

7. UAVIONICS Programme

Programme Coordinator: Professor Lim Meng-Hiot

This programme consists of two stages. The primary objective of the first stage is to develop hands-on practical skill in building a UAV. The task is to build a UAV (unmanned aerial vehicle) with the necessary supporting electronics supported on a light-weight carbon frame structure. Emphasis shall be efficient and reliable flight control and endurance.

The second stage is formulated as an open problem to stimulate creative exploration. Based on the skill and understanding of uavionics from the first stage, participants will expand their creativity to develop innovative solutions to problems in real-life scenarios. The flight controller offers expandability, with options to interface with various electronic parts such as GPS and sonar. The microcontroller is fully programmable for experimentation with different on-board sensors; gyroscope, accelerometer, barometer, magnetometer. With the incorporation of external sensors and on-board sensors, the UAV can be configured to fly in autonomous mode.

UAVIONICS Sub-Topic 1

Wireless communication and positioning of unmanned vehicles in Indoor environments using UWB-IR

Supervised by: Prof Law Choi Look

Summary:

Ultra Wideband Impulse Radio (UWB-IR) is a promising low power technology for wireless communication and localization of unmanned vehicles in indoor environments. Instead of continuous carrier wave used in current wireless systems, UWB-IR uses short impulses of a few nano-second wide. This extremely short time duration helps to reduce power consumption and resolve interferences from multiple paths propagation in indoor cluttered environments. Our research group has been doing research in this area for many years and the fruits from the numerous PhD students have resulted in prototypes which can be used to built experimental test bed for wireless communication and positioning of unmanned vehicles in indoor environments. The test bed consists of tags mounted in the unmanned vehicles and distributed receivers surrounding the unmanned vehicles. The pulses received are used to compute differences in time of flight from the tag to the receivers. These range differences are then used to compute the position of the vehicle. This project cover the following skill sets: (i) ultra

wideband impulse radio technology (ii) wireless communication protocol (iii) positioning algorithms (iv) wireless communication protocol firmware development (v) wireless positioning algorithm implementation in MATLAB. This project is tailored towards hands-on experiences in wireless communication hardware, protocol design and implementation from ground up.

No of students: 10