Persim: A Simulator of Human Activities in Pervasive Spaces

Simulation of Human Activities

Human-centric research involving intelligent interactions between humans and smart environments relies heavily on test data to verify modeling techniques and algorithmic performance such as accuracy and recall. In particular, activity modeling and recognition research, which aims at identifying what activities are being performed or attempted by a human, is direly needy of datasets for validation. The goal of many applications that utilize activity recognition is to help improve the quality of daily life of users especially frail elderly or individuals with special needs. Activity recognition research is especially critical to the assistance or rehabilitation of those with cognitive impairments or traumatic brain injuries. However, data from real deployments are scarce, expensive and time consuming to obtain. And even if cost is not an issue, regulatory limitations on the use of human subjects prohibit the collection of extensive datasets that can test all scenarios, under all circumstances. Powerful and verifiable simulation tools are needed to accelerate research on human-centric research such as activity and behavior recognition and understanding. Of course, one of the main challenges in developing smart space simulators lies in the ability to verify how close the simulated data are to the real world data.

Uses of Persim

Persim is a tool set whose objective is to empower researchers to generate needed datasets without having to have the luxury of an expensive smart house or other smart spaces. Converting datasets (any datasets) into the lab's own SDDL standard format is one the basic features of Persim. Creating a Persim simulation project is the main feature of Persim. This involves graphically creating a smart space, instrumenting it the desired sensors and injecting activities in that space. A simulation project is typically created over a period of time via multiple sessions. Once a simulation project is completed, generating a synthesized dataset is only a click of a button. To facilitate sharing of the generated datasets, Persim uses a community resource repository hosted at Google. Persim offers its users another powerful feature, which we call pervasive space "stem-celling". By accessing and extending an existing dataset, a partial version of the Persim simulation project that represents the space/activities of the modified dataset can be properly constructed. The user is then able to complete the automatically constructed partial project to generate the corresponding dataset. To validate a generated dataset against a real or a reference dataset can be done in one of two methods as we demonstrated and published. Such validation are not yet integrated into the Persim tool set even though this is the plan moving forward on this project.

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Active Research and Projects

Publications

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