PRD - Andrômeda I - Extended Abstracts

Team 18 Project Technical Presentation to the 2020 LASC

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# INTRODUCTION

The fires are one of the most problematic questions that the environment must deal with, specially, nowadays. It could be seen, for instance, by the recent events that happened in some Brazil’s ecosystems, whose results were 22% of the Pantanal burned 1 and about to 13000 km2 burned in the Amazon Forest 2. However, the wildfires do not happen just in a single country, the fires happen in all world and, for example, just from January to November 2020, almost 34000 km2 has burnt around the world3. These burned areas are pictured by satellites4, however it occurs, most of the time, after that the ravage has already been done. Thinking in that, in some places, drones5 and Unmanned Aerial Vehicle (UAV)6 are used to find fire focus while the fire is burning the land. Although, these methods are efficient, they are too expensive to achieve, besides that, there are several risks that could damage the equipment, turning the process more expensive than it already is. Thus, there is a need to find a cheaper way to support the professionals to detect, immediately, the fire focus during any wildfire. Therefore, the main purpose of this project is to develop a cheap CanSat, which uses its sensors and camera to help to detect the fire focus, intending to avoid unnecessary spending and trying to foment a technology that might be useful in wildfires.

# FIRST BODY SECTION

The Andromeda I’s experiment was designed to have 66 mm in diameter and about to 105 mm in height. The CanSat is composed by 6 modules, being 2 in vertical, 24 mm x 54 mm each, and 4 in horizontal, 56 mm in diameter each. That way, each module is connected one another by vertical pin sockets and pin headers, that also transport the electric connections. Specifically, there are three pins headers that fix one board to another, 2 of 1x4 and 1 of 1x2, this will transport the UART communication and those will take the I2C and the SPI communication.

In the first module, it is the camera, OV7670, connected in the board by one pin socket of 2x11. The camera will be pointed to the case that will be crossed by the camera’s lens, allowing it to record outside the CanSat. Its communication is a little bit different, compared to the other modules, it comes by scattered pins all around the board, which come from the right above plate, the processor’s board.

The processor’s board is the second module, and in it there are an ESP32, a DHT1, a resistor, a push button, and some capacitors. This processor was chosen, because it has 2 cores and it will allow to process a huge amount of sensor’s data in a short time, moreover, it will send faster the information to the storage device.

The third module is the tiniest one, in terms of components, because, in it, there are only two sensors, being a BMP280 and a MPU6050. The first one will be used as an altimeter once it will save the measurement of temperature and pressure to get the altitude data. In the other hand, the MPU6050 will be utilized as a gyroscope, which could help in the control of the CanSat when it is ejected. Lastly, the communication established for both sensors was the I2C.

Finally, the last horizontal board supports both vertical plates and the battery, as well. The voltage source provides 3.7 V, but the LM1117 converts it to 3.3V to supply all the CanSat’s components. In addition, the alimentation system can hold the circuits on for almost 30 hours. In one of the vertical PCBs, it was settled a SD Card module, that communicates by the SPI method, and in the other was putted a GPS module, which uses the UART communication.

Thus, this device will be able to mix the information from the sensors and the camera, aiming to get a better conclusion about where it is the focus of the fire. Therefore, the Andromeda I’s experiment was projected to be easy to do maintenance and to be found in the middle of the forest, due to its components that was just inserted in pins, instead of welded in the boards, and the fluorescent line around it.

# RESULTS, CONCLUSIONS, AND FOLLOW-ON WORK

As a result, it is perceptible that it is possible to create a cheap and small device to help in the wildfires problems, even if it does not contain high technology. Nonetheless, before it goes to practice, the CanSat must pass through a bunch of tests and modifications to be able to be putted working. Thereby, to upgrade the experiment and to overcome this technology lacking, there are some points that could be improved to achieve a better performance, like implementing a telemetry system to send the data during the flight, as well as, putting some actuators to control the CanSat while it is flying. Lastly, this flight control could be done, for instance, by Artificial Intelligence (AI) and Machine Learning, aiming to achieve certain autonomy to the experiment.

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