Autonomous Flight Safety for Unmanned Aircraft Systems (UAS)

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THIRTY YEARS OF SYSTEMS RESEARCH EXCELLENCE

INSTITUTE FOR SYSTEMS RESEARCH
A. JAMES CLARK SCHOOL OF ENGINEERING

HISTORY OF RESEARCH

Project goal is to develop means for UAS to react to dynamic situations by integrating situational awareness and autonomous decision-making capabilities for situation-adaptive mission replanning, navigation, guidance and control.

FUTURE OF RESEARCH

Experimental Flights

- AUVSI Student Unmanned Aircraft Systems (SUAS) Competition
- Open-source Autopilot Architecture Research with NAWCAD
- Certificate of Waiver or Authorization for flights in southern Maryland

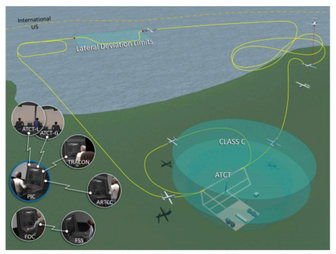

RMRC Anaconda PNP


AeroVironment Dragon Eye

CURRENT STATE OF RESEARCH

Inputs

Aircraft Models



FAA ConOps Scenario

Mission Requirements

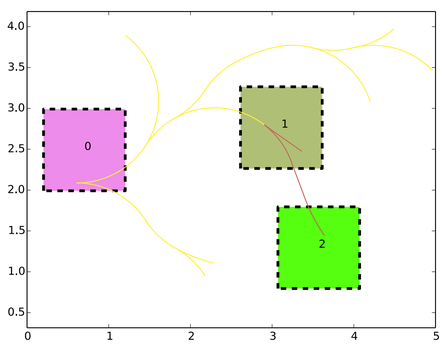
$\vee$	"or"
$\wedge$	"and"
$\neg$	"not"
$\bigcirc$	"next"
$\Diamond$	"eventually"
$\Box$	"always"
$\Box\Diamond$	"repeatedly"
$\models$	"satisfies"

Formal Specification Languages

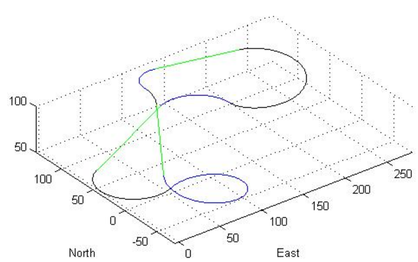
Linear Temporal Logic (LTL)

$$\varphi = \varphi_e \rightarrow \varphi_s$$

Path Planning



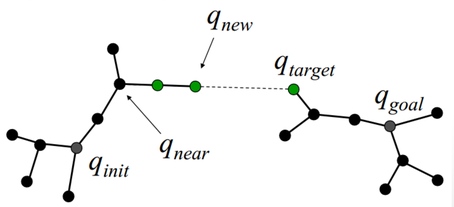
Dubins Vehicle 2D Path

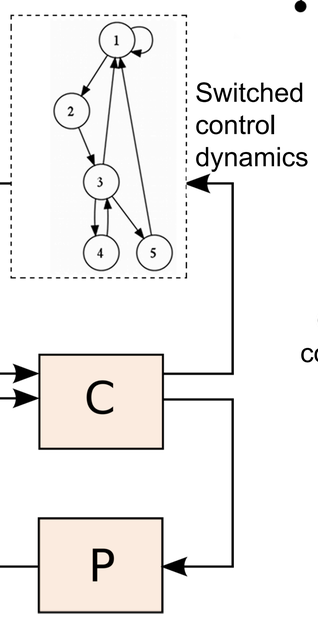


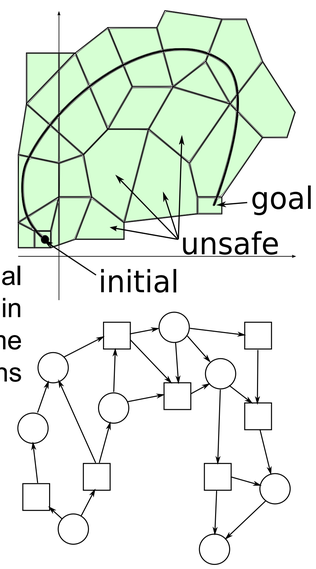
Dubins Vehicle 3D Path

Collision Avoidance

RRT*: Randomly exploring random tree







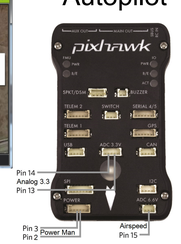
Outputs

Simulation Code

FlightGear Simulator

Hardware Code

Mission Planner Software



Millennium Engineering, Inc.
NAVAIR/NAWCAD

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