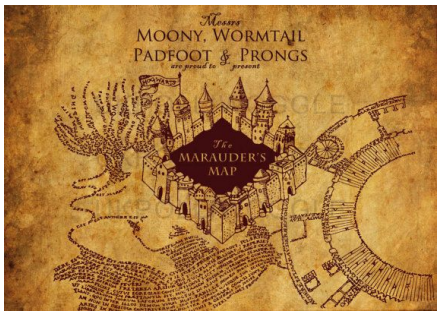
ELE 480 Capstone Project – URI Marauder's Map



The Harry Potter books introduced the Marauder's Map, a magical device that locates creatures within Hogwarts. The goal of this project is to prototype a hardware and software system that emulates this map, showing locations both locally at the device and more widely, through a web site.

Project advisors – Profs Swaszek and Vetter

Motivation

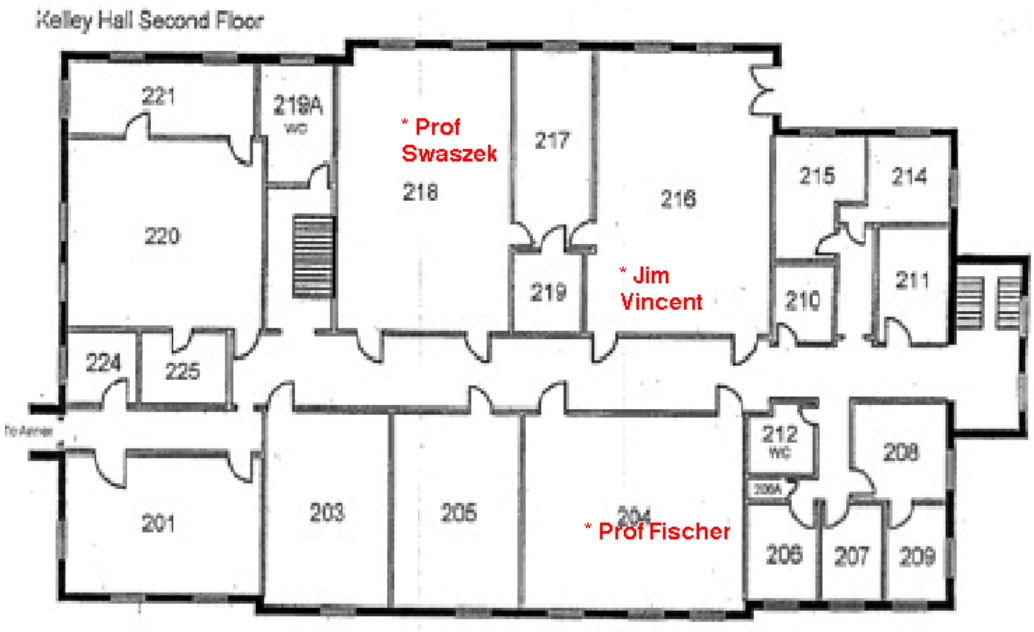
Our interest in this concept comes from several sources. One is an application:

- Prof. Swaszek's contacts at the US Coast Guard described a problem with their new Headquarters building – the building is large and its layout is quite complex; hence, visitors often get lost. And while many visitors have a GPS enabled cell phone, GPS performance indoor is quite poor so would likely not yield sufficient precision. What approaches should be considered to solve this?

Another is research:

- Ubiquitous navigation is a difficult, and current, problem since GPS performance is quite poor in some environments (especially indoors). So called "signals-of-opportunity" systems, which exploit any RF transmissions available, is cutting edge, for both indoor and outdoor navigation.

For a URI version, the "interface" might look like this



showing the locations of enabled participants.

Requirements

Prototype a "signals-of-opportunity" system (both hardware and software) to exploit existing wireless access points using Received Signal Strength Indicator (RSSI) algorithms:

- Develop the hardware platform itself (small, low cost, low power – Arduino or Raspberry Pi based?) to identify the existence of and to measure the power levels of nearby access points.
- Develop software to implement algorithms to estimate the hardware's location based upon the measured data and to relay that information to other users. To allow for multiple users, it might be best to do this computation off device.
- Demonstrate a working system on a small scale (e.g. Kelley Hall, maybe just one floor).
- Adapt the system:
    - To improve performance add additional signals (WiFi and/or ZigBee?)
    - Add a compass
    - Add a GPS unit so that the system is both indoor and outdoor capable
    - Add RFID for transition performance (stairways? doorways?).
- Interact with a parallel team at the Coast Guard Academy working on the same project.

Team requirements

- One EE and one CPE
- Familiarity and/or interest in wireless communications, small/portable hardware platforms and sensors, etc.