Abstract

Title: Fail-Proof Rocket Flight Computer Hardware-in-the-loop Testing System

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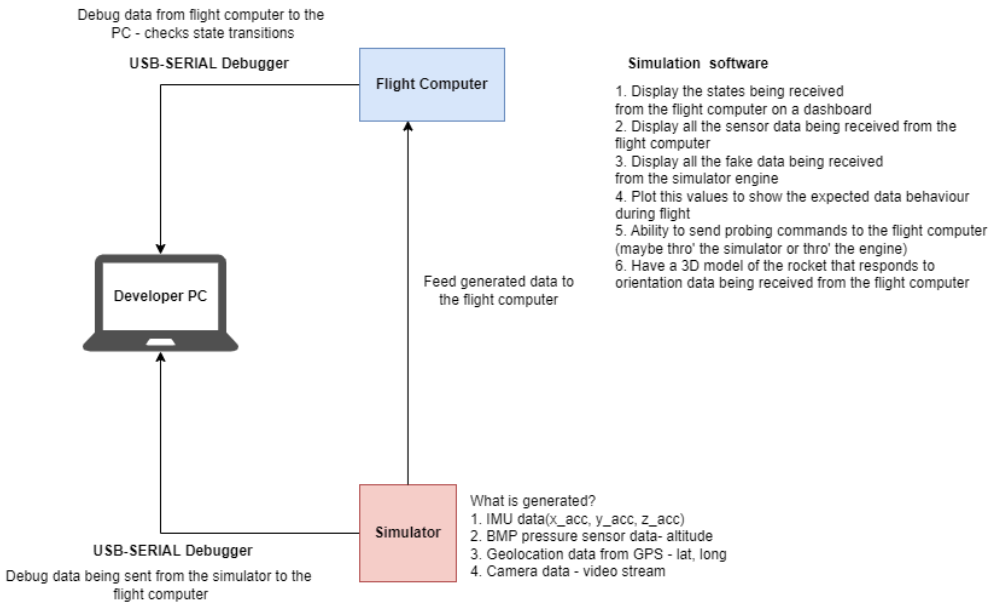
All space institutions, from the most advanced like NASA, to student rocketry clubs, must perform adequate and thorough testing on their space systems before the actual flight. They do what is called ‘Test like you Fly’. We lack this at the Nakuja Project, especially for the telemetry and recovery teams. This is why our most recent launch at Isiolo on 8th May 2024 had some pre-flight problems that saw us failing to achieve some critical mission objectives, which is a problem.

This project aims to address this issue. We would like to implement a hardware-in-the-loop (HIL) testing system which takes the software and electronics, and using a controller, feeds actual signals to the controller, tricking the controller to behave as though it was in the actual assembled product. In addition, it runs for the period expected during the actual launch.

HIL Testing System Block Diagram



Furthermore, this test system employing HIL will also develop essential preflight avionics system checks, arming and abort techniques and implement them in the actual flight software to aid in preventing pre-flight misfires especially on the ejection system, therefore improving the system reliability, safety and performance.

Since rocketry is a safety-critical endeavor, I am certain that the HIL test system will ensure we develop and build rocket avionics that are resilient to erroneous behavior, even though actual launch events cannot be exactly predicted.

We believe implementing this system will be a critical addition to the workflow and goals of the overall Nakuja Project.