



## TECHNOLOGY SOLUTION

### Information Technology and Software

# Automata Learning in Generation of Scenario- Based Requirements in System Development

[A technique for fully tractable code generation from requirements](#)

NASA sensor networks can be highly distributed autonomous systems of systems that must operate with a high degree of reliability. The solar system and planetary exploration networks necessarily experience long communications delays with Earth. The exploration networks are partly and occasionally out of touch with the Earth and mission control for long periods of time, and must operate under extremes of dynamic environmental conditions. Due to the complexity of these systems as well as the distributed and parallel nature of the exploration networks, the exploration networks have an extremely large state space and are impossible to test completely using traditional testing techniques. The more code or instructions that can be generated automatically from a verifiably correct model, the less likely that human developers will introduce errors.

#### BENEFITS

- The medium reduces partiality of system requirement specifications, system development time and the amount of testing required of a new system
- The medium allows translating the scenario of the system to a script, without the use of an automated inference engine



## THE TECHNOLOGY

In addition, the higher the level of abstraction that developers can work from, as is afforded through the use of scenarios to describe system behavior, the less likely that a mismatch will occur between requirements and implementation and the more likely that the system can be validated. Working from a higher level of abstraction also provides that errors in the system are more easily caught, since developers can more easily see the big picture of the system.

This technology is a technique for fully tractable code generation from requirements, which has an application in other areas such as generation and verification of scripts and procedures, generation and verification of policies for autonomic systems, and may have future applications in the areas of security and software safety. The approach accepts requirements expressed as a set of scenarios and converts them to a process based description. The more complete the set of scenarios, the better the quality of the process based description that is generated. The proposed technology using automata learning to generate possible additional scenarios can be useful in completing the description of the requirements.

## APPLICATIONS

The technology has several potential applications:

- Satellites
- Software Systems
- Sensors
- Robotic Operations
- Spacecraft
- Artificial Intelligence

## PUBLICATIONS

Patent No: 7668796

## More Information

National Aeronautics and Space Administration

**Agency Licensing Concierge**

**Goddard Space Flight Center**

Code 102

Greenbelt, MD 20771

202-358-7432

Agency-Patent-Licensing@mail.nasa.gov

**www.nasa.gov**

NP-2015-04-1663-HQ

[technology.nasa.gov](http://technology.nasa.gov)

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

GSC-15148-1, GSC-TOPS-71