Testing the range and accuracy of Ultra Wideband (UWB) devices for UAV localization applications.

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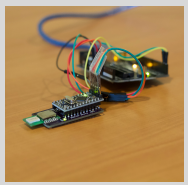
Introduction

- A key problem in the field of unmanned aerial vehicle (UAV) navigation is simultaneous localization and mapping (SLAM). Ultra Wideband (UWB) localization systems present a partial solution because they are highly effective in featureless dynamic environments.
- This study sought to understand the accuracy, range, and localization capabilities of two UWB products: the commercial Posyx system and a custom-built Arduino Pro Mini connected to a DecaWave1000 UWB transceiver.

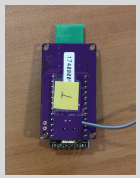


DW1000 Arduino

Pozyx

Testing the Arduinos

Challenges while configuring the DW1000 Arduinos



- Code must be uploaded to each Arduino Pro Mini via an Arduino Uno.
- Code cannot be uploaded to the device unless its reset pin is connected to the reset pin of the Arduino Uno.
- An error in the DW1000 Arduino library prevented the devices from initializing the UWB module.

Testing the Arduino to determine optimal settings

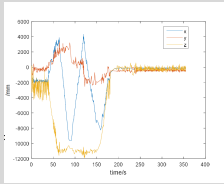
- We used ranging between 1 tag and 1 anchor to optimize settings.
- The DW1000 module should be oriented vertically upward, not towards the other anchors/tags.
- The DW1000 module should use a 128 character preamble length, 6.8 Mbps data rate, and 16 MHz pulse frequency.

Localization Field Tests

- The Arduino and Posyx have similar maximum ranges of about 20 meters, but the Posyx has a commercially-built UI and faster refresh rate, so Tian used the Posyx to conduct localization field tests.

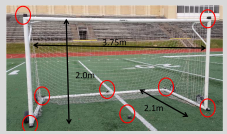
Bridge inspecton field test

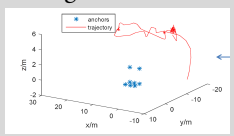
- Tian flew a UAV with an attached tag up from the ground, two times back and forth underneath the bridge, and then landed it.



Soccer net field test

- Tian flew a UAV with an attached tag above a soccer net.





Next Steps

Fuse UWB technology with inertial navigation systems (INS) and LIDAR

Robust SLAM for UAVs