

SURFACE TEXTURE CHARACTERIZATION OF FIBERS USING FRACTIONAL BROWNIAN MOTION MODEL

JIUN-JIAN LIAW¹, CHUAN-PIN LU^{2,*} AND LIN-HUANG CHANG³

¹Department of Information and Communication Engineering
Chaoyang University of Technology
No. 168, Jifong E. Rd., Wufong Township, Taichung County, Taiwan
jjliaw@cyut.edu.tw

²Department of Information Technology
Meiho Institute of Technology
No. 23, Pingguang Rd., Neipu, Pingtung, Taiwan
*Corresponding author: chuan.pin.lu@gmail.com

³Department of Computer and Information Science
National Taichung University
No. 140, Min-Sheng Rd., Taichung, Taiwan
lchang@mail.ntcu.edu.tw

Received November 2009; revised April 2010

ABSTRACT. *The texture of the surface of individual fiber is an important characteristic. The fibers can be classified and recognized using the surface texture by a specific parameter. To describe the texture, the fractal parameter (or Hurst coefficient) is a proper value. In this study, we use the Fractional Brownian Motion (FBM) to model the texture of the fiber surface. And we apply a Fourier-domain Maximum Likelihood Estimator (FDMLE) to calculate the fractal parameter of FBM. According to the experimental results, we can objectively classify different types of fibers.*

Keywords: Texture characterization, Fiber classification, Fractional Brownian motion, Fourier-domain maximum likelihood estimator

1. Introduction. In recent years, the developments in sciences and technology, such as Internet, digital image processing and micro-manufacture, etc, is drastically changing the life of the mankind. Science and technology have been used in radar systems, robots, networks and communications [1-4]. Using science and technology to investigate crime scenes is the major aspect of fighting crime in democracies. They are necessary not only to fight crime efficiently, but also to protect human rights and maintain the social order. Evidence collected from the crime scene includes fingerprints, DNA, blood and fibers. The evidence can be used to identify the criminal or to reduce the number of suspects. Many classification schemes were proposed for fingerprints, DNA and blood, but nothing for fabrics. However, fiber identification has not only been an important object in the forensic science, but also in many applications such as wool manufacture, textile processing, archeology and zoology [5]. In the textile industry, accurate classification of animal fibers proved very difficult. In the past, physical and chemical properties of fibers have been used to solve the classification problem. Recently, some techniques have been proposed to identify animal fibers by the cuticle on the surface of the fiber, such as image processing methods and artificial intelligence techniques [6-11]. As seen from the proposed literature, classification of fibers is actually important and the texture of fiber surface is a characteristic useful in classifying fibers.