Collaborative Navigation for Flying Robots

MSc in Eletronics and Computer Engineering

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1ST SYMPOSIUM OF APPLIED RESEARCH

BACKGROUND

In recent years, there has been an increasing interest in the development of autonomous vehicles[1]. An autonomous flying robot must be able to take off, carry out a mission and land when a mission ends without any human interaction[2]. The use of multiple robots within the same system allows a new range of missions possibilities, that are not possible using a single robot[3].

OBJECTIVES

The main contributions of this dissertation will be the creation of real-time image processing algorithms to obtain spatial coordinates **(Fig.1)**, implementation of a control feedback mechanism to be able to control the position of the robot(s) and a method to navigate and synchronize the movements of the UAVs inside buildings, where GPS technology is not accurate.

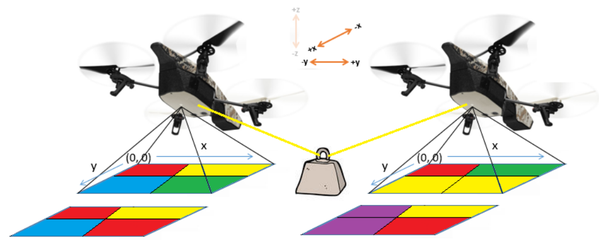


Fig. 1 – Representative scheme of the system

METHODOLOGY

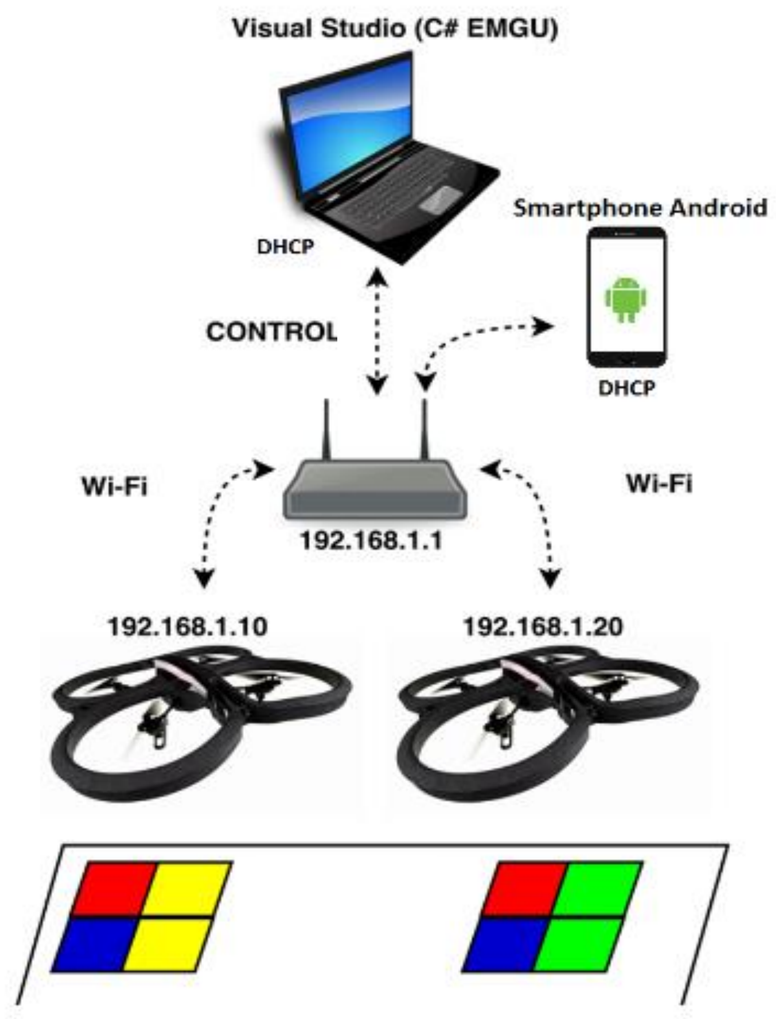
1. Each **UAV** is configured to communicate with the PC through a Wi-Fi acess point;

2. The **C# framework** creates a TCP server to communicate with Android devices and manages all communications between the PC and each quadcopter connected to the network, such as sending movement command requests and receiving all navigation data;

3. The **spatial location system** is based on a rug with multiple squares divided in quadrants to determine the position of each robot in space, in order to create movement trajetories and avoid collisions during the cooperative tasks;

4. The image processing algorithms allow a self-guided autonomous system based through **computer vision algorithms**;

5. The **position control** is based on a closed loop PD (Proportional and Derivative) controller.



RESULTS AND CONCLUSIONS

The results of this dissertation, proves that it is possible to create a fairly accurate and robust spatial system using real-time image processing algorithms on a relative cheap UAV (around 250€) available for purchase to everyone on the market. All the image processing algorithms and control mechanics can be implemented to other quadcopter models, as long as they are equipped with an camera.

BIBLIOGRAPHY

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