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Knowledge extraction

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Abstract— This article presented an anomaly detection method based on techniques of knowledge extraction from data, which can be fully applied to detect anomalous working conditions and prevent unexpected faults and shut downs of subsystems of energy production and fluid process plants such as in the LNG transport and production industry.
This method characterises the dynamic behaviour of a system using parameters data series collected during the system normal operation and detects changes in the signals behaviour comparing them with respect to their known (or normal) behaviour, through the analysis of transitions among the quantization levels.
One of the main advantages of the method here described is that it requires no a priori knowledge about the physical relations or characteristics of the system, relying only on the data stored during the system operation.
In addition, this approach is capable of detecting anomalies that a fixed threshold-based approach applied either to the monitored signal or to its derivatives may not be able to detect.
Finally, it is worth highlighting that the only parameter to be set in the proposed approach is the number of quantization levels for the discretization of numerical data, which is however not a critical issue, as some automatic optimization of the number of quantization levels, depending on the signals frequency content, can be implemented.
In conclusion, this article presented one among many possible diagnostic methods for the exploitation of valuable information stored into field process databases that could help field engineers evaluating the plant status by highlighting those subsystems that require further investigation.
An additional step of analysis based on correlation techniques will allow also the automatic interpretation of the plant behaviour, presenting to the field engineer a set of possible cause/effects relations that justify an anomalous behaviour.

Index Terms—

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