Initial approach:

The initial goal for this project was to achieve stable autonomous flight using a proprietary local positioning system. Two potential options that were considered were using the proprietary Loco positioning system and the use of acoustic beacons. The Loco positioning was too expensive and was abandoned. The Crazyflie’s limited battery life made acoustic positioning impractical.

Inertial Navigation:

An attempt was made to navigate using only the drones onboard sensors; however, progress developing this approach was impeded by communication issues between the control PC and the drone. The project goals were reformulated to achieving autonomous hovering.

Hovering:

The Crazyflie firmware has provisions for PID controllers. During controlled flight the user has the ability to activate an altitude hold mode via a controller input. Attempts were made to discover and emulate these control signals; however, connection issues continued to impede progress.

Hardware Issues:

Throughout the project, connection issues made the connection between the drone and the radio dongle unreliable. The exact behavior of this issue varied, but the core issue was that excess packet loss would eventually break the connection. To reconnect the radio dongle would have be unplugged then reconnected to the control PC.

Troubleshooting: Channel interference

The active communication channel and bandwidth were changed to avoid any potential interference. The channel was set too channel 49 and the bandwidth was set to 2Mbit/s While this did improve connection latency, it did not resolve the core issue.

Troubleshooting: Bluetooth connection

Posts on the developer’s forum suggested that the Crazyflie’s Bluetooth connection could interfere with the connection to the radio dongle. An attempt was made to disable the Bluetooth connection. This was accomplished by editing make file parameters and rebuilding and re-flashing the communication MCU’s firmware. While this did disable the Bluetooth connection it did not solve the connection issues. The Bluetooth connection was eventually re-enabled using the terminal to navigate to the firmware directory and running the following commands: *ake BLE=1 all, make clean,* and *make cload*.

Troubleshooting: Virtualbox settings

After an update, a setting in Virtualbox to support USB 3.0 was found. The PC that we were developing on had one USB 2.0 and two USB 3.0 ports. While the radio was plugged into the USB 2.0 port, changing the setting to USB 3.0 resolved the connection issue.