CONTROL SYSTEM ALLOWING DRONES FLIGHT AUTONOMOUSLY

DESCRIPTION OF THE TECHNOLOGY

At present, UAV (Unmanned Aerial Vehicles also colloquially called drones) market has significantly increased. There are different types of aircraft and multiple applications for both, civilian and military.

These vehicles have a flight control system that allows them to travel and develop the requested manoeuvres while remaining in the air. These movements are operated from the ground by a person or directed by following a pre-set flight plan.

Flight plans are defined prior to the take-off and drones usually follow these plans with very little flexibility. In other cases drones are operated from a ground station by a pilot. In short they are not autonomous flight systems that can make decisions according to new unexpected conditions or have the ability to send data about a better new route while in flight.

The system developed by the researchers attempts to overcome the limitations of current flight control systems and propose a truly autonomous and flexible system based on its own model.

In this way, a small electronic device, that incorporates a software system developed by the researchers, was designed. This device connects to the drone by MAVLINK protocol. Specifically, the device is linked with the drone flight controller (which manages the different elements that are used to stabilize and manoeuvre) and also with sensors and communication systems, which provide information about the environment. This sensor array can be expanded by incorporating any supported sensor with USB, RS232 or I2C protocols.

The system has a number of software subsystems that allow it to interact with the outside, receive data, interpret it and execute the necessary actions.

The drone can communicate with the ground station through the communications subsystem and send data about the flight or information collected by its sensors and cameras. From the station, a person can send data to the drone, even assign new instructions or flight plans when the aircraft is flying.

In short, using the developed system, the drone can be managed properly by a human operator, either following a fixed flight plan or in a autonomously way based on a dynamic flight plan where the aircraft will define its next movement depending on its state, the circumstances detected by the sensors and the instructions received from the base.

This system also enables communication with other similar vehicles allowing a drone to establish a group of flying aircrafts, providing new features and potential applications that an individual drone cannot develop.

MARKET APPLICATION

Developed technology is applicable in all types of unmanned aerial vehicles to implement flight controllers compatible with MAVLINK protocol. These aircrafts can have both civilian and military uses. It is particularly interesting for their application in the flight planning of robotic swarms.

The system facilitates the performance of specific tasks as surveillance, forests monitoring, agricultural monitoring, surveillance of animal groups, automatic transport of small goods, etc.

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MAIN ADVANTAGES AND INNOVATIVE ASPECTS

This system allows to develop dynamic flight behaviours using a high-level planning of the control board. It uses non-proprietary protocols and widespread technology, so that it can be implemented in different types of vehicles.

Therefore, the system allows the aircraft to carry out an intelligent flight. It can react to changing circumstances or dynamic objects and for example can track specific landmarks.

This aspect is highly innovative and makes work easier for users. The drone does not require constant monitoring and has the autonomy to modify its path to the ultimate goal of fulfilling its mission.

Main advantages:

- It can perform tasks without human intervention and decide in flight time the necessary movements to complete their mission. This includes autonomous take-off and landing, hold position at a point or develop the route determined by the system board in real time

- Ideal for missions in hazardous environments requiring quick decisions or distant environments where communications system can be interrupted

- Incorporates a high-level flight planning method using MAVLINK protocol

- It allows the aircraft to include any type of sensor or device via USB, RS232 or I2C connections

- It enables stable communication protocols for the aircraft that allow interconnection with ground stations and even drones to conduct missions in cooperation (swarm system)

CURRENT STATE OF DEVELOPMENT

There is a prototype of the technology that has been tested in standard aircraft and also conducting complex missions, with optimum results.

INTELLECTUAL PROPERTY RIGHTS

This technology is protected by patent:

- Application number: 201431195
- Application date: 05/08/2014

COLLABORATION SOUGHT

Researchers are looking for companies acquiring the technology for implementation in their facilities.

It is possible to reach license agreements, commercial agreements or technical cooperation agreements.

The research group has know-how to develop systems for automation of vehicles meeting the specific requirements of each company.

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RELATED IMAGES

Image 1: Drones flight test

Image 2: UAV control system

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