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A Drone For Security And Safety

ScienceDaily (May 29, 2009) — European researchers have developed a small robotic drone capable of helping save lives in emergency situations or preventing terrorist attacks in urban areas.

Drones, known as unmanned aerial vehicles (UAVs), have proven to be of great value in military operations, but so far, their advantages have not been fully exploited for civilian uses.

In civil life, drones are mainly used in the agriculture sector – for assessing how well crops are growing in a particular part of a field – or for meteorological measurements.

Demo of a EU-backed micro-UAV. (Credit: Copyright µDrone)

The main barrier to the wider use of drones is their large size and lack of manoeuvrability around obstacles. Most military drones are fixed-wing UAVs designed to operate at high altitudes and do not need a lot of manoeuvrability. In built up, highly populated areas such drones would pose a danger to people if they hit a tree or a building, or crashed due to the loss of its navigational signal.

Smaller, lighter and autonomous

Seeing a market opportunity, European researchers and companies that make up the EU-funded µDrone (Micro Drone Autonomous Navigation and Environment Sensing -- http://www.ist-microdrones.org/) project are developing a smaller, more manoeuvrable drone that is capable of sensing and avoiding objects in its flight path. The new drone would be capable of carrying out missions autonomously in places with obstacles, such as in an urban area or inside a building.

Such drones could be used to patrol sensitive areas to detect intruders, find the survivors of a disaster or detect chemical spills, among other operations, says project coordinator Christophe Leroux.

"The monitoring of public and private sites is becoming increasingly important in the field of security and surveillance," says Leroux. "Mobile multi-sensor surveillance systems, able to be deployed quickly to analyse a situation, will boost the efficiency of the security teams. By combining sensors and robots, we can develop applications to search and warn, and to detect hazardous materials."

The project team is close to developing a prototype of a small-size UAV capable of vertical take off and landing and for autonomous inspection and survey operations in urban areas with moving obstacles.

The mini-UAV was developed by AirRobot, a Germany-based company which is part of the project consortium. The drone is about 50cm in diameter, weighs less than one kilogram and can carry about 200grams. It looks like a miniature helicopter with four propellers, allowing it to take off and land vertically. A protective band surrounds the machine, preventing harm to people and the machine if an accident occurs.

The team also developed the software and hardware so the drone can locate its position in the air, navigate autonomously, and respond to unexpected events, such as an obstacle. Mission planning, collision avoidance and trajectory determination have been built into the drone's software and hardware. The software's visual memory map allows it to return home along its previous flight path.

The drone can be controlled from the ground or it can fly on a mission autonomously following a predefined path. Manual control can be switched on and off depending on the mission. The software and interface allows an operator without any technical knowledge to control it easily in urban areas or inside a building, Leroux says.

Monitoring for safety and security

He believes the new drone will be useful for policing, for example to determine the extent of a riot and for deploying forces, or for support at a crime scene. A remotely operated micro-UAV could be used to explore a crime scene inside a building without endangering the lives of police officers.

It can also be used for security. If an intrusion is detected, a UAV should be able to move faster than any ground-based robot or a human guard. Public places, airports, oil production facilities, pipelines and nuclear sites could be monitored using the micro-UAV.

The consortium is now focusing on evaluating and testing the new drone with potential users, including fire services. A small-sized UAV could be used for reconnaissance of the fire scene, helping fire fighters better assess how the fire is developing and if lives need to be saved. The drone will be tested with a fire service in Greece in November 2009 to determine how it performs.

"There is a need in the market for such a drone," Leroux says. "Many end-users have already expressed an interest."

μDrone received funding from the Specific Targeted Research Projects (STREP) strand of the Sixth Framework Programme for research.

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