3rd Buffalo Day *for* 5G and Wireless Internet of Things

Air IoT, Automatic UAV

Yuqing Cui, Zhiyuan Zhao, Hao Li (yuqingcu@buffalo.edu, zzhao24@buffalo.edu, hli67@buffalo.edu)
University at Buffalo, Department of Electrical Engineering

Background

The Internet has become a big part of human life and the Internet of Things is now being used everywhere. Major smart devices:

- Smart planting systems
- Smart trash cans
- Amazon Alexa
- Smart lock door

The Internet of Drone Things can also take a big part in IoT. IoT Drones can be used as:

- Delivery trucks

Introduction

Our IoT Drones can be used as a flying hotspot. Our IoT Drone is designed for

- Ground network infrastructure not functioning correctly.
- Emergency networks
- To assist spectrum coexistence, it will be used as relying nodes.

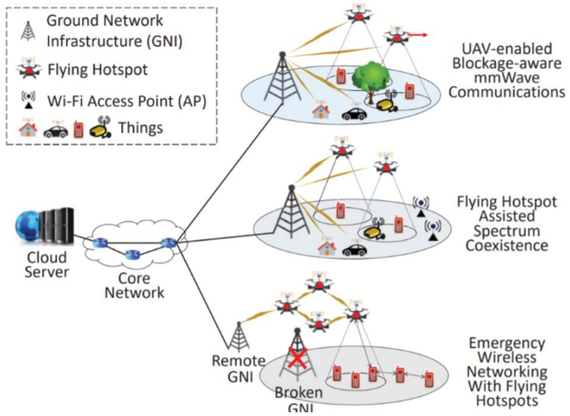

Fig. 1. General blueprint of the working principle for IoT Drone. [1]

Hardware & Software Overview

- **Hardware :**
  - Pixhawk 4 flight controller
  - Raspberry PI 4B -- Processor with ubuntu mate
  - Power Distribution Board PM07 -- Distribute the power to speed controller
  - Electric Speed Controller x 4 -- Control speed of motors
  - LeddarOne -- Measure the height between the ground and IoT drone
- **Software :**
  - ArduPilot Firmware
  - Mission planner
  - DroneKit -Python

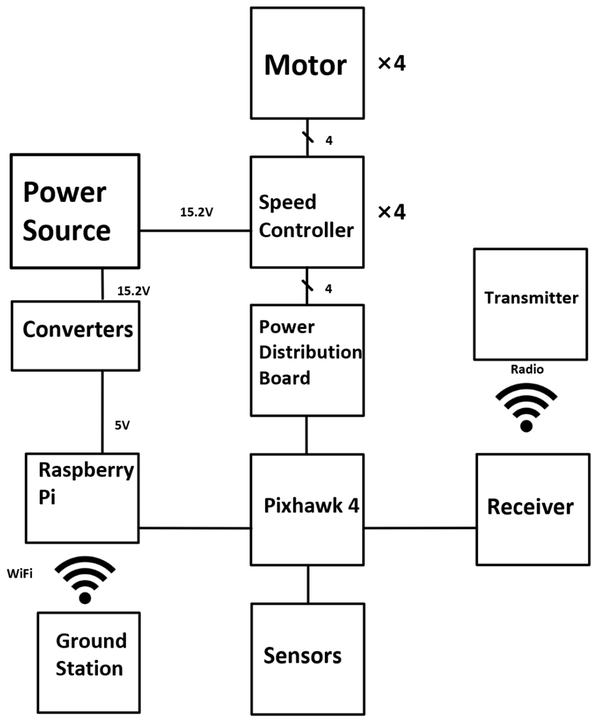

Fig. 2. General working principle for our drone system.

Results

Fig. 3. IoT Drone without adding Raspberry PI 4 which can only fly with a remote controller.

Fig. 4. Fully builded IoT Drone without USRP B210

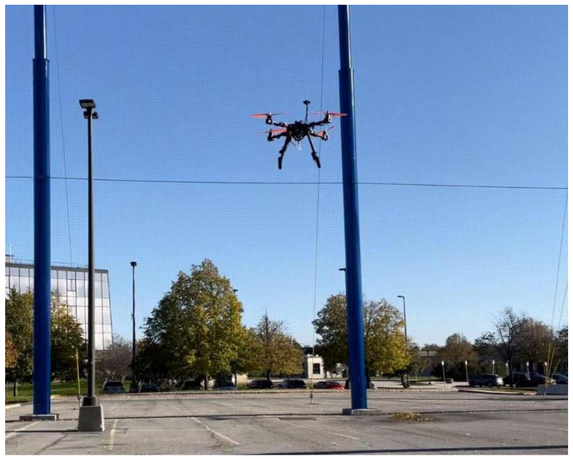

Fig. 5. IoT Drone flight test in SOAR facility.

General Specifications

- Power for IoT Drone: 15.2V 3300mAh
- Power for Raspberry PI 4: 5V 6400mAh
- Flight time: approximately 0.5 hr
- Weight: approximately 1.5kg without battery
- Carrying weight: approximately 1.5kg without battery and drone
- Motors: 2212-920kV
- ESC: 40A x 4

Conclusions

The Internet is very important for employees, teachers, and students, etc. People use the internet to communicate and learn, if the internet is down, it will be much harder for people to communicate. In case of an emergency, IoT Drones can be used as emergency wireless networks and assist spectrum coexistence, which indicates the importance of IoT Drones.

Further Work

- Minimize the weight of the IoT Drone by switching the yellow layer from PETG to carbon fiber material
- Able to carry a USRP B210
- Test srsRan on the IoT Drone

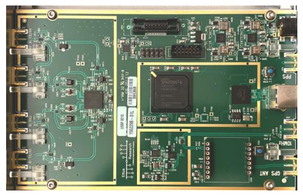

Fig. 6. USRP B210.

References

1. A. Anand, R. S. Suresh Kumar, F. Malandra, Z. Sun, Z. Guan, "UBSpot: A Universal Broadband Flying Hotspot Experimental Testbed Toward Programmable Aerial-Ground Wireless Networks," in Proc. of IEEE Radio & Wireless Symposium (RWS): Internet of Things (IoT) and the mmWave Frontier, San Antonio, Texas, USA, 26-27 January 2020.