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Spacecraft Fault Management in the Presence of Uncertainty

This dynamic neural network-based system enhances spacecraft autonomy for fault detection, isolation, and recovery, resulting in fewer false positives and more reliable root cause analysis.

Researchers at Purdue University have developed a dynamic neural network-based fault detection, isolation and recovery (FDIR) system which demonstrates reduced false positives and more robust determination of root cause. Increasing numbers and complexity of small spacecraft and missions demands improved autonomy for FDIR. Traditional rule-based methods such as limit checking possess limit ability to perform onboard diagnosis. Data-driven approaches based on data mining of telemetry have emerged out of the field of machine learning and provide more capable and informative ways of detecting faults, but many of these algorithms are susceptible to a high rate of false positives. The system has been validated against several common methods in a spacecraft simulator.

Advantages:

-High computational efficiency

-Reduced rates of false positives

-Robust determination of root cause

-Allows spacecraft to return to the desired operational state without ground intervention

Applications:

-Small satellites

-Other spacecraft

TRL: 5

Intellectual Property:

Technology ID
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Category
Aerospace & National Security/Space Technologies
Artificial Intelligence & Machine Learning/Reinforcement & Federated Learning
Robotics & Automation/Autonomous Systems & Perception AI

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