

# Special Section on Prognostics and Systems Health Management (PHM), Extended Papers From the PHM Macau 2010 Conference

**T**HIS SECTION contains 6 papers selected from the best papers presented in the PHM Macau 2010 conference. The papers were significantly extended from the conference papers, so are unique and significant work vetted through peer review. The papers cover a wide range of PHM applications from traditional machine diagnosis and prognosis to health informatics. The paper by Caesarendra et al. proposed an application of relevance vector machine (RVM), logistic regression (LR), and ARMA/ GARCH models to assess the failure degradation based on run-to-failure bearing simulating data. Their result showed the novelty of the proposed method, which can be considered as a machine degradation prognostic model. In Rosunally et al., a fusion approach for a prognostic framework of a heritage structure was presented. Four approaches were applied, which included canary and parrot devices, physics-of-failure models, precursor monitoring and data trend analysis, and Bayesian networks. This is a good demonstration of PHM applications to a real case study. In Wen et al., they presented an advanced condition monitoring technology based on electrostatic induction for detecting the debris in aero-engines exhaust gas. Their experiment results showed the effectiveness of the methods proposed in the paper. Feng et al. presented a novel gear damage assessment based on cyclic spectral analysis. They showed the ratio between the sums of cyclic spectral density magnitude at the cyclic frequencies of

modulating frequency and 0 Hz along the frequency axis has an obvious increasing trend, which can be used to track localized gear damage. Jiang and Liu used Wavelet transforms to extract deterioration features with different mother wavelets for power engines. A Learning Vector Quantization (LVQ) neural network was then used to classify the machine conditions, including typical, abnormal, and failure states. The results showed that the LVQ classification system had good accuracy for machine condition classification, and was adaptable to various power engine conditions. Tsui et al. reviewed recent research on temporal and spatiotemporal surveillance methods for public health surveillance, which is an important area for PHM application in health care. They have addressed specific challenges and research gaps in the relevant research. They finally discussed a comparative example by using a dataset of male thyroid cancer cases in New Mexico.

PHM has gained popularity recently, largely because of the availability of measured health related data. This trend will continue with more publications to appear. The selected papers are only a few examples to show the recent advance in this research area, but more is to be expected.

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