

xy_axis_characterisation

May 16, 2025

1 Testing the XY-axis direction on the T7 behavioural setup

Analysis of experiments performed to test the direction of air flow in the T7 experimental setup

2 Experiment Details

Date	Experimenter	Setup	Notes
2025-04-09	Tihana & Sharbat	T7 behavioural setup, Behavioural room (2061)	Pair of tweezers, permanent marker (for axis alignment) was placed, photos taken with iPhone camera, experiment run for 30 seconds with no airflow and with 10 larvae

```
[1]: import os
import pandas as pd
from matplotlib import cm
import matplotlib.pyplot as plt
from scipy import stats
import numpy as np
import src.parse_data as anm_parse
import src.plot_data as anm_plot
from matplotlib import animation
plt.style.use('../anemotaxis.mplstyle')
from IPython.display import display
import ipywidgets as widgets
from PIL import Image
```

```
[2]: %matplotlib widget
%load_ext autoreload
%autoreload 2
```

2.1 Photos of the setup

The following shows three photographs showing the position of the air nozzle taken with 3 apparatus : - iPhone camera by Sharbat - Behavioural camera on top of the arena inside T7 - Chore GUI

```
[3]: def display_setup_images():
    # Create figure with three subplots side by side
    fig, axes = plt.subplots(1, 3, figsize=(15, 5))

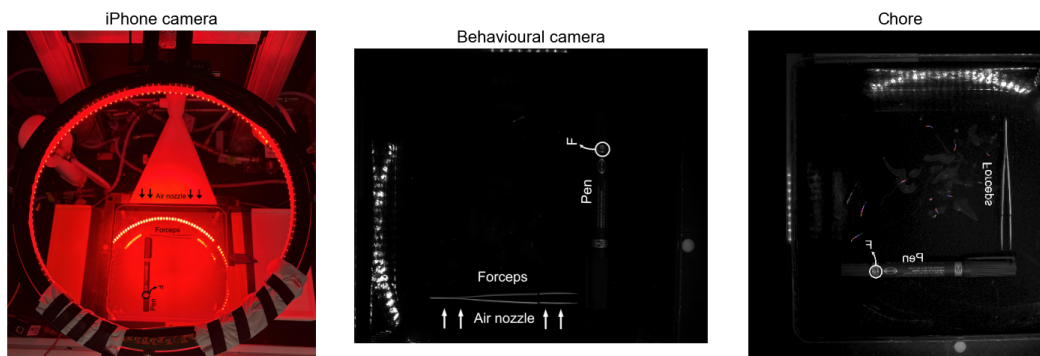
    # Image paths
    image_paths = ['t7_setup_20250409.jpg', 'test.png', 'Chore_test20250409.
    ↪png']
    titles = ['iPhone camera', 'Behavioural camera', 'Chore']

    # Load and display each image in its subplot
    for i, (ax, img_path, title) in enumerate(zip(axes, image_paths, titles)):
        try:
            # Load the image
            img = Image.open(img_path)
            img_array = np.array(img)

            ax.imshow(img_array)
            ax.set_title(title)
            ax.axis('off') # Hide axes
        except Exception as e:
            ax.text(0.5, 0.5, f"Error loading image:\n{str(e)}",
                    ha='center', va='center', transform=ax.transAxes)

    plt.tight_layout()
    return fig

[4]: # Display the images
fig = display_setup_images()
```



2.2 Calculation from Chore program

Now, we see if what we saw from Chore GUI is the same as from the calculations from the output of Chore .dat files.

```
[5]: data_folder = "/Users/sharbat/Projects/20250409_162408/"
columns = ["time", "x", "y"]
larvae_data = anm_parse.extract_all_larvae(data_folder, columns)
```

```
[6]: from pprint import pprint
larva_id = 'test01' # Example larva ID
# Accessing metadata, data, and summary for larva
pprint(larvae_data[larva_id]["metadata"]) # Experiment details
pprint(larvae_data[larva_id]["summary"]) # Summary statistics
```

```
{'date': '20240219_140808',
 'effector': 'test',
 'genotype': 'test',
 'raw_protocol': 'none#n#n#n',
 'stimulus_type': 'none#n#n#n',
 'tracker': 't7'}
{'time': {'max': np.float64(30.137),
          'mean': np.float64(14.267793733681463),
          'min': np.float64(0.006),
          'size': 383},
 'x': {'max': np.float64(60.947),
        'mean': np.float64(57.220684073107044),
        'min': np.float64(53.427),
        'size': 383},
 'y': {'max': np.float64(155.391),
        'mean': np.float64(152.02590600522194),
        'min': np.float64(149.433),
        'size': 383}}
```

```
[7]: def plot_trajectory_over_time(data, larva_id, plot_type="interactive"):
    """
    Plot larva trajectory with either interactive time slider or static
    colormap.

    Parameters:
    -----
    data : dict
        The larvae data dictionary
    larva_id : str
        ID of the larva to plot
    plot_type : str
        Either "interactive" or "static"
    """
    plt.ioff()
    # Get data
    larva = data[larva_id]['data']
    time = np.array(larva['time'])
```

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x = np.array(larva['x'])
y = np.array(larva['y'])

# Create figure with two subplots side by side
fig, (ax1, ax2) = plt.subplots(1, 2, figsize=(12, 6))

# Set up the RIGHT subplot (reference image) - common to both plot types
try:
    from PIL import Image
    # Load and display the image
    img = np.array(Image.open('Chore_test20250409_2.png'))
    ax2.imshow(img)
    ax2.set_title('Chore Reference Image')
    ax2.axis('off') # Hide axes for image
except Exception as e:
    ax2.text(0.5, 0.5, f"Error loading image:\n{str(e)}",
            ha='center', va='center', transform=ax2.transAxes)

# Set common axis properties for trajectory plot
x_padding = (np.max(x) - np.min(x)) * 0.1
y_padding = (np.max(y) - np.min(y)) * 0.1
ax1.set_xlim(np.min(x) - x_padding, np.max(x) + x_padding)
ax1.set_ylim(np.min(y) - y_padding, np.max(y) + y_padding)
ax1.set_aspect('equal')
ax1.set_xlabel('X Position')
ax1.set_ylabel('Y Position')
ax1.grid(True, alpha=0.3)

if plot_type == "interactive":
    # INTERACTIVE PLOT (with slider)
    point, = ax1.plot([], [], 'o', color='blue', markersize=10)

    # Plot full trajectory as background
    ax1.plot(x, y, '-', color='gray', alpha=0.3, linewidth=1)
    ax1.set_title('Larva Trajectory')

    def update(frame):
        # Update point position
        point.set_data([x[frame]], [y[frame]])
        ax1.set_title(f'Time: {time[frame]:.2f}s')
        return (point,)

    # Create interactive controls
    play = widgets.Play(
        value=0,
        min=0,
        max=len(time) - 1,

```

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        step=1,
        interval=50,
        description="Play"
    )

    slider = widgets.IntSlider(
        min=0,
        max=len(time) - 1,
        description='Frame:',
        value=0,
        style={'description_width': 'initial'},
        readout_format='d',
        layout=widgets.Layout(width='800px')
    )

    # Link play and slider
    widgets.jslink((play, 'value'), (slider, 'value'))

    def update_plot(change):
        if change['type'] == 'change' and change['name'] == 'value':
            update(change['new'])
            fig.canvas.draw_idle()

    # Connect events
    slider.observe(update_plot)

    # Display controls and figure
    display(widgets.HBox([play, slider]))
    display(fig.canvas)

    # Initialize plot
    update_plot({'type': 'change', 'name': 'value', 'new': 0})

elif plot_type == "static":
    # STATIC PLOT (with colormap)
    # Create colormap based on time values
    norm = plt.Normalize(time.min(), time.max())
    cmap = plt.cm.viridis

    # Create a scatter plot with points colored by time
    scatter = ax1.scatter(x, y, c=time, cmap=cmap, s=30, alpha=0.8)

    # Also plot trajectory line
    points = np.array([x, y]).T.reshape(-1, 1, 2)
    segments = np.concatenate([points[:-1], points[1:]], axis=1)
    lc = plt.matplotlib.collections.LineCollection(
        segments, cmap=cmap, norm=norm, alpha=0.6
    )

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)
lc.set_array(time[:-1])
ax1.add_collection(lc)

# Add colorbar
cbar = fig.colorbar(scatter, ax=ax1)
cbar.set_label('Time (s)')

ax1.set_title(f'Larva Trajectory - Static View')
display(fig.canvas)

plt.tight_layout()
return fig

```

```

[8]: # fig = plot_trajectory_over_time(larvae_data, larva_id, "interactive") #
      ↳ Default interactive view
fig = plot_trajectory_over_time(larvae_data, larva_id, "static") # Static
      ↳ colormap view

```

