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Quality and safety, a challenge for traditional and new space (1)

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RESEARCH AND APPLICATION OF MACHINE-LEARNING-ORIENTED SPACECRAFT HEALTH MANAGEMENT PLATFORM

Abstract

The complex environment, conditions, aging failure and other comprehensive factors, making the spacecraft fault detection, diagnosis, prediction exceptionally difficult. The capability of traditional expert knowledge systems in spacecraft's system-level fault handling is limited, and still require designers and domain experts to spend a lot of time on mechanism analysis, formula derivation, and experimental verification. The traditional manual-analysis-based work model obviously cannot meet the development requirements of the spacecraft's high-reliability and quantity growth. In recent years, the new machine learning platforms (e.g., Microsoft's Azure, Google's Cloud Machine Learning, Alibaba's PAI), which have friendly process analysis framework, rich plugs and play machine learning tools and distributed services, can provide new ideas of complex problem handling in the fields of spacecraft. It proposed a machine-learning-oriented spacecraft health management platform design based on the analysis of the difficulties in spacecraft fault diagnosis and fault prediction, including modeling, health management platform architecture, massive data preprocessing methods, TensorFlow and other typical machine learning tools integration method, diagnosis and prediction of distributed service design and the results display and evaluation design, etc. Finally, the actual application effect is verified with the solar array power forecasting and other cases. The experiment results show that the research can provide technical reference for the research and application of spacecraft health management technology based on machine learning, and ultimately improve the safety of the spacecraft.