Can SLEAP be Used to Track and Quantify Octopus Arm Movement?

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Studying octopus arm movement is important for behavioral and motor control research as octopuses use their arms to capture prey, mate, fight, hide from predators, and complete tasks in experiments. Animal pose estimation, a tool that enables researchers to study animal behavior by quantifying movement, could help answer questions in octopus behavioral research. However, it is unknown whether available softwares are capable of tracking the octopus' nonrigid body parts. We aimed to resolve this technological gap by determining if SLEAP, a multi-animal pose tracking machine learning system, can track the octopus' eight arms. We trained a SLEAP model on videos of an Octopus insularis by labeling video frames using a skeleton made up of seven nodes from the base of each arm to the tip, generating and correcting automated predictions, and retraining the model. To measure the performance of the SLEAP model, we calculated the percentages of frames in which the arms were not tracked, partially tracked, mostly tracked, and fully tracked in one training video and three test videos. We found that visible arms were fully or mostly tracked in the majority of frames and concluded that SLEAP is capable of tracking octopuses. By analyzing average speed data extracted from our model's predictions, we distinguished between different types of movement and the speeds of individual arms. While our training and test videos did not include any behaviors we could examine, our results show that future studies could use quantitative data from SLEAP to study octopus behavior and movement.

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