Saab Challenge

P5 - Saab Group
Quoc Quang Ngo - Ville Hirvonen

Members Introduction

Ville Hirvonen

- Academic Level: Bachelor Student
- Major: Electrical Engineering
- Year: Period V of 1st Year

Quoc Quang Ngo

- Academic Level: Bachelor Student
- Major: Digital Systems and Design
- Year: Period V of 2nd Year

Presentation Overview

SA Scientific American

Drone-on-Drone Combat in Ukraine Marks a New Era of Aerial Warfare

In the skies over Ukraine, a new epoch in air warfare is emerging: drone-on-drone combat. These aerial duels don't involve bullets,...

3 Apr 2023

WSJ The Wall Street Journal

Opinion | The Future of War Has Come in Ukraine: Drone Swarms

My most recent trip to Ukraine revealed a burgeoning military reality: The future of war will be dictated and waged by drones.

1 month ago

MIT MIT Technology Review

Mass-market military drones have changed the way wars are fought

The war in Ukraine has exposed that widely available, inexpensive drones are being used not just for targeted killings but for wholesale...

30 Jan 2023

SAAB

I. Introduction

Name - Purpose - Use case

Sky Sentinel

- Drone Detection and Alerting Device
- Enhancing Security in Warzones

I. Introduction

List of Targets

- Drone detection (RF based method)

- Detecting range at least 20m.

- Highly portable

- Multiple ways of alerting.

- Can be used in battle field.

- Low cost

II. Design Choice

1. Notification Method Selection
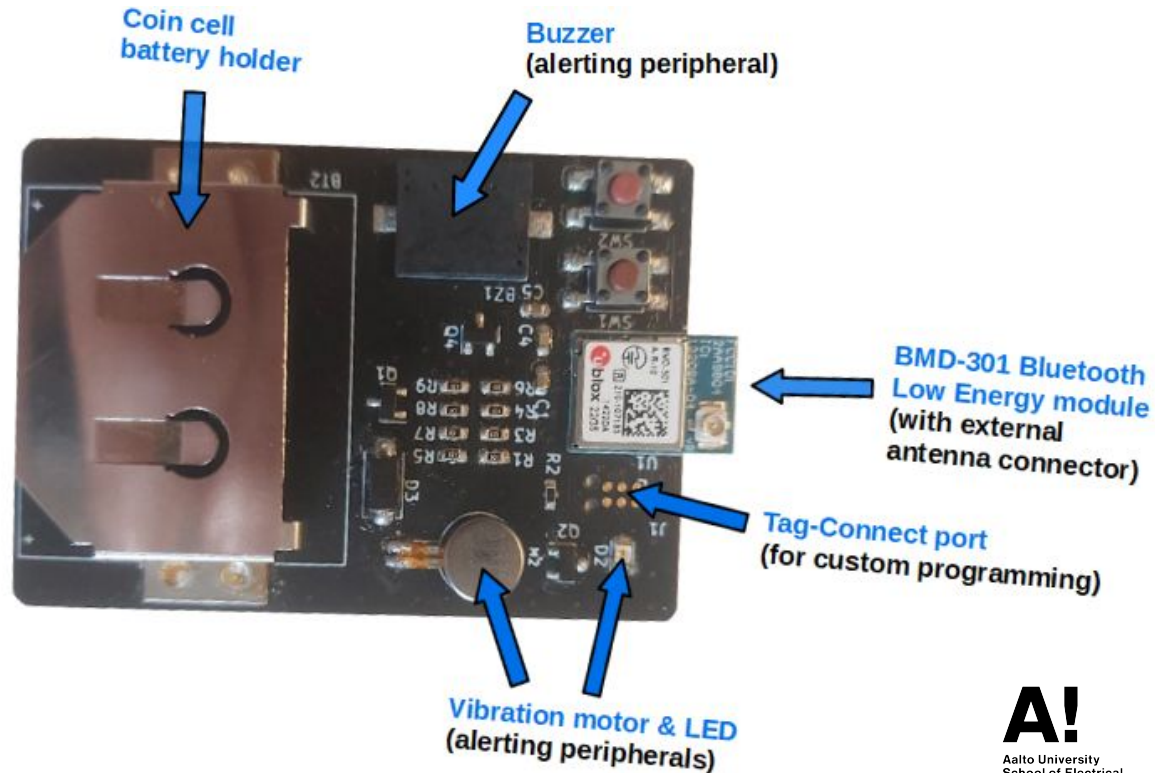2. Components Selection

1. Notification Method Selection

- Sound, vibration, and light.
  - Easily observed in closed range.

- BLE beacon
  - Solution for long range observing.

2. Component Selection

Components are chosen based on:

- Commercial availability
- Portability/small size
- Low power consumption
- Wireless functionality

Coin cell battery holder

Buzzer (alerting peripheral)

BMD-301 Bluetooth Low Energy module (with external antenna connector)

Tag-Connect port (for custom programming)

Vibration motor & LED (alerting peripherals)

III. Developing Process

1. Hardware Developing
2. Software Developing

1. Hardware Developing

1. Research the needed electronic components
2. Create circuit schematics
3. Learn the basics of PCB design software and create PCB layout
4. Send the required files over to a PCB manufacturer
5. Assemble all components to the board
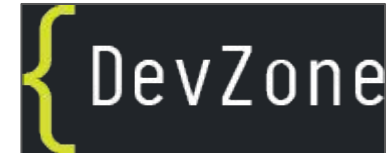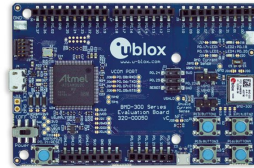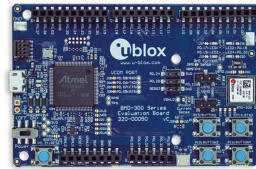6. Design enclosure for the device using 3D modelling software
7. 3D print
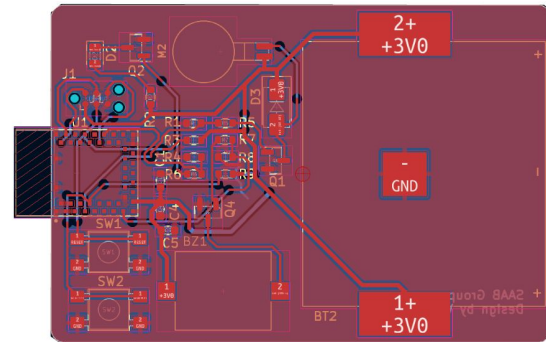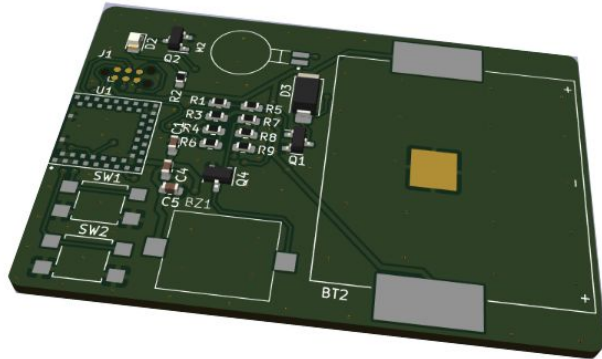
2. Software Developing

- BMD-301-EVAL u-blox

- nRF SDK + other nRF utilities

- SEGGER Embedded Studio

- Getting help from Devzone forum

2. Software Developing

1. Get used to the development kit
2. Developing RSSI signal scanning
3. Developing beaconing
4. Developing GPIO control
5. Developing PWM control
6. Developing detection algorithm
7. Developing Wireless DFU
8. Uploading and debugging

IV. Developing Results
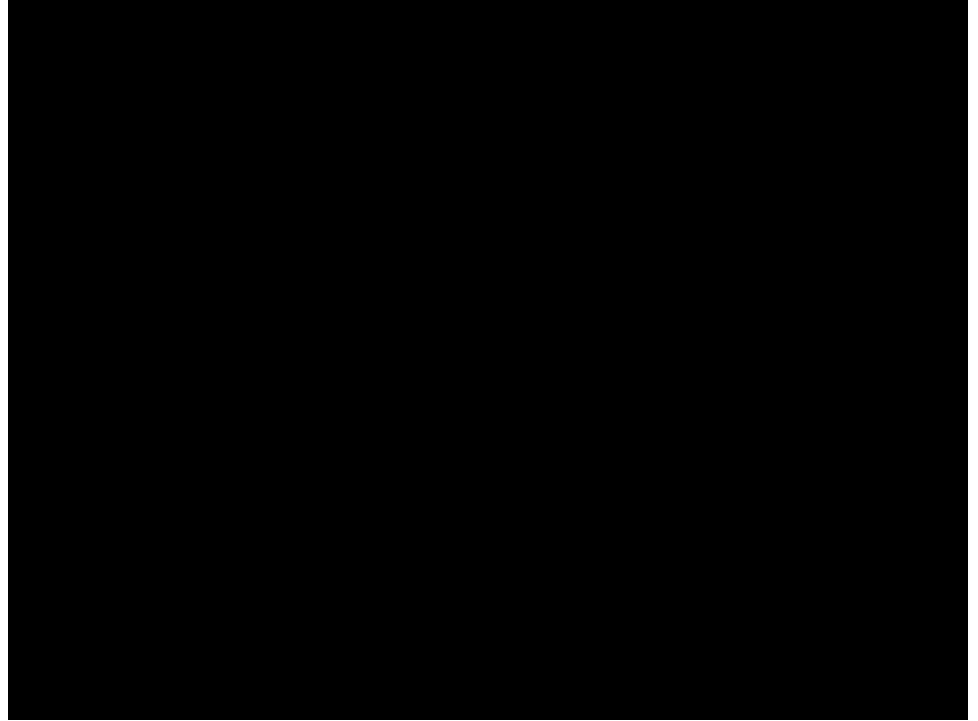
1. Software Unit Test
2. Objective Reaching
3. Future Upgrades and Scaling Opportunities
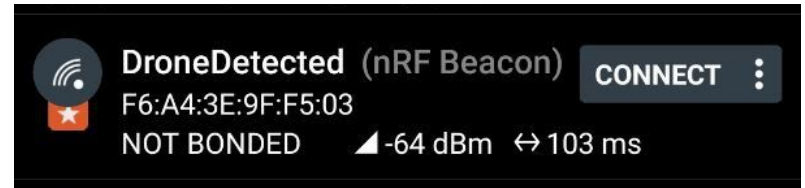4. Prototype Demo

1. Software Unit Test
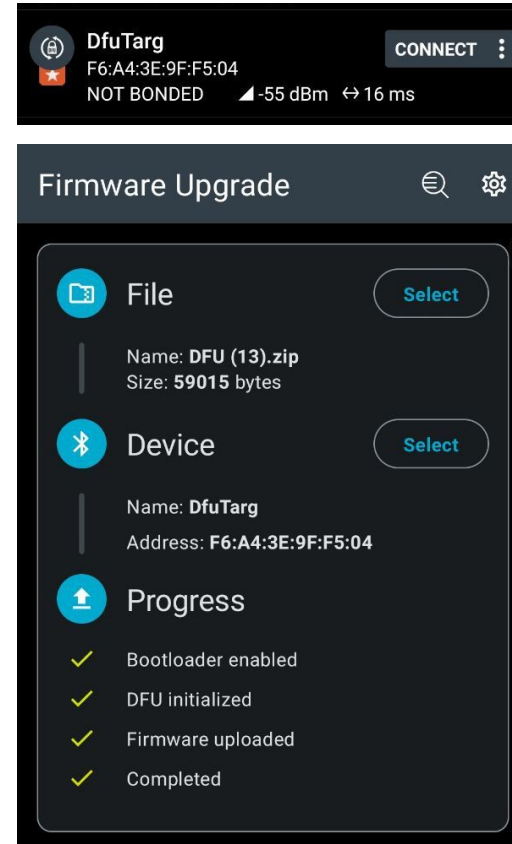
- RSSI Scanning

1. Software Unit Test

- RSSI Scanning

- Beaconing

1. Software Unit Test

- RSSI Scanning

- Beaconing

- Device Firmware Upgrade

2. Objective Reaching

- 2.4Ghz drone detection ✓
  - 2.4Ghz signal can be detected.
- Detecting range at least 20m ✓
  - The device can catch signal from at least 100m range.
- Highly portable ✓
  - The device is small and light.
- Multiple ways of alerting ✓
  - 3 ways of alerting are achieved.
- Can be used on battle field ✓
  - Theoretically possible in a low-noise environment but still need in-depth testing.
- Commercial availability and affordability ✓
  - Total cost of all components less than 40€ (not including PCB manufacturing).

3. Future Upgrades and Scaling Opportunities

- Detection Algorithm
- BLE based Software
- Better Testing Implementation and Location
- Better Product Appearance
- Enhance Usability

4. Prototype Demo

- Note that the device cannot distinguish the 2.4Ghz drone signal with other 2.4Ghz device signal.

Thank you for listening!

Q&A