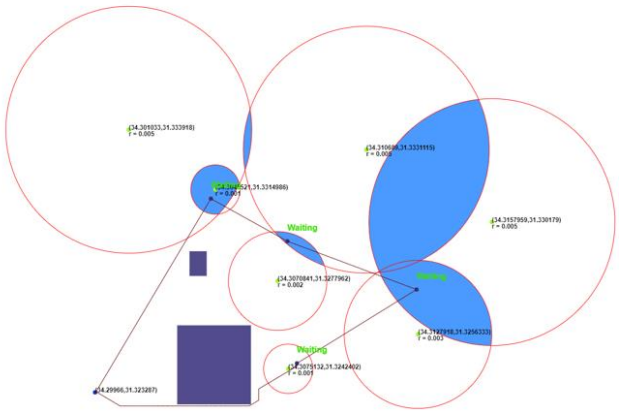
Smart Mobile LoRaWAN Gateway

Abstract:

Low-power WAN (LPWAN) is a wireless wide area network specification that interconnects low-bandwidth, battery-powered sensors with low bit rates over long ranges.
To meet the challenges of long range, low power consumption and secure data transmission, the sensors are based on LoRa Technology and on LoRaWAN media access control (MAC) layer protocol that manages communication between LPWAN sensors and the Gateway.
Not in all circumstances its possible for an end node sensor to communicate with the outside world. This requires to use mobile gateway utilized on drone. The drone on its flight path can reach the remote location where the sensor device is running and collect its data. The challenge in this solution is to establish a communication link with every sensor node, by being at the correct location at the right sensor duty cycle time.



Goals:

1. Learn about LoRa and LoRaWAN.
   Refer to:
   https://www.lora-alliance.org/
   https://www.link-labs.com/blog/what-is-lorawan
   https://books.google.co.il/books?id=iSE6DwAAQBAJ&pg=PT108&lpg=PT108&dq=LoRaWAN+systems+can+receive+eight+messages+simultaneously&source=bl&ots=4uDTCW0rVm&sig=IIcolgkwCe0EiSRtFfqegns2cy0&hl=iw&sa=X&ved=0ahUKEwje2qS777nZAhVP26QKHU4pCbIQ6AEIJjAA#v=onepage&q=LoRaWAN%20systems%20can%20receive%20eight%20messages%20simultaneously&f=false
   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5038744/

   https://medium.com/home-wireless/testing-lora-radios-with-the-limesdr-mini-part-2-37fa481217ff

2. Bring-up the LoRaWAN development and working environments (sensor-gateway-server) based on Multi-channel Gateway Project . Refer to instructions in:
   https://gitlab.cs.technion.ac.il/lccn/w2018-multichannel-lorawan-gw

3. Refer to Mobile-LoraWAN-Gateway project - https://gitlab.cs.technion.ac.il/lccn/s2019-mobile-lorawan-gateway and implement the following:

   a. Sensors should operate in Class A with duty cycle
   b. Path Planning algorithm should calculate the sensor radii according to last flight RSSI
   c. Flight mode will be “Guided” and so should wait in given waypoint for the sensor to wake up
   d. The LoRaWAN GW should be “Smart” – i.e – able to classify the incoming LoRaWAN packets received from the sensors (i.e – identify sensor UUID)

Requirements:

Introduction to Networking (236334 or 044334)

C Programming

Advantage: Drone flying experience

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