Spatially Enabling
Australia and New Zealand

Project 1.04 | Development of a Test Facility for GNSS Positioning System Validation and Certification

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- **Objectives** This project is developing a system that can be used to quantify and validate the performance of real-time Global Navigation Satellite System (GNSS) positioning systems in determining its 'fitness-for-purpose'

Outcomes Outcomes of this research will include:

- Identify the requirements of a test system based on an assessment of application requirements and operating scenarios
- Revise a practical methodology for repeatable and traceable system tests
- Develop, implement and test a robust set of statistical algorithms that characterise the performance of the positioning system

Introduction

GNSS technology has become so pervasive that a lot of critical applications depend on the positioning outputs of a GNSS device. The consequences of the equipment not working to its expected requirements may have legal repercussions or even endanger personal safety. Currently, there are no assessable and independent facilities which provide system 'fitness-for-purpose' certifications for end users and as such, this research aims to establish both the theoretical and practical foundations of the underlying architecture used for these proposed facilities.

The Need for Receiver Benchmarking

GNSS receivers across different manufacturers have proprietary ways of processing positioning information which has made receiver performance benchmarking difficult. A universal benchmarking algorithm is being developed to understand the capabilities of a receiver which would allow end users to determine and test the most suitable equipment for an application.

Figure 1: Different GNSS receiver types

Developing Repeatable Test Scenarios

Repeatability of the tests being a crucial aspect of the overall methodology and the Record and Playback System (RPS) has been used as an invaluable tool to record and generate consistent GNSS signals.

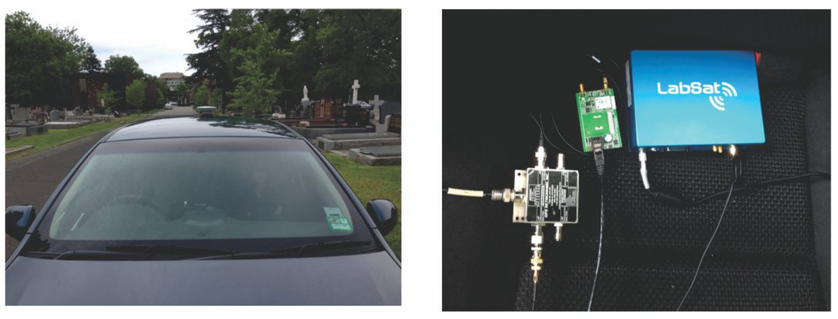

Figure 2: Scenario modeling and tests using LabSat2 RPS

Repeatable Scenario Tests

The graphs show the variability of standalone positioning for 55 repeated playback sequences from the RPS. For the purpose of benchmarking, the acceptable thresholds of variability are still being determined.

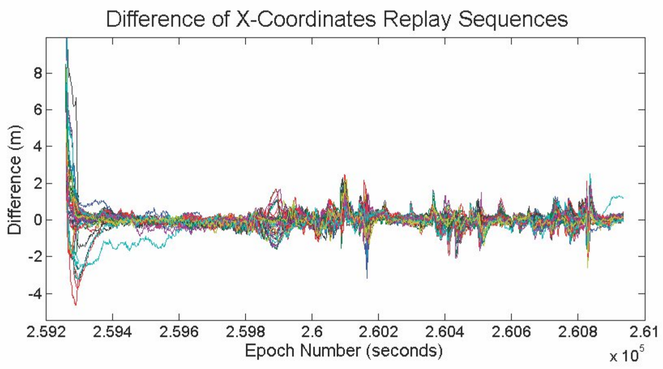

Figure 3: Variability of 55 Playback Sequences for coordinates and locked satellites from reference. Static epochs: 259263 to 259863 . Receiver in motion: 259864 to 260936

Testing Mechanism

Using a standardized processing algorithm, the test software being developed will be able to quantify the error handling of the receiver which is to be used for receiver benchmarking.

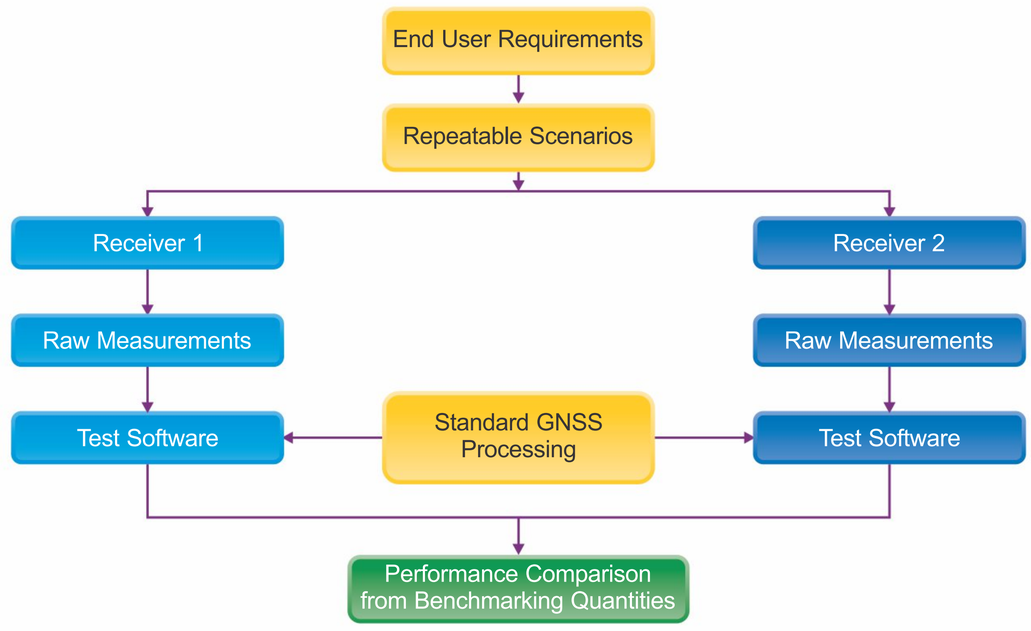

Figure 4: Test Concept

Summary

The test facility concept being proposed in this research envisages providing users with the ability to routinely and regularly assess the performance of GNSS equipment. Once realised, greater assurance can be given to an individual equipment towards its intended and expected levels of performance under common GNSS operating scenarios.

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