Human Pose and Affordance Estimation

Understanding human actions is important if robots are to be assimilated into our world. Firstly, understanding what humans intend to do can improve safety when humans and robots work together. Secondly, robot behavior can be improved by replicating human actions. One form of understanding human actions is to observe them and to track how they move. Intention can then be identified by identifying key postures and gestures. For example, identifying the difference between a sitting and standing pose, or identifying if a human is holding a heavy item in their hand.

The goal of this project is to develop a method that tracks humans and registers when they are in a known pose. This will then be used to better understand the environment, such as identifying the type of a room by the actions observed in the room or identifying the class of objects based on the corresponding human actions that are performed nearby.

Tasks

- Develop a robust human pose tracking system by building on the state-of-the-art human pose 2D estimation work in [1]. This implementation should be able to track multiple people and there poses in the 3D world.

- Extract representative poses for typical tasks that humans perform, e.g. standing, walking, sitting, opening door, holding object, waving, etc.

- Classify the observed human poses with the known set of expected poses to continuously identify what actions are being performed by the people in the scene.

- Incorporate human pose estimates to make sense of the environment. For example, identify which actions are most often performed in a certain room to understand the identity of that room (e.g. lying down is often performed in room X, therefore, room X is likely to be a bedroom). Alternatively, match human poses to segmented structures in a household in an attempt to classify the structures (e.g. sitting on structure X means that structure X is likely to be a chair).

Workload split

- Research and theory: 30%

- Programming and implementation: 50%

- Writing: 20%

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References