CAP - A Decision Support System for Crew Scheduling using Automated Planning

Aditya Prasad Mishra, **Sailik Sengupta***, Sarath Sreedharan, Tathagata Chakraborti and Subbarao Kambhampati

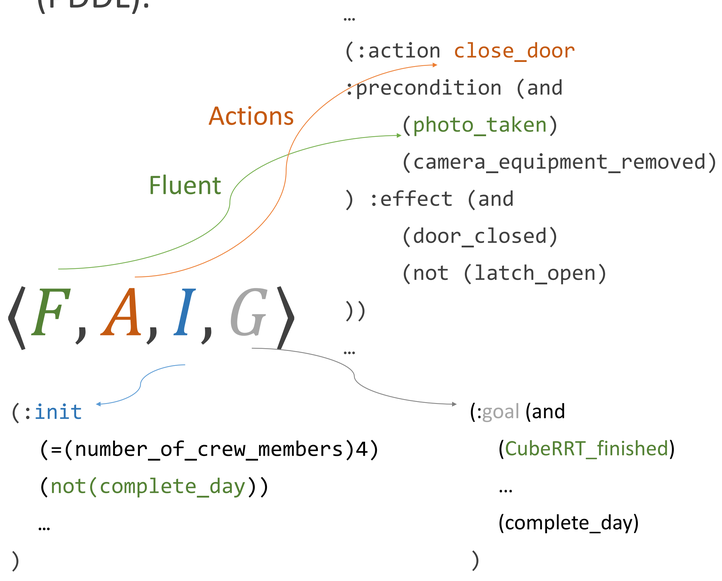
Problem

- A team of crew members are expected to perform a set of tasks (or achieve some goals) when on a mission.
- A human planner, who has a holistic view of the system can make a schedule for the crew.
- There may exist organizational and temporal ordering constraints which have to be accounted for when coming up with this schedule.

In this work, we come up with a schedule authoring system that aids the human planner to come up with a schedule that fulfills all the requirements.

Representation

- We model the scheduling problem as an automated planning problem and represent it using the Planning Domain Definition Language (PDDL).



Scheduling Domain

- Previous work by NASA creates a plan authoring tool to aid human planners (focuses on UI design, does not use artificial intelligence in the backend to provide decision support).
- We create a mock scenario that makes a **ten** hour plan with **four** crew members in this domain to achieve a goal in which,

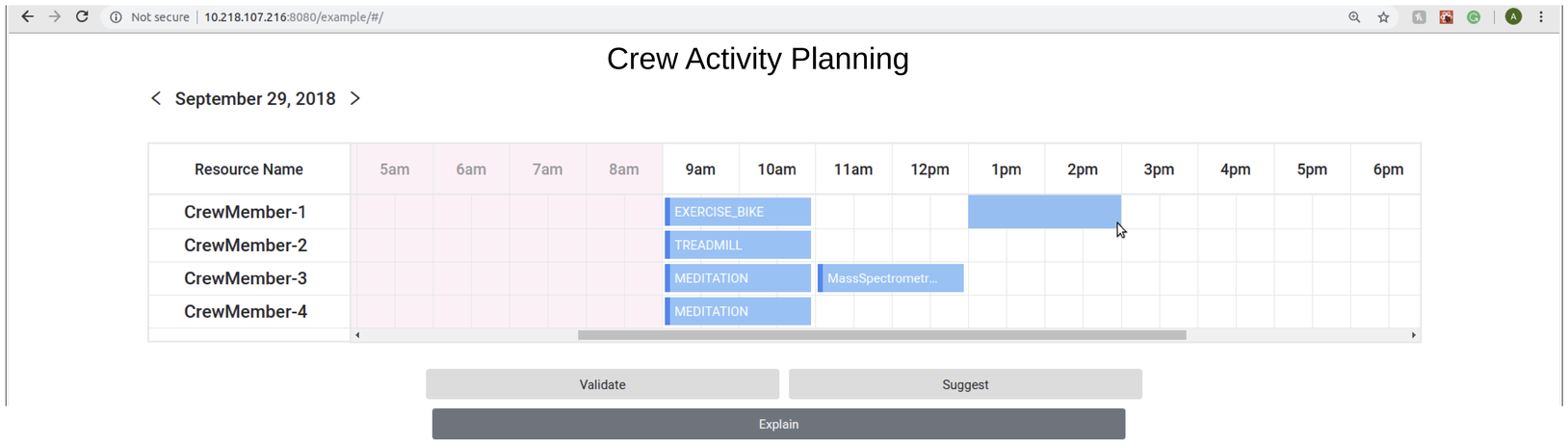
Some science experiments have to be completed:
CubeRRt
Advanced_Diagnostic_Ultrasound_in_Microgravity

Some crew members need to exercise on a treadmill**.**

Communication has to be done when the space craft is in line of sight with the ground station.

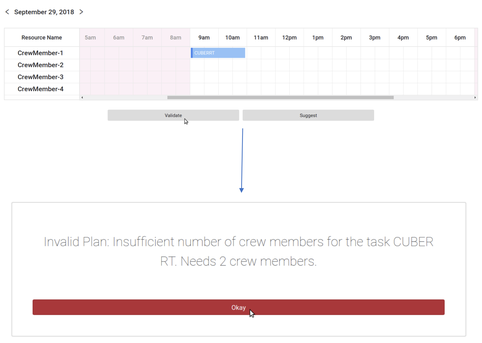
Photos have to be taken for certain parts of the planet.

Repair Tasks have to be performed on certain parts of the aircraft.



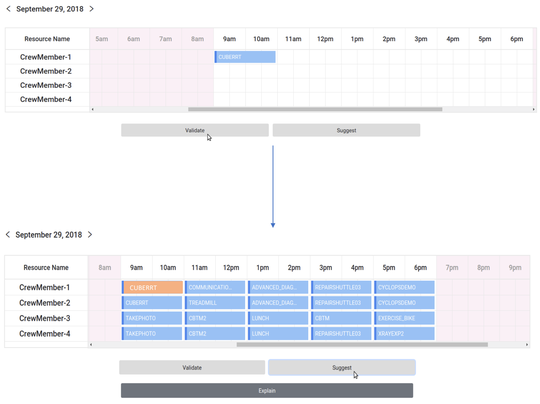
Plan Validation

- Plans being constructed can be validated using VAL at any point in time. VAL highlights the reason when it finds a plan being constructed is not valid.



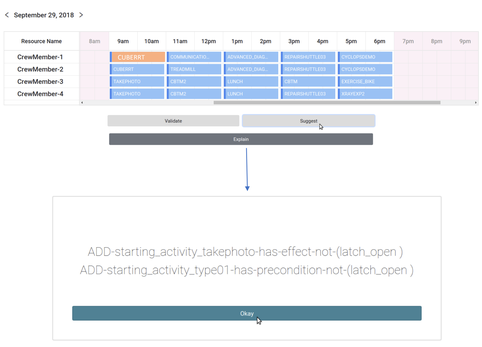
Plan Correction and Plan Suggestion

- Possible plan completions given a partial plan can be suggested using Probabilistic Plan Recognition technology.



Explaining Suggested Plans

- When generated plans look inexplicable to humans, we can provide explanations based on model differences between the human and the system.



Corresponding author. Sailik Sengupta, sailiks@asu.edu

Acknowledgements. This research is supported in part by the NASA grant NNX17AD06G, the ONR grants N00014-16-1-2892, N00014-18-1-2442, N00014-18-1-2840, the AFOSR grant FA9550-18-1-0067

NDM 2019