Visualization of activity data in smart environments

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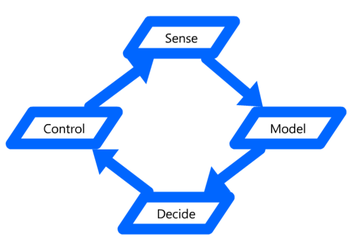
Objective

The focus of my work is adding enhancements and robustness to the visualizer; on using the visualizer to summarize and annotate data, and on assessing the visualizer.

Introduction

- **Project goal:** Add report features to 2D environment simulator
- **Hypothesis:** Enhanced visualizer can be used to analyze and annotate sensor data
- **Motivation:** Provide better models for medical monitoring, increased comfort, efficiency and security

Smart Home Basics:

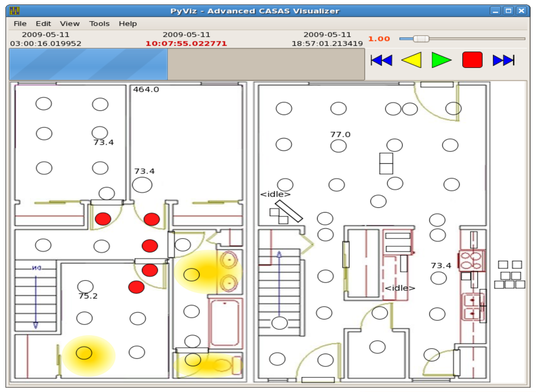


- The reasons for better modeling
- Current data
- Relevance and relationships
- Current caregiver methods
- Benefits of routine, continuous, non-obtrusive monitoring

Example of Data

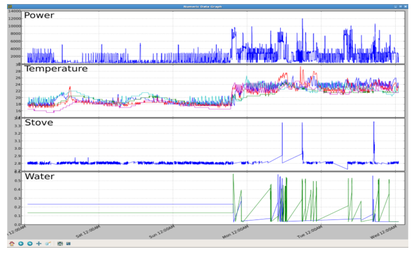
```
2009-04-03 07:48:24.476429  127C375F000000F3   ON
2009-04-03 07:48:24.058644  1215824600000090   ON   5-end
2009-04-03 07:48:25.064383  12DD7846000000B5   ON
2009-04-03 07:48:26.568219  1215824600000090   OFF
2009-04-03 07:48:28.801189  12DD7846000000B5   OFF
2009-04-03 07:48:29.453119  127C375F000000F3   OFF
2009-04-03 07:48:30.464469  28BC95310100006D   22.5
2009-04-03 07:48:31.082969  28FD8B31010000F1   21.5
2009-04-03 07:48:36.060715  129E375F000000B4   ON
```

Sources of Data



We have placed sensors in three on-campus testbeds and three off-campus participant homes

Sensor events and power/water/burner readings can be analyzed manually using PyViz visualizer.

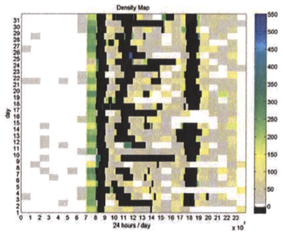


Motion Density Histogram

- Motion sensor data only
- Motion provides a vague idea of activity
- Histogram
- Implementation using Python and matplotlib

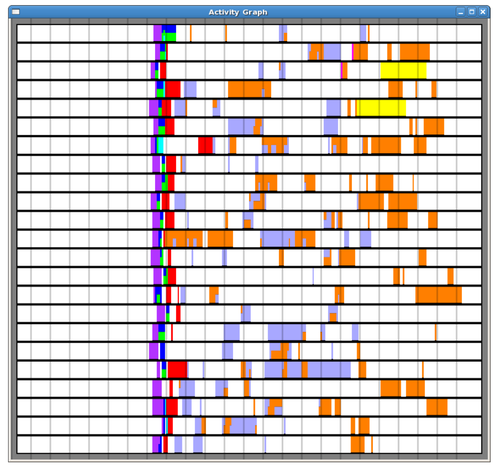
Issues

- Scaling and Consistency
- Limitations of the library
- Robustness



Activity Visualizer

- Incorporates the results of ongoing work
- Provides more information and accuracy
- Annotated data avoid clarity and robustness issues
- Options of Annotation



Future Work

- Various display modes
- Visualization of completeness
- Learning tools