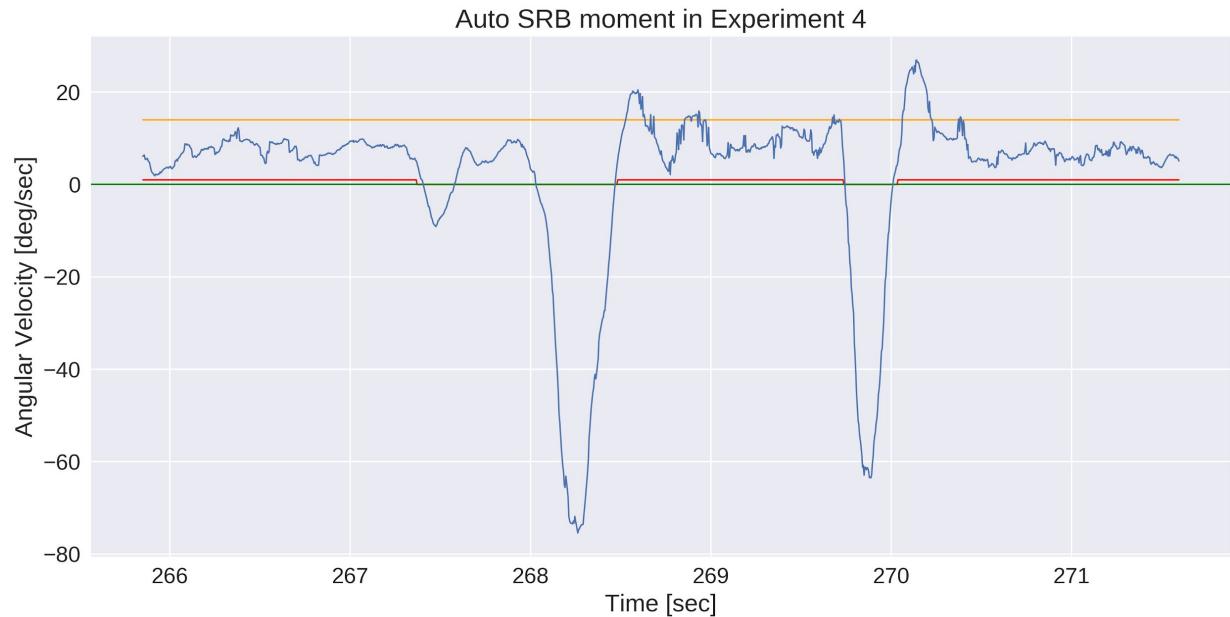
- Velocity range
- Duration
- Variance



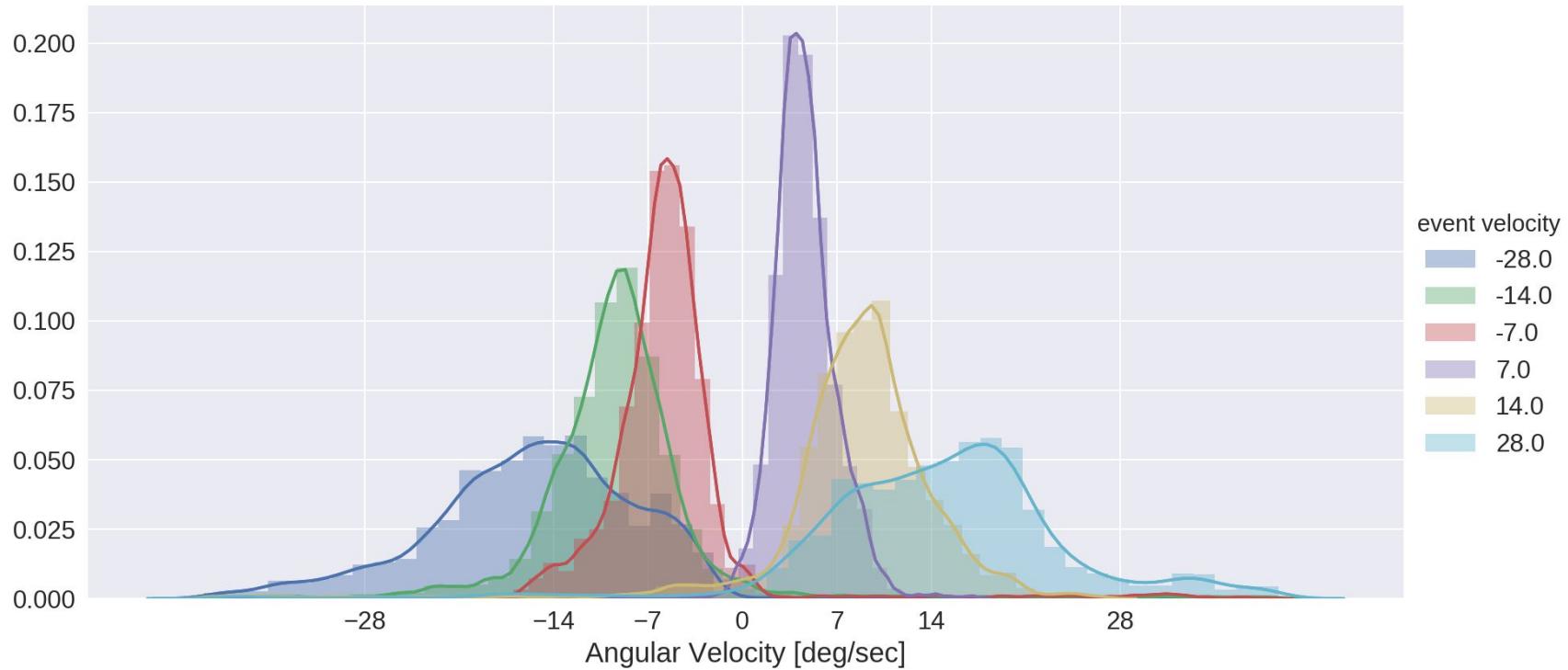
# Stimuli Related Behavior - Automatic Detection

Procedure:

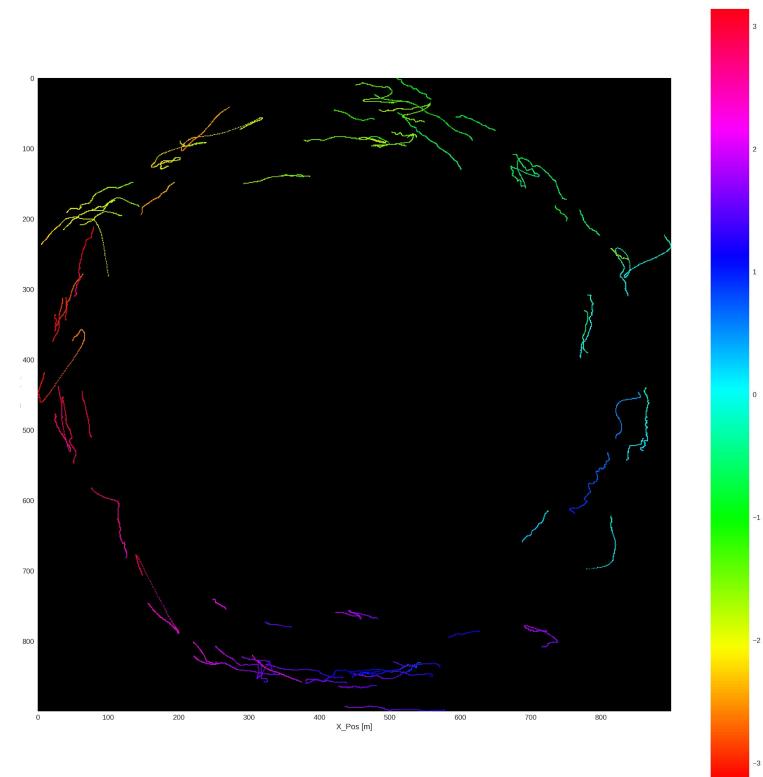
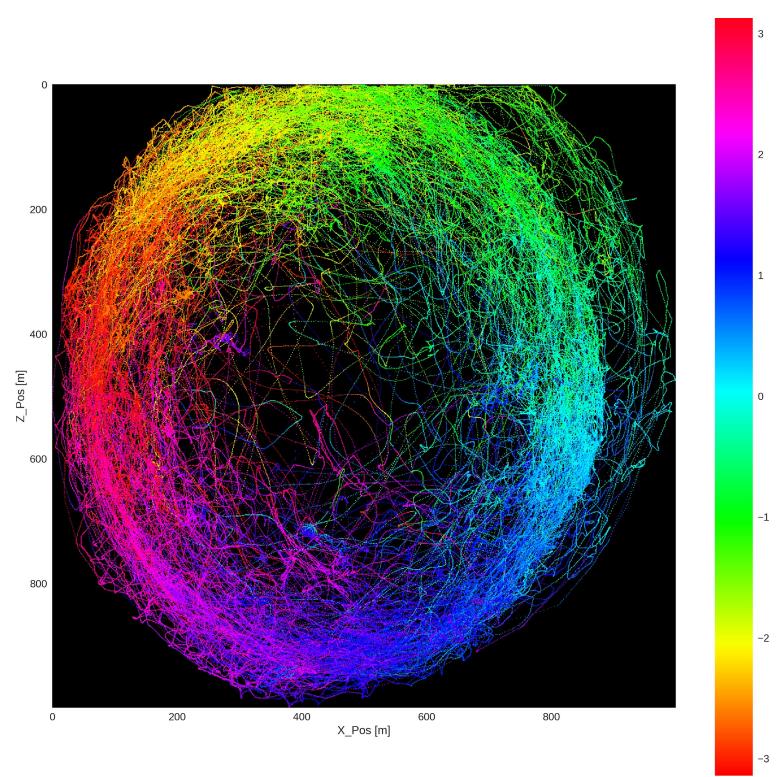
1. Compare angular velocity and event speed (with tolerance level)
2. Eliminate too short events
3. Merge close events



# Results II



# Results II

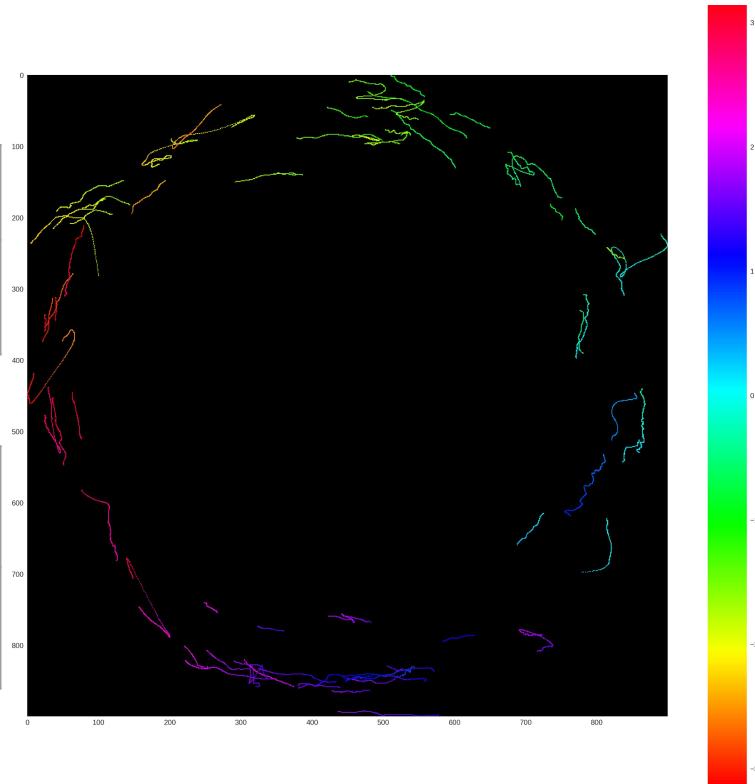


# Results II

Statistics:

session	0	1	2	3	4	5	6	7
SRB[%]	1.995	2.165	3.568	1.281	2.175	5.629	0.997	2.081

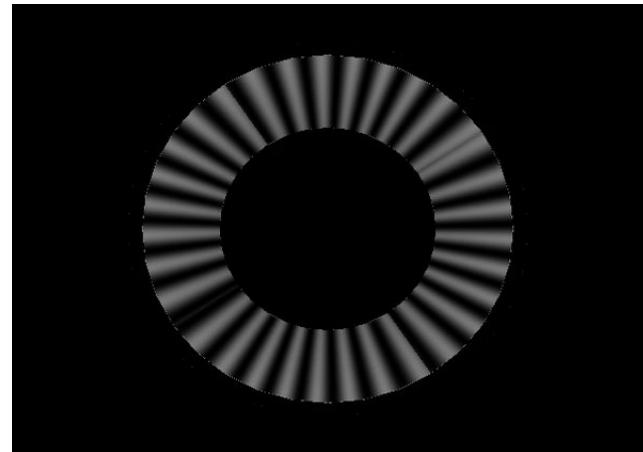
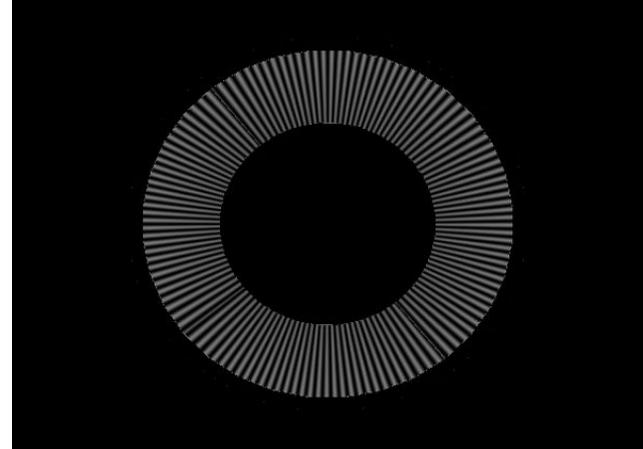
Event velocity	-28	-14	-7	7	14	28
SRB[%]	24.753	21.808	8.302	18.074	16.787	10.277



# Graphical Simulation

Parameters:

- Velocities
- Duration of:
  - Event
  - Visibility
- Spatial frequency



# Future Direction

1. Fine tuning/developing improved automatic method to detect SRB moments.
  - a. Creating automatic detection for head retraction
2. Possible further experimental setup:
  - a. Exploring event velocity decision
  - b. Exploring spatial frequency
3. Investigating rat behavior:
  - a. The angle of head movement
  - b. Duration of one SRB moment
4. Modifying the experiment to explore stereopsis of rodents

Thank you for your attention!