Internet of Things: Project 1

IoT system construction

- Project description at a high level
  - Construct a small IoT system from IoT sensors and actuators using an IoT platform

- Objective
  - Learn about IoT platforms and how to use them for constructing IoT systems
  - Learn how to program on Raspberry Pi
  - Consider more complex IoT systems

- IoT system construction steps
  - Define the goal of the system you would like to construct
  - Design the workflow to realize the goal
    - What will be the input events?
    - Define the actions to be performed for each input event
    - Define the overall system policies to ensure the proper operation of the system
  - Implement the workflow under the IoT platform
    - Understand how to use the hardware
    - Understand how to use the IoT platform to realize the implementation
  - Implement the policies under the IoT platform, if possible

- Example IoT system
  - System objective
    - Home comfort management
  - Get sensor input
    - Get sound sensor input event
    - Get PIR sensor input event
    - Read light sensor input
  - Activities
    - Upon PIR event, read light sensor, switch on one of the lights if the luminance is low
      - E.g., if it is day time, the room is anyway luminated, no need to switch the light on
    - Upon sound event:
      - Use Google speech recognition to determine which case the speech is about
        - A. not relevant, B. light 1 on, C. light 2 on, D. all lights on, E. all lights off
      - Respond with the status of lighting
    - After a duration without PIR event
      - Turn off the lights
  - Policy
    - When there is someone in the room, the luminance level has to be beyond a certain threshold

- Further design the project to make it more interesting

- IoT Platforms for constructing an IoT system
  - Study a few IoT middleware
    - Open source middleware: OpenIoT, Kaa, Node-RED, ThingsBoard
    - Cloud and Edge based commercial IoT middleware: AWS IoT, AWS Greengrass, Microsoft’s Azure IoT Hub, Samsung’s SmartThings, ThingWorx
  - Choose one IoT platform and use it for constructing your project

Submission

- Report
  - Survey different IoT platforms
    - Discuss compare common features in all platforms
Discuss special features in some of the platforms you have explored and why they are good to have in what types of IoT applications

➢ Your system design and implementation

➢ Vision
  ♦ Based on the project, assume you can scale the small project up, what would be the large-scale IoT system you would like to construct
    • Try to pay more attention to multi-tenant IoT systems
    • Try to consider really interesting policies that requires more complex analysis
  ♦ If you construct such an IoT system, what features are needed but not exist in some of the IoT platforms

❖ Demo
  ➢ Discuss the system you designed and show it actually works
    • Goal of the system, middleware used, workflow realized in the middleware
  ➢ Discuss your vision