Imagine for a moment these two scenarios:

Scenario 1: You work at a job that demands much of your time, and you are too exhausted by the time you come home from work to cook dinner. Taking one of the new TV dinners equipped with an RFID (Radio Frequency IDentfication) tag you bought from the grocery store. You simply scan it with an RFID reader attached with the computer, which will display the dietary (and other) information. Furthermore, when you place the TV dinner into the microwave attached with the computer, it automatically configures itself to cook at the appropriate temperature for the appropriate time based on the RFID tag.

Scenario 2: You live in a neighborhood that has recently been hit by a string of burglaries. Moved by compassion for your elderly parents down the streets and an increased need for security, you want to purchase a set of motion detectors and video cameras that, when one of the motion detectors is triggered, can turn on the video camera(s), point the video camera(s) in the direction of motion start capturing images, turn on the television and living room lights or any combination of the above actions.

Both of these situations are uses cases of what is known as a “smart home”. A smart home can simply be thought of as a house that has in some way been automated by a computer or set of computers for the benefit of its inhabitants. The level of automation varies depending on the inhabitant’s wishes and the inhabitant’s benefit can be luxury, efficiency, safety, or a combination of these. Existing smarthome packages generally consist of some types of sensors (i.e. temperature, motion, light intensity) combined with devices that change the environment (i.e. turn the thermostat down, turn on the television, or draw the shades), called actuators, that are all controlled in some way by a controlling device, called a controller.

This project will consist of reviewing existing smarthome frameworks, identifying their advantages and disadvantages, designing a universal smarthome framework that includes these types of devices, and implementing some use cases of your own choosing in your framework. You are encouraged to use an iterative design process (i.e. make changes to your framework as you find out more information) and the use cases you implement need not be the same ones presented earlier. Your framework should be scalable in terms of the number of devices and number of control routines in your system, dynamic in the sense that devices should be able to be added, configured, and removed from your system (similar to networking protocol DHCP), and well-documented in terms of the requirements you identify, the design decisions you make, and the readability of your code. Finally, your implementation should be written entirely in Java.
See some of the references on the following pages for existing smarthome frameworks and research areas related to smart homes. Direct questions to Dr. Johnny Wong at wong@cs.iastate.edu or Ryan Babbitt at rbabbitt@iastate.edu.

**Existing Smarthome Frameworks**

- The Adaptive House, University of Colorado at Boulder
  - [http://www.cs.colorado.edu/~mozer/house/](http://www.cs.colorado.edu/~mozer/house/)
- AIRE, Massachusetts Institute of Technology
- The Aware Home, Georgia Tech University
  - [http://www.cc.gatech.edu/fce/ahri/](http://www.cc.gatech.edu/fce/ahri/)
- CyberManor, Internet Home Alliance
- Easy Living, Microsoft
  - [http://research.microsoft.com/easyliving/](http://research.microsoft.com/easyliving/)
- Gator Tech Smart House, University of Florida
  - [http://www.rerc.ufl.edu/](http://www.rerc.ufl.edu/)
- House, Massachusetts Institute of Technology
  - [http://architecture.mit.edu/house_n/](http://architecture.mit.edu/house_n/)
- IIB, Trinity College Dublin
  - [http://www.cs.tcd.ie/research_groups/IIB/](http://www.cs.tcd.ie/research_groups/IIB/)
- i-Land, Amiente
  - [http://www.darmstadt.gmd.de/ambiente/i-land.html](http://www.darmstadt.gmd.de/ambiente/i-land.html)
- MavHome, University of Texas at Arlington
  - [http://mavhome.uta.edu/](http://mavhome.uta.edu/)
- Prima, Inria
- Smart Spaces Lab, National Institute of Standards and Technology

**Existing Component-based Architectures**

- Niagara Framework, Tridium
• **Control Systems**
  Software and Controls Requirements, Advanced Technology Solar Telescope

• Control System Design, University of Newcastle

• Control Systems Centre, University of Manchester
  o [http://www.csc.umist.ac.uk/](http://www.csc.umist.ac.uk/)

**Privacy/Security Issues**


• M. Kantarcioglu and C. Clifton. Privacy-Preserving Distributed Mining of Association Rules on Horizontally Partitioned Data. *ACM SIGMOD Workshop on Research Issues in Data Mining and Knowledge Discovery (DMKD 2002).*


**Learning Algorithms**


• S. Das, D. Cook, A. Bhattacharaya, E. Heierman, T. Lin. The role of prediction algorithms in the MavHome smart home architecture. *IEEE Wireless Communications*, December 2002, pp.77-84.

**Mobile Users/Location Awareness/Context Awareness**


• Y. Cai, K. Hua and G. Cao. Processing Range-Monitoring Queries on Heterogeneous Mobile Objects.


**Miscellaneous**