SMARTSAT COOPERATIVE RESEARCH CENTRE

RMIT UNIVERSITY

Cooperative Spectrum Sensing for Cognitive Satellite Communication

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Introduction

- The Satellite spectrum is congested due to higher utilization and due to increasing number of satellites in the space
- Frequency reusing is the most promising solution for spectrum scarcity.
- Cognitive radio communications evolved to the satellite communication as cognitive satellite communication.
- Spectrum sensing plays a vital role in efficiency of cognitive satellite communication system.
- Cooperative spectrum sensing by using more than one spectrum sensor can improve the performance of the system

Aims

- Propose an efficient spectrum sensing method for cognitive satellite Communications when the satellite is using UPA antenna.

Method

- Consider the importance of each spectrum sensor location for decision
- Propose an energy detection based cooperative spectrum sensing

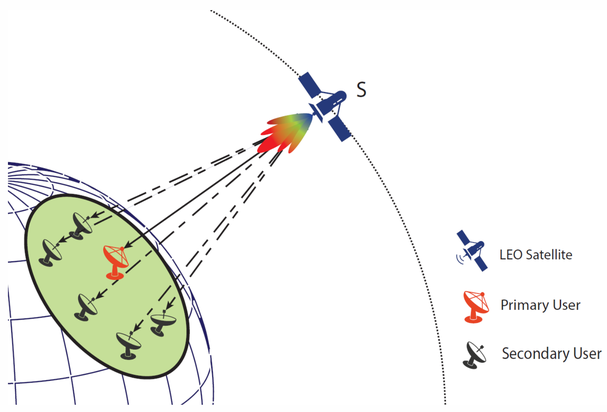

Fig 1. System Model

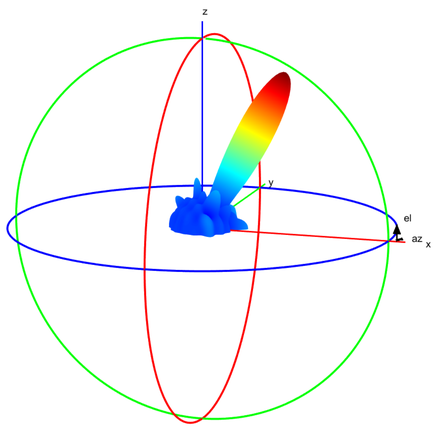

Fig 2. Uniform Planer Array (UPA) beamforming

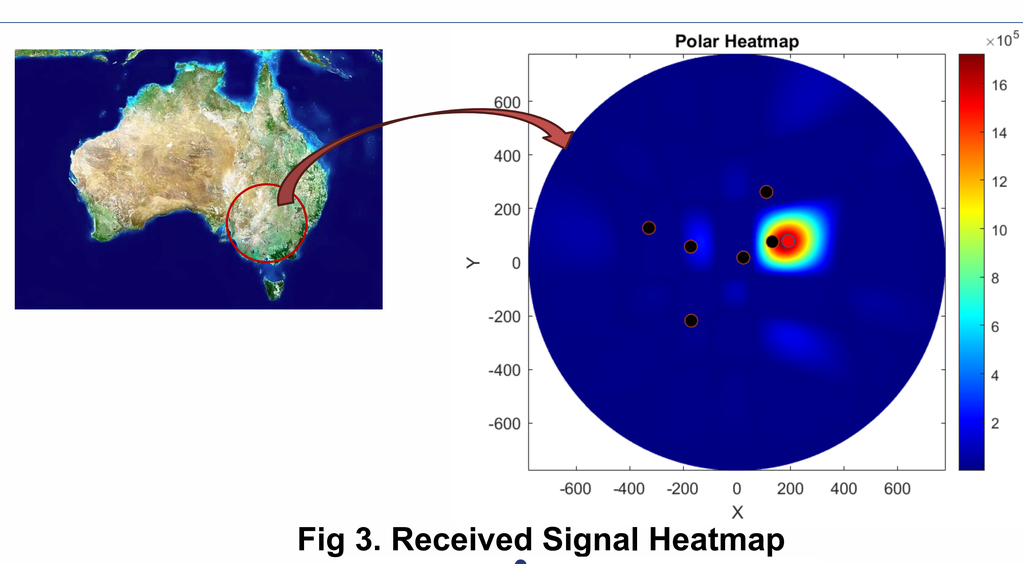

Fig 3. Received Signal Heatmap

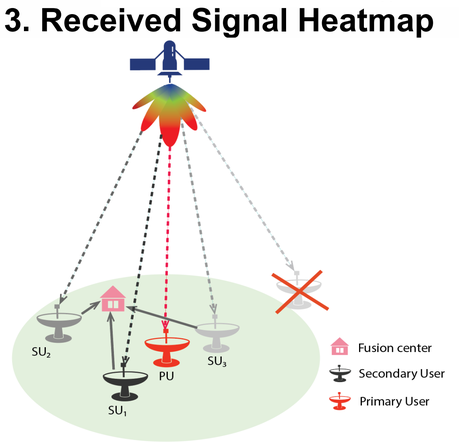

Fig 4. Cooperative Spectrum Sensing

Results

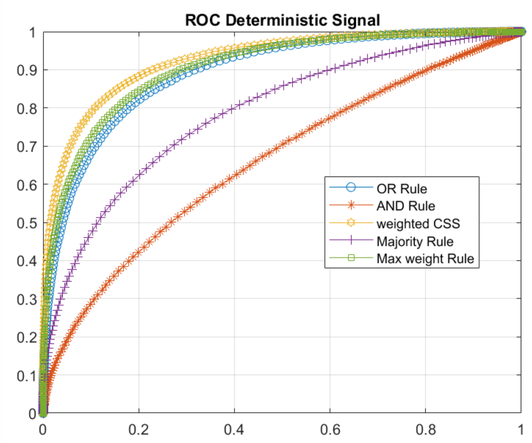

Fig 5. ROC Performance

Future Work

- Consider multiple beamforming at the satellite for spectrum sensing and resource allocation.
- Use of machine learning techniques and eigenvalue-based detection techniques to improve the spectrum sensing decision performance.

Major References

- Tian, Qing, Yuhang Wu, Feng Shen, Fuhui Zhou, Qihui Wu, and Octavia A. Dobre. "ED-Based Spectrum Sensing for the Satellite Communication Networks Using Phased-Array Antennas." IEEE Communications Letters (2023).
- C. A. Balanis, Antenna theory: analysis and design. John wiley & sons, 2016.

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