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BUILDING AN EDUCATIONAL CUBESAT TRACKING NETWORK IN AUSTRALIA

Abstract

CubeSats or micro-satellites are now commonplace, with teams across the globe now regularly launching their vehicles into orbit and the orbits chosen are increasingly complex. While orbiting a CubeSat is a major achievement, it is one part of a wider mission for the satellite. In my experience, many CubeSat project teams have encountered problems receiving data from the satellite due either to unavailability, or high cost of Ground Station time to receive and relay signals from the vehicle to the project team. Following my presentation at last year's iNATS (National Astronomy Teaching Summit) this challenge was flagged, particularly in the Southern Hemisphere where Ground Stations are particularly sparse. Back in Melbourne Australia, I assembled a team of local schools, University students and corporate sponsors, to set about building a low-cost high-performance fully automated Ground Station to be used for CubeSat/micro-satellite tracking and basic radio astronomy projects. To remove barriers to school participation I set a cost target of AUD $500 and sourced corporate funding (NEC Australia) for the first two stations/schools. The hardware is based on open-source designs and leverages 3D printing of components and SDR (Software Definable Radio) technology. Similarly, the software components are open-source to minimise cost and maximise the flexibility of the Ground Station. A prominent local University (Swinburne University) provided access to their industrial 3D printers and radio astronomers from their School of Astrophysics to help us build out the project portfolio. The resulting Ground Station kit includes all parts required to build a fully automated satellite tracking Ground Station with configurable antennae and comprehensive build instructions along with project guides for science teams. This allows schools to include various areas of the school curriculum (Mechatronics, Coding, Metalshop and Science) in construction and use of the Station. Each station can be connected to the SATNOGS (Satellite Network of Ground Stations) to collect requests for observations and the portfolio of science projects will expand over time. Prototyping and testing commenced in late 2018 with the first full build completed in early 2019. Rollout will continue throughout 2019 and could spread internationally. This project is building a body of capable Ground Station personnel and junior Astrophysicists to populate the expanding space industry.