Weave as a tool for electrotextile design

Inese Parkova
Riga Technical University, Institute of Textile Technologies and Design

Keywords **– conductive yarns, weave, contact area, insulation**

INTRODUCTION

Replacing traditional electronic materials with conductive textile materials it is possible to create electrotextile structures using different fabric designing methods, for example – weaving [1]. The development of smart textiles with embedded conductive yarns requires a understanding of the structural behavior and geometry of textiles. For the proper integration the processing parameters and final shape conditions of the textile structures need to be carefully identified [2]. Using weave as a tool for electrotextile design, it is possible to create and develop new approaches of interconnecting and integrating electronic components into textile structure.

In this research weaving method was used and explored to find out and describe different conductive yarn and electronic elements integration ways and construction in textile.

MATERIALS AND METHODS

For electrotextile design digital looms was used with warp density 38 ends / cm. In warp and weft systems cotton yarns were used, in some part in textile for electrical connections copper yarns (330/34x7 dtex/f) were interwoven. Light emitting diodes (LEDs) were attached to electrotextile after it was woven.

CONTACT AREA OF CONDUCTIVE YARN IN WEAVE

The number of weave structures that can be produced is practically unlimited, but all of them are developed from basic structures: plain, twill and satin weave [3].

Using respective fabric weave definite functional properties of electrotextile can be designed. For example – to hide conductive yarn in textile structure using dense plain weave or to lift it on textile upper layer using satin weave if it is necessary to make lager contact area of conductive surface in textile.

DESIGN OF ELECTROTEXTILES

During weaving different constructions and placements of conductive yarn into textile were performed using parallel port electrical circuit construction. Conductive yarns were integrated into weft yarn system. Plain, satin and twill weaves were used in woven samples to obtain certain properties for specific purpose of electrotextile. Interwoven yarn in plain (a) and satin (b) weave is shown in Fig.1.

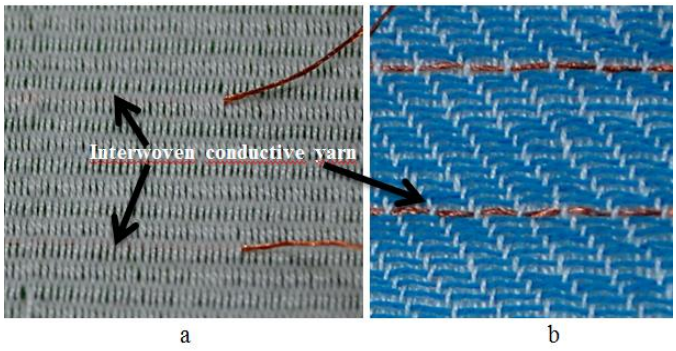

Figure 1. Interwoven yarn in plain (a) and satin (b) weave

Using these structural properties, different constructions of textile electrical circuits were designed. To demonstrate the application of textile scheme, light-emitting diodes were attached to woven samples, but given electro-active textile traces can also be used for other systems in smart clothing or other with smart textile related fields.

ACKNOWLEDGEMENT

Author would like to thank scientific adviser prof. Ausma Viļumsone.

This work has been supported by the European Social Fund within the projects "Support for the implementation of doctoral studies at Riga Technical University".

Electrotextiles were designed in Smart Textiles Design Lab at The Swedish School of Textiles (Borås, Sweden).

REFERENCES

[1] Jeong, K.S., Yoo, S.K. (2010). Electro-Textile Interfaces: Textile-Based Sensors and Actuators. Smart Clothing Technology and Applications, 98-113

[2] Integration of fibre optic sensors and sensing networks into textile structures in Wearable electronics and photonics (Ed. Xiaoming, T.). Woodhead Publishing Limited, Cambridge, England, 2000, pp. 105 – 135

[3] Handbook of technical textiles. Ed. A.R. Horrocks, S.C. Anand