**System Architecture**

- Hybrid approach consisting of fixed location and mobile sensors in combination with agent-based simulation to measure and model both occupancy and environmental conditions

**Data Gathering: Sensors and Simulation**

**Fixed Location Sensors**
- Positioned strategically throughout the buildings under study
- Currently measuring humidity, light and temperature
- Transmit measurements wirelessly to a base station

**Mobile Sensors**
- Using mobile phones with commonly-found embedded sensors
- Use Wi-Fi and Bluetooth signal strength to determine location within a building
- Buildings maps are developed with Wi-Fi and Bluetooth signatures for each room

**Agent-Based Simulation**
- Used to simulate data for areas where sensor data is not available
- Based on the theory that occupancy drives energy consumption
- Software agents simulate the dynamic occupancy of a building through the day

**Future Work**
- Expand capabilities of fixed location sensors (carbon dioxide, sound, watts consumed, air flow, etc.) and add actuators (cooling fans, task lighting, etc.)
- Expand coverage area for mobile and fixed location sensors
- Perform analytical study of collected data
- Use collected data to refine the simulation model
- Expand energy consumption simulation model beyond lighting energy

**Visualization**

- Can we suggest ways to use a building differently to reduce the energy cost for the building?