

Robotics, Automation and Control

Lightweight Sensing and Control System

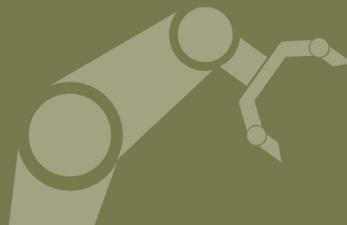
for unmanned aerial vehicle monitoring capabilities

NASA's Langley Research Center has developed a new sensing and control system for unmanned aerial vehicles (UAVs) that allows for semi-autonomous flight. With this technology, pilots need not leave the ground to conduct routine monitoring and surveillance quickly and cost-effectively. Such systems are particularly useful during long flight segments or over remote locations, or for scientific applications such as atmospheric monitoring or crop monitoring, which might require long and repeated sampling in a specific pattern. The small, lightweight technology can be quickly adapted to your specific configuration.

BENEFITS

- Lightweight
- Less power used than with current systems
- Useful for both small and large UAVs
- Able to run off solar power
- Inexpensive
- Easily modifiable for different sensor configurations
- Capable of acquiring up to 16 channels of flight and navigational data (e.g., inertial gyro data, airspeed, pressure, accelerometers, air temperature, GPS)

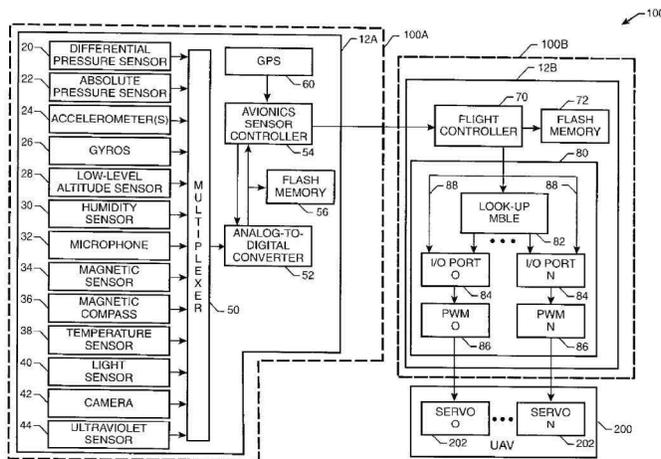
technology solution



THE TECHNOLOGY

Increasing demand for smaller UAVs (e.g., sometimes with wingspans on the order of six inches and weighing less than one pound) generated a need for much smaller flight and sensing equipment. NASA Langley's new sensing and flight control system for small UAVs includes both an active flight control board and an avionics sensor board. Together, these compare the status of the UAVs position, heading, and orientation with the pre-programmed data to determine and apply the flight control inputs needed to maintain the desired course.

To satisfy the small form-factor system requirements, micro-electro-mechanical systems (MEMS) are used to realize the various flight control sensing devices. MEMS-based devices are commercially available single-chip devices that lend themselves to easy integration onto a circuit board. The system uses less energy than current systems, allowing solar panels planted on the vehicle to generate the systems power. While the lightweight technology was designed for smaller UAVs, the sensors could be distributed throughout larger UAVs, depending on the application.



A block diagram of an avionics sensing and flight control system for a UAV

APPLICATIONS

The technology has several potential applications:

- Humidity sensors
- Microphones
- Magnetic sensors
- Magnetic compass
- Temperature sensors
- Light sensors
- Cameras
- Ultraviolet sensor

PUBLICATIONS

Patent No: 7,962,252

National Aeronautics and Space Administration

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