Knitted Fabric Surface Density Measurement by Image Processing Using of Smart Phone Technique

Kumar Ghosh[1] and Amit Kundu[2]

Department of Textile & Fibre Engineering , IIT Delhi, New Delhi, India[1]

Department of Textile Chemical Processing

Government College of Engineering & Textile Technology, Serampore, WB, India[2]

Correspondence: kghosh9326@gmail.com

Abstract*: In this paper ,A proposed image operation method of measuring the stitch density (course per inch and wale per inch) of a knitted fabric has been developed in this research. The stitch density of a knitted fabric measured by proposed image method which captured by a smart phone technique. The measured stitch density to be examined by the said algorithm. The method was tested using 5 knitted fabric samples with different densities. In order to validate the proposed method, The results were compared with the stitch density directly measured by conventional (The ASTM standards methods) methods. It has been found that the results between conventional and proposed image method are significant (with 0.95 & 0.99 significance value) with 97.30 %.*

Keywords: Smart phone, Image processing , Course per inch, Wale per inch , Stitch density

REFERENCES

[1]. Wang Shengxian & Yuan Yea, "Estimation of the Fabric Yarn Density Based On Hiblert Marginal Spectrum", Beijing Institute of Fashion Technology, Beijing 100029, China, published by Elsevier Ltd. 2011.

[2]. Lenka Hájková & Maroš Tunák, "Extraction of quality parameters of technical fabrics using image processing", Technical University of Liberec, International Journal of Advanced Computational Engineering and Networking, ISSN: 2320-2106, Volume-5, Issue-7, Jul.-2017.

[3]. Zhongjian Li, Jun Xiang, Lei Wang et.al, "Yarn-Dyed Fabric Image Retrieval Using Colour Moments and the Perceptual Hash Algorithm", Jiangnan University, Wuxi, Jiangsu, China, 214122, DOI: 10.5604/01.3001.0013.2900.

[4]. Mina Emadi, Mohammad Ali Tavanaie & Pedram Payvandy, "Measurement of the uniformity of thermally bonded points in polypropylene Spunbonded non-wovens using image processing and its relationship with their tensile properties", Yazd University, Yazd, Iran, AUTEX Research Journal, Vol. 18, No 4, December 2018.

[5]. H. İbrahim Çelik, Elif Gültekinm & Serkan Nohut," Development of an Algorithm to Determine the Liquid Spreading Area of Air-laid Nonwoven Fabrics by Image Processing Method", Turkey, VOL: 30, NO. 2 DOI: 10.32710/tekstilvekonfeksiyon.585336.

[6]. B K Behera, Ajit Kumar Pattanayak & Rajesh Mishra," Prediction of Fabric Drape Behaviour using Finite Element Method", Indian Institute of Technology, New Delhi-110016, India, The Textile Machinery Society of Japan, accepted for publication 19 May 2008.

[7]. Ebraheem Shady, Khadijah Qashqary, Mounir Hassan & Jiri Militky," Image Processing Based Method Evaluating Fabric Structure Characteristics", Fibres and Textiles in Eastern Europe, January 2012.

[8]. Erdoğan ALDEMİR, Hakan ÖZDEMİR & Selçuk KILINÇ," Kumaş Sikliklarinin Görüntü İşleme Teknikleri İle Otomatik Olarak Belirlenmesi", İzmir, Türkiye, Journal of Textiles and Engineer, Accepted 30 Nov 2016.

[9]. Ruru Pan, Weidong Gao, Jihong Liu & Hongbo Wang," Automatic Inspection of Woven Fabric
Density of Solid Colour Fabric Density by the Hough Transform", Wuxi, Jiangsu, China, Fibres & Textiles In Eastern Europe 2010, Vol. 18, No. 4 (81).

[10]. Andrian Wijayono & Valentinus Galih Vidia Putra," Stitch Per Inch Measurement Using Image Processing Techniques", Bandung, Indonesia, accepted 17 December 2018.

[11]. Aqsa Rasheed, Bushra Zafar et.al," Fabric Defect Detection Using Computer Vision Techniques: A Comprehensive Review", Mirpur-10250, AJK, Pakistan, Hindawi, Mathematical Problems in Engineering Volume 2020, Article ID 8189403, 24 pages.

[12]. M Senthil Kumar, L Ashok Kumar et.al," Design and development of an instrument for non- destructive fabric weight measurement", Indian Journal of Fibre & Textile Research Vol. 40, September 2015, pp. 329-333.

[13]. Pallavi A. Patil & Kumbhar," Fabric Defect Detection Using Image Processing Technique", Rajarambapu, Institute of Technology (India), international journal of advanced research in science and engineering, Vol. no. 6, issue no. 4 April 2017.

[14]. Kazım Yildiz, Volkan Yusuf Şenyürek, Zehra Yildiz & Mustafa Sabri Özen," A New Approach to the Determination of Warp-Weft Densities in Textile Fabrics by Using an Image Processing Technique", Kadıköy, İstanbul, Turkey, Journal of Engineered Fibers and Fabrics, Volume 9, Issue 1 – 2014.

[15]. Jie Zhang, Binjie Xin2 & Xiangji Wu3," A Review of Fabric Identification Based on Image Analysis Technology", Shanghai, 201600, China, Textiles and Light Industrial Science and Technology (TLIST) Volume 2 Issue 3, July 2013.

[16]. E Ghassemieh, M Acar and H Versteeg," Microstructural analysis of non-woven fabrics using scanning electron microscopy and image processing. Part 1: development and veri cation of the methods", Mechanical and Manufacturing Engineering, Loughborough University, Loughborough, UK, Proc Instn Mech Engrs Vol 216 Part L: J Materials: Design and Applications.

[17]. Ruru Pan & Jie Zhang et.al," Applying Image Analysis for Automatic Density Measurement of High-tightness Woven Fabrics", Wuxi, Jiangsu, China, Fibres & Textiles In Eastern Europe 2016, Vol. 24, 2(116).

[18]. Jie Zhang, Ruru Pan and Weidong Gao," Automatic inspection of density in yarn-dyed fabrics by utilizing fabric light transmittance and Fourier analysis", Wuxi 214122, China, 1 February 2015 Vol. 54, No. 4 Applied Optics.

[19]. Jie Zhanga, Ruru Pana, Weidong Gaoa & Dandan Zhua," Automatic inspection of yarn-dyed fabric density by mathematical statistics of sub-images", Jiangnan University, Wuxi, China, The Journal of The Textile Institute, 2015 Vol. 106, No. 8, 823–834.

[20]. Hossein Hasania & Sanaz Behtaz," Measuring the roughness of knitted fabrics by analysis of surface signals obtained from image processing", Isfahan University of Technology, Isfahan, 84166-83111, Iran, Indian Journal of Fibre & Textile Research, Vol. 38, March 2013, pp. 101-105.

[21]. Singh JP, Anuhbav G, Aprajita A, Himanshi S and Vandana J," Digital Image Processing Techniques: A Versatile System for Textile Characterization", Department of Textile Technology, U.P. Textile Technology Institute, Kanpur, India, J Textile Sci Eng, ISSN: 2165-8064 JTESE, Volume 4 Issue 3 1000156.

[22]. B K Behera & Rajesh Mishra," Measurement of fabric wrinkle using digital image processing", Department of Textile Technology, Indian Institute of Technology, New Delhi 110 016, India, Indian Journal of Fibre & Textile Research Vol. 33, March 2008, pp. 30-36.

[23]. S. L. Bangare, N. B. Dhawas2 et.al," Fabric Fault Detection using Image Processing Method", India, IJARCCE, Vol. 6, Issue 4, April 2017.

[24]. Ravina D. Karnik & L.S. Admuthe," Density Evaluation and Weave Pattern Classification of Fabric Using Image Processing", Department of electronics, DKTE's textile and engineering institute, Ichalkaranji, India, International Journal of Engineering Research and Technology. ISSN 0974-3154 Volume 10, Number 1 (2017).

[25]. B K Behera & Ajit Kumar Pattanayak," Measurement and modeling of drape using digital image processing", Department of Textile Technology, Indian Institute of Technology, New Delhi 110 016, India, Indian Journal of Fibre & Textile Research, Vol. 33, September 2008, pp. 230-238.

[26]. Jarrett Radbourne," A Versatile System for Textile Characterization", NC State University, Raleigh, SSRG International Journal of Polymer and Textile Engineering (SSRG – IJPTE) – Volume 3 Issue 1 Jan to April 2016.

[27]. Ryan Rudy & Andrian Wijayono2 et.al, "Knitted Fabric Density Measurement Using Image Processing Techniques", Politeknik STTT Bandung, Proceeding Indonesian Textile Conference, ISSN : 2356-5047, 3rd Edition Volume 1 2019.

[28]. Dejun Li, Han Fang, Liwen Zheng, Changjun Ji & Haoran Yuan, Wuhan Textile University electronics and electrical engineering, hubei wuhan 430200, China, IOP Conf. Series: Earth and Environmental Science 252 (2019) 022077.

[29]. Mohamed Abdelkader, "MATLAB Algorithms for Diameter Measurements of Textile Yarns and Fibers through Image Processing Techniques" Technical University of Liberec, 46117 Liberec, Czech Republic, Materials 2022, 15, 1299, Accepted: 8 February 2022.

[30]. Anna Fabijánska & Lidia Jackowska-Strumiłło, "Image processing and analysis algorithms for yarn hairiness Determination", Technical University of Lodz (TUL), 18/22 Stefanowskiego Str, 90-924 Lodz, Poland, Machine Vision and Applications (2012) 23:527–540, Accepted: 19 January 2012.

[31]. Y Wu, J Wang, Z Zhan and L Q Li, "Investigation the effect of weave repeat on woven fabric texture characterization using sparse representation", Shanghai, 201620, China, IOP Conf. Series: Materials Science and Engineering 254 (2017) 162012.

[32]. Kumar Ghosh, "An Investigation of Bursting Strength on Single Jersey Weft Knitted Fabrics", Textile Department, Rupa and Company Limited, India, IOSR Journal of Polymer and Textile Engineering (IOSR-JPTE) e-ISSN: 2348-019X, p-ISSN: 2348-0181, Volume 9, Issue 5 (Sep. – Oct. 2022), PP 09-20 Accepted 14 Oct 2022.