Automated Diagnosis and Control of Complex Systems
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Livingstone2 is a reusable, artificial intelligence (AI) software system designed to assist spacecraft, life support systems, chemical plants, or other complex systems by operating with minimal human supervision, even in the face of hardware failures or unexpected events. The software diagnoses the current state of the spacecraft or other system, and recommends commands or repair actions that will allow the system to continue operation. Livingstone2 is an enhancement of the Livingstone diagnosis system that was flight-tested onboard the Deep Space One spacecraft in 1999 (see figure). This version tracks multiple diagnostic hypotheses, rather than just a single hypothesis as in the previous version. It is also able to revise diagnostic decisions made in the past when additional observations become available. In such cases, Livingstone might arrive at an incorrect hypothesis.

Re-architecting and re-implementing the system in C++ has increased performance. Usability has been improved by creating a set of development tools that is closely integrated with the Livingstone2 engine. In addition to the core diagnosis engine, Livingstone2 includes a compiler that translates diagnostic models written in a Java-like language into Livingstone2’s language, and a broad set of graphical tools for model development.

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