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Space Development Program "Edu Cubesat"

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National Technological University - Córdoba Regional Faculty

Space Development Program "Edu CubeSat"

Robotics Club [1]

Córdoba, Argentina

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As the result of the enthusiasm for space environment, the researches and studies done, brought us to different activities and networking throughout this two years.

In this opportunity we present the bellow program proposal.

In support of the Argentine Educational System, the Robotics Club (CdR) of the National Technological University, Córdoba Regional Faculty [2] (UTN-FRC) joined together with the Preparatory Committee of UNISEC-Argentina [3] (PCoUA) have prepared the next Space Development Plan (PDE).

Introduction

The general objective of this program is to awaken and develop scientific-technological vocations, related to spatial issues, in undergraduate students of Public Universities; cultivating a passion for engineering, promoting advanced technologies and the socio-economic growth of our country. This program also seeks to encourage spatial development based on open technologies (Open Source philosophy). All the material generated around this program is open and can be used by any public university to start its own academic space career.

Phases

- **First phase** of the PDE consist about the Cor-E Sat Project (educational satellite based on 3D printing technology and commercial components for use in the laboratory and in the classroom), presented at the OSCW editions 2017 (Darmstadt) and 2018 (Madrid), in IAA-LACW 2018 (Ubatuba, Brazil), FLISoL 2018/2019 Argentina and CATE 2019 (Argentina).

As of May 2019, a maintenance and continuous improvement phase begins, focusing on the development of the bibliographic material necessary to be able to give a workshop-course based on this technology. Initially, a series of extracurricular courses-workshops will be given using the CorE-Sat platform, theoretical-practical bibliographic material, dictated mainly by the developers. Once these experiences have been completed and the material polished, a university extension course will be proposed.

Infrastructure support: for this first phase the use of the laboratories of the University is proposed, with the aim of sharing and disseminating the initiative among the students and teaching staff.

- **Second phase** is about the Space-Satellite Mission Proposal for Fire Management (ARTI) [4]. This is a simulated mission in a digital environment, covering the design, development, testing, operation, completion and subsequent evaluation of the mission, using tools for analysis and design of missions and space systems, computer models, software in the loop (SIL) and hardware in the loop (HIL). The stipulated life time of the mission is 6 months from the start of Phase A development. Technological and technological demonstration missions developed both nationally and internationally will be taken as a basis.

Infrastructure support: In order to develop capacities around satellite communications, we propose:

Replicate a node to incorporate the UTN-FRC into the SatNOGS open satellite network of the Free Space Foundation (architecture and software provided by the network).

Develop the necessary engineering to be able to receive and transmit from and to the flight segment (satellite) with its own equipment (implementing the ground segment software, supporting several modulation / demodulation, coding / decoding schemes). This station enters the second phase of the PDE as a SIL / HIL element and could become operational to provide satellite services from the University. The general activities would be carried out between this new space (the earth station) and the laboratories of the University.

- **Third phase** of the PDE proposes insert a simplified technological demonstrator into orbit of the flight segment from ARTI Mission and a reduced but functional implementation of ground systems (with a focus on the development of communications, operations and applications, such that allow to validate the response time before a positive detection). The ground systems will be tested and evaluated using a minimum set of three drones flying in formation, with their instrument, processor and communication interfaces, and an artificial scenario initially, to then move to a real controlled scenario to observe. Once the critical design review of this third phase of the PDE has been completed, it is expected to be able to coordinate with CONAE the registration of the flight segment in the National Register of Objects Launched into Outer Space [5]. The estimated duration of this third phase is 12 months from the end of the second phase.

Infrastructure support: With the aim of developing capacities for the development, integration and testing of space systems, the implementation of a small satellite laboratory is proposed for the realization of this third phase of the PDE and upcoming projects. This space could be used for general purposes of the various chairs with responsibilities in the area.

Participation in congresses

The participation of the students involved in the different projects in national and international congresses will be promoted, promoting the generation of publications around the themes addressed.

References

- [1] <https://clubderobotica.github.io/>
- [2] <https://www.frc.utn.edu.ar/>
- [3] Facebook "Preparatory-Committee-for-UNISEC-Argentina"
- [4] https://clubderobotica.github.io/Docs/CdR_UTN_FRC_ProjARTI_2019_revB.pdf
- [5] <http://www.conae.gov.ar/index.php/espanol/registro-de-satelites>

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