

# Modelling and Controlling an Offset Lithographic Printing Process

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## Abstract

The objective of this thesis is to provide methods for print quality enhancements in an offset lithographic printing process. Various parameters characterising the print quality are recognised, however, in this work print quality is defined as the deviation of the amount of ink in a sample image from the reference print.

The methods developed are model-based and historical data collected at the printing press are used to build the models. Inherent in the historical process data are outliers owing to sensor faults, measurement errors and impurity of the materials used. It is essential to detect and remove these outliers to avoid using them to update the process models. A process model-based outlier detection tool has been proposed. Several diagnostic measures are combined via a neural network to achieve robust data categorisation into inlier and outlier classes.

To cope with the slow variation in printing process data, a SOM-based data mining and adaptive modelling technique has been proposed. The technique continuously updates the data set characterising the process and the process models if they become out-of-date. A SOM-based approach to model combination has been proposed to permit the creation of adaptive—data dependent—committees.

A multiple models-based controller, which employs the process models developed, is combined with an integrating controller to achieve robust ink feed control. Results have shown that the robust ink feed controller is capable of controlling the ink feed in the newspaper printing press according to the desired process output. Based on the process modelling, techniques have also been developed for initialising the printing press in order to reduce the time needed to achieve the desired print quality. The use of the developed methods and tools at a print shop in Halmstad, Sweden, resulted in higher print quality and lower ink and paper waste.

**Keywords:** Neural Networks, Self-organizing map, Data mining, Outlier detection, Committee, Multiple models, Colour print control