

Reconfigurable, Cognitive Software-Defined Radio

Enabling multimode operation and scalable architecture

Software-defined radio (SDR) technology allows radios to be reconfigured to perform different communication functions without using multiple radios to accomplish each task. Intelligent Automation, Inc., has developed SDR platforms that switch adaptively between different operation modes. The innovation works by modifying both transmit waveforms and receiver signal-processing tasks.

In Phase I of the project, the company developed SDR cognitive capabilities, including adaptive modulation and coding (AMC), automatic modulation recognition (AMR), and spectrum sensing. In Phase II, these capabilities were integrated into SDR platforms. The reconfigurable transceiver design employs high-speed field-programmable gate arrays, enabling multimode operation and scalable architecture. Designs are based on commercial off-the-shelf (COTS) components and are modular in nature, making it easier to upgrade individual components rather than redesigning the entire SDR platform as technology advances.

Applications

NASA

- ▶ Space Telecommunications Radio Systems (STRS) Project
- ▶ Communications, Navigation, and Networking Reconfigurable Testbed (CoNNeCT) Project
- ▶ Reconfigurable communication radios for extravehicular activities and space missions

Commercial

- ▶ Cognitive radios
- ▶ High-bandwidth, plug-and-play waveform synthesizers
- ▶ Real-time digital processors
- ▶ Unmanned aerial vehicle (UAV)-based communications and radar functions



NASA photo

Phase II Objectives

- ▶ Implement STRS with COTS or custom-designed SDR platforms
- ▶ Identify, study, and test AMC requirements for selected waveforms
- ▶ Design and demonstrate a prototype transmitter system with desired AMC capabilities
- ▶ Modify, test, and implement AMR algorithms on the prototype SDR platform
- ▶ Demonstrate joint operation of AMC and AMR operations in a controlled environment and on SDRs configured as dedicated transmitters and receivers
- ▶ Implement advanced SDR features for the NASA CoNNeCT Project
- ▶ Identify a path to space qualification

Benefits

- ▶ Reconfigurable
- ▶ Scalable
- ▶ Multimode-operation capable
- ▶ Adaptable

Firm Contact

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