1 Behavioural Annotation and Accelerometer Alignment

1.1 Behavioural Annotation Timing

Behavioural annotations were performed using a custom Python-based graphical user interface (GUI). The annotator operates on a frame-based timing principle. Each behavioural event or bout is defined by its corresponding video frame indices rather than by real-time clock measurements.

For each annotated behaviour, the following information is stored:

- Start frame index (f_{start})
- End frame index (f_{end})
- Video frame rate (FPS)

Behavioural time in seconds is computed as:

$$t = \frac{f}{\text{FPS}}$$

If an absolute start datetime (T_0) is provided, absolute timestamps are calculated as:

$$T = T_0 + \frac{f}{\text{FPS}}$$

Thus, the temporal resolution of behavioural annotations is constrained by the video frame rate:

$$\Delta t = \frac{1}{\text{FPS}}$$

1.2 Accelerometer–Behaviour Alignment

Accelerometer data were recorded at a higher sampling frequency (about 100 Hz, I think, which ends up in about 10 ms temporal resolution) than the video frame rate, producing sub-second timestamps (t_{acc}).

For each accelerometer timestamp, a behavioural label was assigned according to:

$$\text{Label}(t_{acc}) = \begin{cases} B_i & \text{if } t_{start,i} \leq t_{acc} \leq t_{end,i} \\ \text{None} & \text{otherwise} \end{cases}$$

This interval-containment approach preserves the behavioural window without nearest-neighbour matching.