Overview and Research findings of SERC Research Program 2: Orbit Determination and Predicting Behaviours of Space Objects

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In 2014, the SPACE Research Centre at RMIT University became an essential partner of the Australian Government Cooperative Research Centre on Space Environment Management (CRC-SEM), managed by the Space Environment Research Centre (SERC Limited).

SERC's goal is to build upon Australia's space debris monitoring capability and to develop new cutting edge technology required to perform laser manoeuvre of space debris objects and mitigate the risk of space debris collisions. The RMIT University SPACE Research Centre leads Research Program 2: Orbit Determination and Predicting Behaviours of Space Objects. This Research Program consists of five work packages.

Work package 1 Atmospheric Mass Density (AMD): A new AMD model was developed which includes the ion mass density. Physics-based atmospheric models were also investigated and are showing encouraging results.

Work package 2 Ray tracing – Signal Propagation: A numerical ray tracing technique which involves tracing a ray tube or finite flux tube was developed. This technique is ideal for simulating the laser signal.

Work package 3 Precise Orbit Determination (POD) for controlled objects: POD algorithms and software were developed.

Work package 4 Debris Reliable Orbit Determination (ROD) using sparse observational data: A new robust ROD software platform was developed.

Work package 5 Semi-analytic Satellite Theory (SST) for fast and accurate orbit propagation: A new SST orbit propagator was developed which takes advantage of the principles of Multi-scale Modelling to provide a scalable architecture for orbit propagation.

A selection of the important research findings from Research Program 2 will be presented.