Abstract

M2M Circuits Inc. has developed a self contained LTE modem. Using this modem, anything from a server down to a microcontroller can be registered on an LTE cellular network and provide machine to machine communication. In continuation with project work from last semester, the goal for this project was to design and build a wireless control system that used the maker modem for command and control in a drone application.

To achieve this, our project involved two different control paths using several different software and hardware technologies. The first control path was the ability to activate a predefined flight path on the drone via an SMS message. This task was completed by using existing drone software, GPS technology, and an onboard Linux system that mediated all the command and control technology. The second control path was the ability to capture the RC pulse width modulated signals from a drone flight controller via UDP datagrams to control the drone. This task involved capturing the RC pulse width modulated signals from the flight controller, packetizing them, and then sending those signals via UDP datagrams to the modem on the drone.

Results

Created a C based SMS listener capable of listening for incoming text messages and executing various methods using the MakerModem library and interacting with the Pixhawk flight controller onboard the drone through MAVLink interface. Demonstrated viability of an automated pre-programmed flight system through RC Controller signals.

Automated Flight via text message

- Successfully implemented a sending protocol via Jasper
- Created an SMS listener that is functional on the drone at startup
- Created a goTo(GPS) function that could be called remotely via SMS
- Wrote and installed a prefigured route to fly via SMS command

Cellular Network Connectivity

- Used ATT’s Jasper API for ATT operability using text messaging

Drone Embedded PixHawk Subsystem

- Calibrated on board hardware sensors including the compass, accelerometer, and remote control
- Programmed Pixhawk flight controller with GPS route using Mission Planner software
- Connected Pixhawk flight controller with embedded linux system via UART over TELEM2 port

Drone Embedded Linux Subsystem

- BeagleBone Black (BBB) running Debian is interface between PixHawk flight controller and the M2M MakerModem
- BBB runs MAVProxy ground control station to talk MAVLink protocol with Pixhawk flight controller

- Created SMS listener using MakerModem library & Jasper API to interface and operate drone system over cellular network

Summary

During the semester, our team worked with a team of Electrical and Computer Engineers to develop the software communication system for an embedded MakerModem in a multicopter application. We were able to demonstrate automated flight control of a drone using preprogrammed flight routes and GPS. We also wrote a C based SMS listener that can trigger the drone to execute various functions.

Project continuation will include MakerModem registration with the AT&T network for testing of the SMS send capability as well as transmitting live remote control signals using UDP/IP. All of our work has been maintained and saved in GitHub and Google Drive, and will be released as open source for the benefit of the maker community.

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