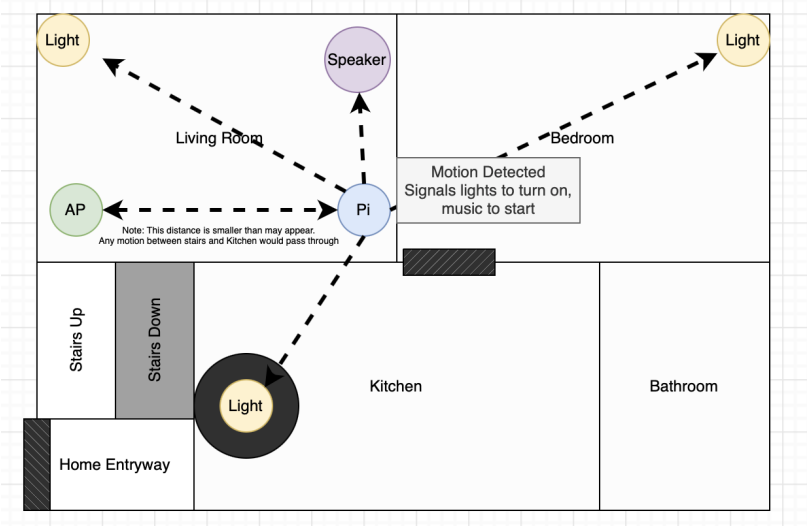
Wi-Fi Motion Detection-Based Smart Home Triggers

Goal: Setup Channel State Information sensing between a Raspberry Pi and a Wi-Fi access point. Use this information to set up special triggers, such as turning on a smart light once motion is detected near the front door.

While motion sensors and cameras are handy to have, an integrated smart home and security system can replace them for basic tasks with nothing more than network interfaces. Using the RF nature of Wi-Fi signals, we can monitor the signal strength, quality, and phase between two network cards to infer what activity is occurring around the cards, or between them.

This project will be using low powered devices, and as a result will aim to detect motion between the access point and Raspberry Pi. At this point, the Pi will examine if any triggers have been set up, and act accordingly. For example, this might turn on some smart lights, turn on some music, or turn up the thermostat. More nuanced descriptions of what motion is occurring is likely beyond the scope of the project.

A tentative testing layout for the project is pictured below.



Tentative timeline

- End of September: Verify hardware is sufficient. Initial tests. (Upgrade Pi model, replace AP with ESP32, etc if necessary)
- Middle of October: Broad-strokes motion detection working reliably. ex. directly interrupting line of sight
- Middle of November: reliable, usable motion detection. Test in every-day scenarios (testing framework is my house, my roommate and I will leave program running during everyday tasks)
- End of November: set up subroutines with callbacks to smart home devices.

- End of semester: polish, prepare demo, prepare report.