

Unsupervised Anomaly Detection for Aircraft Condition Monitoring System

Mots clés :

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Résumé du projet de recherche (Langue 1)

The principle of objective of this thesis is to detect anomalies and changes in the ACMS (Aircraft Condition Monitoring Service) data. In order to improve the health monitoring function of the ACMS. The work is based principally on the univariate anomaly detection. Where the majority of work today are in multivariate and generally based on labeled data. We used the unsupervised learning to process the univariate detection, since we don't have any a prior knowledge of the system and no documentation or labeled classes are available. The univariate analysis focuses on each sensor independently, hence anomalies are detected and labeled for each sensor thank to a decomposition method. The anomalies detected in the univaraite can be potential triggers or can be used to update the existing triggers. And the decomposition method will allow us to work detect anomalies inside each pattern of the sensor. \setlength\parskip{\baselineskip} Otherwise, we propose also a generic concept of anomaly detection based on univariate and multivariate anomaly detection. And finally a new concept of validation anomalies within airbus. \setlength\parskip{\baselineskip} ~\ Bibliography 1- Dehuang Chena, Xiaowei Wangb, Jing Zhaoa, Aircraft Maintenance Decision System Based on Real-time Condition Monitoring, 2012 2- Le Minh Duc, Tan Cher Ming, Cost Comparison of Maintenance Policies, Annual Conference of the Prognostics and Health Management Society 2011 3- Mark A. Schwabacher, A Survey of Data-Driven Prognostics, Nasa, 2005 4- Skormin, V.A, Data mining technology for failure prognostic of avionics, Dept. of Electr. Eng., Binghamton Univ., NY Gorodetski, V.I. ; Popyack, L.J. 2002, 5- Michael G. Pecht, Prognostics and Health Management of Electronics, Chapter 3. Data-Driven Approaches for PHM, 6- Sylvain Létourneau and Mike Halasz, The Use of Integrated Reasoning with Flight and Historical Maintenance Data to Diagnose Faults and Improve Prognosis, NRC Institute for Information Technology, Canada. 7- Nasa Data Mining and Complex Adaptive Systems Group 8- Phm Society (www.phmsociety.org) 9- N. Frankle , R. Shroder, Pattern recognition of health - data derived prognostic health management, Frontier Technology, Inc 10- K. Paul , J. Luna, Strategies For Optimizing The Application Of Prognostic Health Management To Complex Systems, Frontier Technology, Inc 11- Mark Schwabacher, Machine Learning for Rocket Propulsion Health Monitoring, NASA Ames Research Center, 2005. 12- S. Létourneau, C. Yang, C. Drummond, E. Scarlett, J. Valdés, and M. Zaluski, "A Domain Independent Data Mining Methodology for Prognostics", Conference Proceedings: Essential Technologies for Successful Prognostics, 59th Meeting of the Machinery Failure Prevention Technology Society. Virginia, USA, 2005. 13- R. A. Martin, M. Schwabacher, N. Oza, and A. Srivastava, Comparison of unsupervised anomaly detection methods for systems healthmanagement using space shuttle main engine data, NASA Ames Research CenterMoffett Field, CA. 14- T.Warren Liao, Clustering of time series data—a survey, Industrial & Manufacturing Systems Engineering Department, Louisiana State University, 3128 CEBA, Baton Rouge, LA 70803, USA, January 2005. 15- Meng J, Huang Y. Biclustering of time series microarray data. Methods Mol Biol. 2012;802:87-100. 16- Joana P. Gonçalves, Sara C. Madeira and Arlindo L. Oliveira BiGGEsTS: integrated environment for biclustering analysis of time series gene expression data BMC Research Notes 2009, 2:124 17- Govaert G., Nadif M. Block clustering with Bernoulli mixture models: Comparison of different approaches. Computational Statistics & Data Analysis 2008;52(6): 3233-3245. 18- Jérôme Lacaille, Valério Gerez, Online Abnormality Diagnosis for real-time Implementation on Turbofan Engines and Test Cells, Annual Conference of the Prognostics and Health Management Society 2011 19- Kamran Javed, Rafael Gouriveau, Ryad Zemouri, Noureddine Zerhouni, Improving data-driven prognostics by assessing predictability of features, Annual Conference of the Prognostics and Health Management Society 2011