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Automated gesture tracking in head-fixed mice

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Abstract

Background. The preparation consisting of a head-fixed mouse on a spherical or cylindrical treadmill offers unique advantages in a variety of experimental contexts. Head fixation provides the mechanical stability necessary for optical and electrophysiological recordings and stimulation. Additionally, it can be combined with virtual environments such as T-mazes, enabling these types of recording during diverse behaviors.

New method. In this paper we present a low-cost, easy-to-build acquisition system, along with scalable computational methods to quantitatively measure behavior (locomotion and paws, whiskers, and tail motion patterns) in head-fixed mice locomoting on cylindrical or spherical treadmills.

Existing methods. Several custom supervised and unsupervised methods have been developed for measuring behavior in mice. However, to date there is no low-cost, turn-key, flexible, and scalable system for acquiring and quantifying behavior in mice.

Results. We benchmark our algorithms against ground truth data generated either by manual labeling or by simpler methods of feature extraction. We

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