

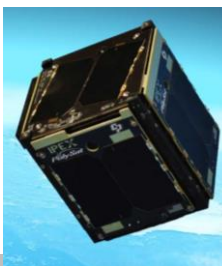
Motivation: The aviation industry relies on rigorous requirement verification processes to ensure the safety and reliability of aviation systems and software. Traditionally, requirement verification often involves manual validation, which can be time-consuming, error-prone, and resource-intensive. Although formal methods could validate this process, common engineers do not have the sufficient background. Here is where natural language models, such as ChatGPT, can help to facilitate the transformation from requirements written in natural language (e.g., English/German) to formal language (e.g., first order logic, linear temporal logic) for automated validation.

Goal: This thesis shall explore the translation of **Cubesat** requirements to formal languages using **ChatGPT**, leveraging its language processing capabilities to improve the efficiency and accuracy of requirement verification/validation .

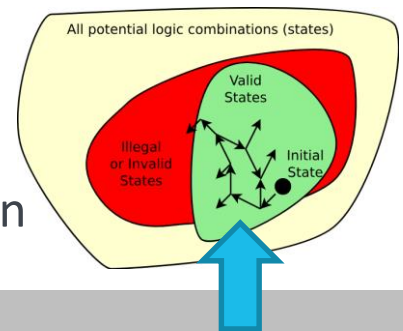
Tasks:

1. Explore the basis's of req. verification and the quality factors for good req.
2. Explore and get familiar with CubeSat req.
3. Select and prepare requirements for ingestion
4. Develop a concept of an interface with ChatGPT API
5. Develop a concept of a dashboard that interacts with experts for formal requirement validation
6. Design and implementation of the interface and dashboard with python/java
7. Assess the translation correctness of ChatGPT based on formal expert feedback

CubeSat



Formal Verification



Natural Language Requirement:
The CubeSat shall transmit the current values of the WOD parameters and its unique satellite ID through a beacon at least once every 30 seconds or more often if the power budget permits.



Formal Requirement

$G(\text{transmit} \rightarrow ((F(30_{sec}) \& \text{power_budget_permits}) \parallel (F(30_{sec}) \& G(\text{power_budget_permits}))))$

Scope of the Thesis

Interested?

Prof. Zamira Daw zamira.daw@ils.uni-stuttgart.de
www.ils.uni-stuttgart.de

