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and CSUG Project
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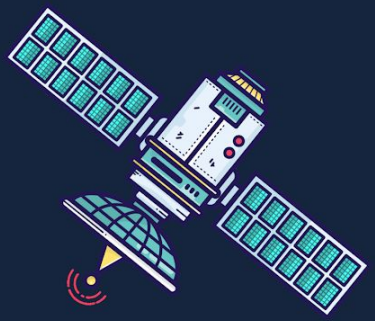
ATISE

Aurora Thermosphere Ionosphere Spectrometer Experiment

Context:

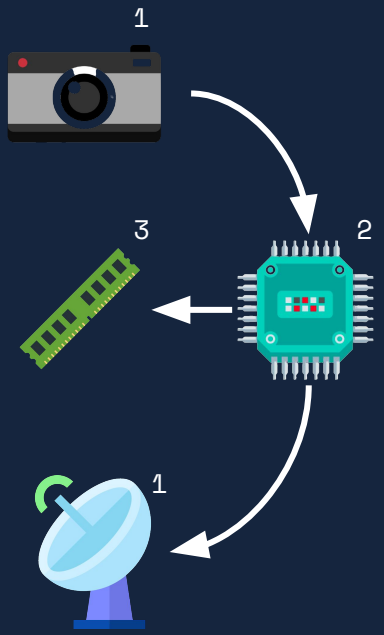
ATISE (Aurora Thermosphere Ionosphere Spectrometer Experiment) is the first nanosatellite project created by the CSUG (Grenoble University Space Center). The objective of this satellite will be to study auroras borealis from space, and to have a better understanding of the magnetosphere and solar activity. This project is predominantly student-made and it started in 2015 and is set to finish at the end of 2021.

Our objective is to manage the internal communication of the nanosatellite : our partners from the CSUT (Toulouse University Space Center) are developing the image processing component of ATISE, and we have to be sure that processed data is sent correctly to the output of the electronic card, so that it is then sent to Earth by an emitter.



Work environment:

We are not able to work on a real satellite, so we were given a high quality MARS ZX3 Electronic Card to work on its internal communication, as its components are very similar. The components we use are described in the Architecture part.



Architecture:

HDPyx (1):
When the nanosatellite is in space, it will include a spectrometer to measure auroral emissions and airglow in the spectral range. As of today, we have the HDPyx component to simulate a spectrometer to give us examples of real data to transmit. We hope to have a real data processing unit made by the CSUT in our final version of the code.

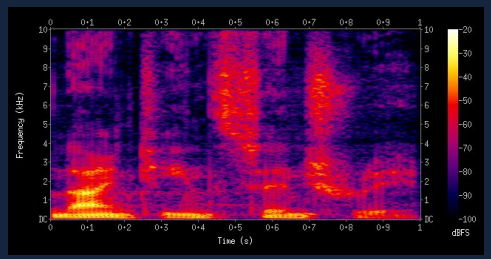
Micro-controller (2):
The micro-controller is an ARM Cortex A9.Its role is to get the data from HDPyx, copy it to the internal memory and send it to the "platform" part of the satellite (3), which will send the data to earth.

Platform part (4):
The platform part contains the satellite system: guidance, communication. The payload part will communicate with it using UART and the CSP protocol.

Results:

We have split our work into three main tasks. In the first task, which we have finished, we have adapted the C code legacy in FreeRTOS, a Real Time Operating System. In a second part, we plan to send data from the MarsXZ3 module through UART. To better understand how the UART works, we would like to exchange data between 2 Raspberry PIs thanks to UART. During our third and last task, we have scheduled to use the Cubesat Space Protocol (CSP) on the UART link.

At the end of the project, our objective is to have a functioning internal communication, and to correctly get through the UART the data of the HDPyx, like this one..



A spectrogram that could be sent by ATISE

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