Vacant PhD position

The research project "A robust and non-Gaussian approach to process sensing of various states in industrial processing plants" offers a fully funded three-year doctoral research position in the field of process system engineering. The position will be filled as soon as possible with a starting date no later than 1st April 2015.

ELIGIBILITY

To be eligible, a candidate should have:

1. A Malaysian citizenship.
2. Willingness to learn new things and to conduct breakthrough research.
3. A Master by research degree or Bachelor degree with a minimum GPA/CGPA score of 3.67 (average mark >75%) in one of these disciplines: Chemical Engineering, Mechanical Engineering, Electrical Engineering and Applied Mathematics/Statistics.
4. Good background in process system engineering, engineering mathematics and statistics. Understanding and experiences on multivariate data analysis and the use of MATLAB/SIMULINK are beneficial.
5. Good command of written and spoken English (e.g. IELTS: overall band of 6.5 and no individual band below 6.0).

FUNDING NOTE

This research is a part of the project funded by Ministry of Education of Malaysia through Fundamental Research Grant Scheme (FRGS) 2015 - 2017. The PhD scholarship will cover full tuition-fee and annual stipend of MYR 24,000. The duration of this scholarship is three years.

PhD SUPERVISION AND PROJECT TEAM

The PhD project will be supervised by Dr. Agus Saptoro and Professor Manabu Kano of Kyoto University, Japan. The successful applicant may also work in tandem with Dr. Garenth Lim King Hann and Dr Hendra Gunawan Harno of Curtin University Sarawak and undergraduate research students and postgraduate students/post-doctoral researchers at Curtin University Sarawak and Kyoto University.

PROJECT DESCRIPTION

Operational excellence has become, more than ever, important to meet economic and environmental targets in the process industries. Overall, operational excellence is a continuous pursuit to improve the processes and qualities of their associated products. As such, it leads to higher cost efficiency, better plant capacity exploitation and loss reduction as well as achieving compliance with environmental and safety legislations. These targets can be simultaneously achieved by operating the processes in their optimal states. Due to these reasons, industries in many different areas are seeking reliable tools to measure, monitor and control increasingly complicated processes. Such tools employ an inferential sensing

technology which utilises easy-to-measure process variables to estimate unmeasured or hard-to-measure variables. Inferential sensors, or also popularly called soft sensors or virtual sensors, have proved themselves to be a valuable alternative to their hardware counterparts. This is due to their ability to accurately predict important process variables that are difficult to measure using hardware sensors where these difficulties might be associated with cost, long time delays and reliability. Therefore, soft sensors play a vital role in modern industrial processing plants to meet stringent requirements of final product quality, production efficiency and compliances to process safety and environmental pollution reduction.

The success stories of implementation of soft sensors, however, involved some practical difficulties. Even if a good soft sensor is successfully developed, its predictive performance will gradually deteriorate after a certain time due to changes in the state of plants and process characteristics, such as catalyst deactivation and sensor and process drifts due to equipment ageing, fouling, clogging and wear, changes of raw materials and so on. When a good soft sensor has been developed, the maintenance is also very important to keep its estimation performance. This is consistent with the survey to the engineers and plant operators where majority of them indicated that the major problem of the soft sensor applications is the deterioration of the accuracy due to changes in the process. The survey result confirms that the maintenance of the soft sensor is an essential aspect concerning soft sensor. Therefore, from practical point of view, to cope with process changes and maintain its good performance, a soft sensor should be updated regularly as the process characteristics change. This motivates the development of adaptive soft sensors.

The existing algorithms used to develop adaptive soft sensors for sensing various states in industrial processing plants assume that process data are always clean and complete and follow Gaussian distribution. However, data in most industrial processes are non-Gaussian distributed and contain outliers and missing measurements. Consequently, existing algorithms will not work well under real scenarios and a new algorithm which is robust against missing data and outliers and works well with either Gaussian or non-Gaussian distributed data is required. This project, therefore, aims for addressing these fundamental research needs. It is expected that the main outcome from this research project is a novel algorithm to develop improved adaptive soft sensors which are applicable for both Gaussian and non-Gaussian data and robust against incomplete and unclean data.

INTERESTED TO APPLY?
Potential candidates should contact:

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