

Public Abstract

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Title:Type-1 and Type-2 Fuzzy Systems for Detecting Visitors in an Uncertain Environment

In this work, I have developed an algorithm to detect the presence of visitors in a noninvasive manner. This algorithm is designed as part of an in home monitoring system. The data from the algorithm will be used as a way to monitor the social health of the resident. It will also be used to help isolate the times when the resident is in the apartment alone, so that parameters like activity levels can be calculated.

Type-1 and Type-2 fuzzy systems are compared for classification performance. A series of lab tests provided the information necessary to model the motion sensors. Results from the motion sensor tests are used as guides for the Footprint of Uncertainty (FOU) used in the Type-2 systems. It is shown that the FOU values do not significantly impact the classification accuracy of the Type-2 systems. Classification accuracy of the ground truth data collected in a test apartment reached 88%. Additionally, the Type-2 MISO 2 Agent and Type-2 SISO systems best identify the known visitor times in the resident apartments.

Ongoing human subject monitoring data is evaluated empirically. The results from an organized set of tests in a test apartment are presented.