

Spectrum Sensing using USRP

The software developed by the Spectrum Sensing using USRP team will increase the safety of deployed soldiers by introducing significant improvements to the Army's radio frequency situational awareness. Right now the Army's ability to visualize the wireless spectrum is extremely limited; they can see the power of various signals, but have no way to differentiate between a cell phone signal and a FM radio signal (that a terrorist might use) at the same frequency. This product will give deployed personnel the capability to identify wireless signals (cellular, Wi-Fi, Bluetooth, FM/AM radio), including those that can pose a threat to allied lives. With this system, soldiers will be able to see what signals exist in their geographical area and can be alerted of signals that are anomalies or likely to be used by malicious groups. Not only will the Spectrum Sensor bring home more soldiers at the end of the day, it will be developed at a cost unmatched by competitors.

The identified customer of the Spectrum Sensing device is the United States Army. MITRE, the project sponsor, is a nonprofit military-contractor who operates with the sole interest of the U.S. Military. Other customers have not, and can not be considered as the group is essentially fulfilling a contract from MITRE to complete the project. Target competitors are other defense contractors in the defense industry and the wireless communications industry. Due to the nature of this industry it is difficult to know what the competitors offer, however the group has operated under MITRE's guidance especially during the project development phase to ensure that the project has an edge against any competition.

The Spectrum Sensing project takes advantage of an up and coming topic in wireless communications, the software defined radio. The objective of this project is to identify and determine the modulation schemes of signals encountered in an open environment. This process will be accomplished by scanning a user-defined spectrum, identifying signals using proprietary signal identification algorithms, and analyzing signal characteristics using proprietary algorithms to determine modulation type. Each of these parts represents significant development that the group has undertaken.

The project has been developed in conjunction with MITRE to surpass the competition in a number of ways. Firstly, competing software is bundled with expensive hardware. The group will use widely available hardware and develop on standard laptops. This gives the advantage of repurposable hardware since the army can run the software on platforms they already have. Additionally, implementing machine learning algorithms from evolving well designed libraries, greater capabilities are achieved than any of the competition (i.e. more possibilities that might pose a threat can be covered). Initial testing has shown that the use of machine learning allows the system to be incredibly dynamic in the types of signals that can be detected. This will allow the Army to evolve with the Spectrum Sensing device as wireless technologies change.

Initial testing and integration using generated and over-the-air signals has shown that the developed software will detect signal in seconds, and the machine learning algorithm will correctly identify the modulation type of identified signals, marking the preliminary phase of the project a success.

This project is operating under the sponsorship of MITRE who has provided all hardware to complete the task. The project relies on software development by the group, which has no associated costs.