Autonomous Aerial Power Plant Inspection in GPS-Denied Environments

M. M. Rizia, A. G. Ortega, A. Flores-Abad, M. McGee, A. Choudhuri

NASA MIRO Center for Space Exploration and Technology Research (cSETR)
University of Texas at El Paso

INTRODUCTION

- Inspection of coal-fired power plants is frequently dangerous, includes difficult places to reach, and can turn expensive.
- Robotic systems have shown capabilities to address some of these issues, but most current robotic inspection technology in power plants is designed for specific components and either RC controlled or GPS dependent [1].
- A close-range and autonomous inspection method in the GPS-denied environments from a CAD model of power plant is introduced here.
- Synthetic vision (used in aerospace industries) inspired approach, using “offline trajectory” complemented with “online trajectory”, using two platforms: a) A quadrotor (external) and b) a low thrust airship (internal inspection).

NEED

1. To enable Unmanned Aerial System (UAS) close quarter inspection within complex over-head and Global Positioning System (GPS)-denied environments of coal-fired power plants, including.
2. Universal reach i.e. exterior and interior inspection of structural elements than component specific approaches, specially without disturbing internal particulate (ash) accumulations.
3. Reduces the heightened risks and accessibility limitations of manual/human inspection.
4. Significantly reduced system downtime.

METHODOLOGY

1. Three different CAD-based methods were used to generate the offline trajectories.
2. MATLAB/SIMULINK was used to verify the obtained trajectories.

RESULTS

Major Advantages
1. Saves time and cost associated with downtime of the powerplant and minimize human risk.
2. Can equally be used for both external and internal inspections.
3. This is a software/data based system that does not need additional component installation in the UAV, thereby does not affect maneuverability or incur additional cost.

Future work
1. Export trajectory data and yaw data points to flight controller for in flight testing.
2. Sync offline and online trajectory generation to work simultaneously.
3. Further refine algorithm for universal application.

BENEFITS AND FUTURE WORK

REFERENCES


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