International Journal of Innovative
Computing, Information and Control
Volume **7**, Number **11**, November **2011**

 ISSN 1349-4198
pp. **6261–6272**

YARN TENSION PATTERN RETRIEVAL SYSTEM BASED ON GAUSSIAN MAXIMUM LIKELIHOOD

Chuan-Pin Lu[1] and Jiun-Jian Liaw[2,*]

[1]Department of Health Industry Information Technology
Meiho University
No. 23, Pingguang Rd., Neipu, Pingtung 91202, Taiwan
chuan.pin.lu@gmail.com

[2]Department of Information and Communication Engineering
Chaoyang University of Technology
No. 168, Jifong E. Rd., Wufong District, Taichung 41349, Taiwan
*Corresponding author: jjliaw@cyut.edu.tw

Received July 2010; revised December 2010

Abstract. *The unusual yarn tension inspection plays an important role in yarn quality measurement. The patterns of unusual tension, which are captured and recorded by an on-line yarn tension monitor system, can ensure precise recognition of the unusual type of tension in order to solve the problem immediately. However, it is not easy for operators of twister machines to recognize the patterns of unusual tension without related training. The traditional on-line yarn tension monitor systems only detect unusual variation in tension, but cannot identify the patterns of unusual tension for operators, especially in the improved quality yarns. To assist the operators in the pattern recognition of unusual tension, in this paper, we propose an unusual yarn tension retrieval system based on Gaussian maximum likelihood classification algorithm. The proposed system uses four features to describe the tension patterns, and includes the following processes: pattern generation, feature calculation, similarity degree measurement, new class detection and pattern retrieval. Experimental results show that the proposed system can serve as an efficient and fast tool to identify unusual tension patterns.*
Keywords: Unusual tension, Yarn, Retrieval system, Gaussian maximum likelihood

1. **Introduction.** Many automatic methods and systems [1-3] have been developed to improve the quality of products and the operation efficiency, such as on-line yarn tension monitor systems (like Barmag's Unitens [4], Yu Hwa's QAI [5] and FAG's product), which serve as an important tool for automatic package grading, real time data view, historical data report, unusual yarn tension detection and recording. Yarn quality grading is based on the number of occurrences of unusual tension. Thus, the records of unusual tension can enable operators to track the unusual events, find the yarn's defects and improve it. These traditional monitor systems only carry out the patterns detection and record for unusual variation in tension, but cannot help operators to identify patterns, especially in yarn quality improvement. In factory, unusual tension pattern identification is now performed by operators. It is difficult for an operator to perfectly identify many kinds of patterns without the assistance of equipment. The curve is crucial in the unusual tension pattern identification. However, the patterns' curves are not the same while the yarn's production equipment, manufacturing conditions or manufacturing processes are different. Sometimes, patterns of a new class can also be found. As mentioned above, even well-trained and experienced operators cannot remember all class patterns, especially when they are tired. To assist operators in the identification of unusual tension patterns, we