



KAL_FLY

"Flying machine" using a Kalman filter

Project Summary

Even if drones (military or civilian) are used by several countries they are too expensive for many other "small budget" applications. The last decade's efforts in electronics miniaturization have helped reduce the costs of such systems. Lighter components mean smaller airframe, batteries, motors and, last but not least, risk reduction. Some of those applications which could benefit from a small and low-cost automated flying platform are forest fire survey, avalanche research, building thermal analysis, topography-mapping, meteorology, archeology prospection, agriculture management, etc.

The "sensor cloud" concept relies on the ability of a Kalman filter to provide enhanced measures based on a lot of various sensors, even if some measure the same physical phenomena or are interdependent. This allows combining cheaper sensors while mixing advantages of each, resulting in precise position and speed measurement. Some of the sensors used are GPS, pressure sensors (static and dynamic), magnetometer, Inertial Measurement Units (IMU: 3 accelerometers, 3 gyroscopes), current and voltage sensors.

The successful outcomes demonstrate that:

1. The complete electronic embedded in the drone performs perfectly (i.e. sensors and actuators, sensor and actuator conditioning, communications between sensors and actuators with main computer) allowing the drone to fly without any crash.
2. The Kalman filter regulates the drone attitude correctly and allows the drone to fulfill a small mission in automatic mode (i.e. without human support).
3. At present, some flights have been performed in order to determine the ability of the airframe to follow a virtual line (the mission).

Valorisation

The future project steps are to make multiple, fine, and precise drone trajectory characterizations.

But we have to consider that in the last few years the interest for flying machines has become so important that many people are working on this field in the world at the moment. Consequently more and more money is invested in the field of civilian drones and the competition has strongly risen. Some experts forecast a business of more than 60 billion dollars in the civilian drone activities per year around 2020. The price to pay to stay competitive is important. The challenge will be to convince partners to invest in the development of an industrial automatic flying machine.

Contacts have been taken with the Institute for Snow and Avalanche Research SLF and Armasuisse.

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