AUTONOMOUSLY GUIDING VEHICLES THROUGH ORIFICES

A GUIDANCE AND CONTROL ALGORITHM TO FACILITATE AUTONOMOUS UAV PASSAGE THROUGH ORIFICES

TECHNOLOGY FIELD

Software and Algorithms

IP PROTECTION

Patent Pending

RESEARCHER

Dr. Animesh Chakravarthy is a professor of Aerospace Engineering at Wichita State University (WSU). His research focuses primarily on path planning/obstacle avoidance of autonomous vehicles/robots in dynamic environments, along with bio-inspired and morphing aircraft flight dynamics and control, systems of interconnected vehicles, and PDE based modeling of multi-vehicle systems. Dr. Chakravarthy is a reviewer of popular Journals including Guidance Control & Dynamics, IEEE Transactions on Automation Sciences and Engineering, and IEEE Transactions on Intelligent Transportation Systems, among others. He serves as a national president for Sigma Gamma Tau, the American Honor Society for Aerospace Engineering.

The Unmanned Aerial Vehicles (UAVs) industry has exploded over the recent decade, serving a broad range of applications for both the military and consumer markets. The military and defense markets are anticipated to continue investing substantial resources into UAV projects, focused on developing technologies for the next-generation of UAVs that will make them more autonomous, stealthy, and able to operate in contested airspaces. Recent advancements in collision-aviodance systems now enable UAVs to autonomously avoid obstacles in their flight path.

ADVANTAGES

At Wichita State University, the concept of collision-avoidance has been taken one step further. An algorithm developed at Wichita State allows for the autonomous UAV's passage through an orifice, hole, or window, while ensuring that it does not collide with the surrounding edges. The algorithm is computationally light and is processed by the on-board computer, adjusting and orientating the UAV body to fit through the orifice - even if it is barely larger than the UAV itself.

APPLICATIONS

The autonomous guidance of UAVs can be used to enhance defense-related operations involving intelligence, surveillance, and reconnaissance. Increased surveillance capabilities in emergency situations would aid law-enforcement agencies, such as firefighters and police. Uses include:

- Disaster prevention
- Assessement and management
- Environmental protection
- Infrastructure monitoring
- Agriculture surveying
- Freight delivery

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