

Demonstration of a Goal-Based Planning AI for Satellite Missions

Code: 21/25

Company: Craft Prospect

Location: Glasgow (potentially remotely)

Company Description:

Craft Prospect is an engineer-led space engineering practice. We deliver mission-elevating products and services and develop novel mission applications to realise our goal of SMART SECURE SPACE. We aim to be the partner of choice on small satellite missions and provide agile dedicated services, adding value to the offerings of our clients. Using expertise in areas including AI, cybersecurity, quantum technologies and systems engineering, we architect and deliver solutions to the global small satellite market.

Founded in 2017, we have since grown to a team of 18. We have a strong contingent of engineers and scientists working in areas including embedded systems, AI and machine learning, remote sensing, quantum technologies, space systems and software engineering. Our three main programs of working are Responsive Operations (on-board AI and autonomy), Space Quantum Technology and Mission Architecture (designing small satellite missions from the ground up). We have consulted on design and operations for both UK Space Agency and ESA missions.

Embedded within the UK supply chain and based in Glasgow, a city that produces more small satellites than anywhere outside of California, we collaborate closely with industrial and academic partners both within and outwith the UK.

As a company, we have a strong focus on engineer-led work and encourage team members to contribute to the culture and future direction of the company. We have an office in the historic Fairfield shipyard offices in Govan which is fully equipped with a workshop, testing facilities and computing resources.

Project Description:

As part of our autonomy-focussed Responsive Operations programme, we are developing a framework and components to enable fully autonomous data processing and mission operations on-board small satellites. We have defined a system architecture which allows the satellite to operate itself based on real-time on-board telemetry and high-level goals supplied by mission stakeholders. Currently, satellites are driven by human-defined activity schedules uploaded periodically from the ground. With this work, you will prototype an autonomous planner that can generate this activity schedule itself on-board. A simple mission use case will be provided to give context to the mission goals and planned activities.

You will prototype a software component that receives high-level mission goals, real-time telemetry (power, battery level, temperature, attitude, etc.) and information extracted from instrument data (e.g. cloud masks, geolocated ground features, etc.). These inputs will be provided via existing components and simulation models. You will investigate and select different approaches to generating plans and schedules from these inputs. For example, an AI constraints solver could be used to generate a finite state machine which selects different activities based on the current goal(s). You will then prototype this solution in Python or C++, returning an activity schedule in a format similar to those used just now, of which examples will be provided.

The prototype demonstration should be documented to facilitate usage. This could be done via Jupyter notebook or similarly interactive approach if desired.

Applicant Specification:

Student with background in software engineering, computing science or embedded systems background

Minimum Requirements:

- Strong programming skills in Python and/or C/C++
- Good understanding of embedded and real-time system design
- Excellent written and verbal communication skills
- Ability to research, understand and prototype technical solutions to problems
- Ability to work autonomously

Preferred Additional Requirements:

- Knowledge of ML, AI and autonomy
- Knowledge of orbital and attitude mechanics
- Enthusiasm for space and the space industry

Further details:

8 weeks minimum fixed term contract to be agreed with successful candidate. Virtual Induction Event to be held on 21 June, 2021. Ideally to complete before the start of the next academic year. Salary is £1,423 per calendar month gross plus £200 to cover travel and subsistence across the 8-week period.

Closing Date for Applications: 5pm Friday 14 May

Applications should be made through the online form attaching a CV, before the closing date. Please note that elements of the form left incomplete will be deemed to render the application ineligible. They will be checked for eligibility and forwarded to the employer.