

Autonomic Sonar Sensor Fault Manager for Mobile Robots

Authors : Martin Doran, Roy Sterritt, George Wilkie

Abstract : NASA, ESA, and NSSC space agencies have plans to put planetary rovers on Mars in 2020. For these future planetary rovers to succeed, they will heavily depend on sensors to detect obstacles. This will also become of vital importance in the future, if rovers become less dependent on commands received from earth-based control and more dependent on self-configuration and self-decision making. These planetary rovers will face harsh environments and the possibility of hardware failure is high, as seen in missions from the past. In this paper, we focus on using Autonomic principles where self-healing, self-optimization, and self-adaption are explored using the MAPE-K model and expanding this model to encapsulate the attributes such as Awareness, Analysis, and Adjustment (AAA-3). In the experimentation, a Pioneer 3-DX research robot is used to simulate a planetary rover. The sonar sensors on the 3-DX robot are used to simulate the sensors on a planetary rover (even though in reality, sonar sensors cannot operate in a vacuum). Experiments using the 3-DX robot focus on how our software system can be adapted with the loss of sonar sensor functionality. The autonomic manager system is responsible for the decision making on how to make use of remaining 'enabled' sonar sensors to compensate for those sonar sensors that are 'disabled'. The key to this research is that the robot can still detect objects even with reduced sonar sensor capability.

Keywords : autonomic, self-adaption, self-healing, self-optimization

Conference Title : ICACCE 2017 : International Conference on Autonomic Computing and Computer Engineering

Conference Location : London, United Kingdom

Conference Dates : May 25-26, 2017