SHORT TERM SCIENTIFIC MISSION (STSM)
SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: ECOST-STSM-Request-CA17107-44743
STSM title: Scientific Mission from Hogent (Ghent) to Niederrhein (Mönchengladbach) to streamline Smartseam, a joint research proposal.
STSM start and end date: 29/09/2019 to 05/10/2019
Grantee name: Dr. ir. Sheilla Odhiambo

PURPOSE OF THE STSM: (max.200 words)

The purpose of this STSM was to visit the Faculty of Textile and Clothing Technology (Hochschule Niederrhein) with intention of cementing our project proposal SmartSeam. Particularly I gained knowledge in the working techniques of a double needle lock stitch machine, type HM 835 by Habraken based on an M-type sewing machine. This is a heavy duty machine that handles sewing of tough, thick fabrics like laminated leather. However, we intend to use it the conventional fabrics with application in sports and other functional clothing. The machine has two free heads that can lay additional covering threads (of variable sizes) into the double lock stitch simultaneously as the sewing continues, hence an appropriate solution for us to use it in integrating our hybrid conductive yarns into the seam with the least friction possible. I also got to see and interact with other smart textile products and wearables developed in different research frameworks by Hochschule Niederrhein.
We initiated a convenient working arrangement of how to go about our Smartseam project when the funds are granted. SmartSeam is a noble idea to produce sensing or actuating smart textile products by integrating hybrid conductive/functional yarns into the garment seams. This will speed up innovation and development of new smart textile products in a simple and fast way. Altimately the visit strengthen the existing collaboration and networking between the two institutions.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM (max.500 words)

One of the challenges of making smart textiles that can sense or actuate reliably, is the integration of the sensors or the actuators into the textile/clothing. Therefore it is important to have a solution of integration without affecting the functionality of the yarns/ devices. We realise that by using double needle lock stitch machine, type HM 835 by Habraken based on a M-type sewing machine we could easily intergrate our own to be developed hybrid conductive yarns into the seams, using different combination of yarns and designs there by forming a sensor or an actuating device in one step. Therefore in this case we would achieve two functions in one step. This is is a desirable aspects to the manufacturers.

In a nut shell the work carried out while in Hochschule Niederrhein were:
A general introduction to all the available R&D facilities within the institution covering the whole textile manufacturing chain, i.e, spinning (ring spinning, dref and rotor spinning), weaving (rapier, airjet, jaquard) knitting, braiding, finishing, and garment section (3 different labs) and R&D laboratories. All the sections have different types of machines with different capabilitie.
They have other additional facilities like Physics, Chemistry and innovation labs.

I was scheduled to attend lectures on Clothing Production Machinery, to have a sufficient background required for working with the HM 835 by Habraken based on a M-type sewing machine.I was given also a small practical training in developing a given part of the garment. We developed a pocket flap for the suit. Later on I was shown on the working principle of button hole machines.
After the orientation, we had a discussion with Prof Ann Schwarz, with a better view of our ideas towards SmartSeam project.
I had carried a few samples with me of sport fabrics from our department with the intention to try them on the type HM 835 by Habraken based on a M-type sewing machine. The pieces of fabrics I carried are made of different types of yarns of different fineness and stretch the fabric structures are also different. The aim was to try them and see if we can use this specific machine to sew all of them. I also carried some conductive yarns made from stainless steel and polyester filament yarns twisted together. Therefore in another day we spent in the lab developing seams on different types of sport fabrics (our main target material in SmartSeam) see Figure 1. It is indeed very good that we did this preliminary experiment, since we found out that some fabrics were difficult to sew, hence we needed a number of modifications in terms of settings and also playing around with their thicknesses. After knowing the required parameter to make proper representative seams we eventually tried to produce some seams with HM 835 by Habraken based on a M-type sewing machine. Again here we also had to play with the settings based on the fabric type we input into the machine.

Figure 1. Studying the HM 835 sewing machine

The base threads that forms the double lock stitch were also varied depending on the stretchbility of the base fabric.We also tried a few things with the embroidery machine available in Hochshule Niederrhein making use of the tailored fibre placement head. This techniology would come in handy in producing high visibility vests.
We carried a few physical test measurements on our experimental seams of which we were happy with the results. We eventually brainstormed on how we will incorporate other components of the smart textile system(i.e Batteries and connectors into our final product (SmartSeam)). Luckily they had a few samples of compact battery cases that could go well with the SmartSeams. However, we agreed to look out on advanced wearable technologies to see if we can get even smaller (miniaturised batteries with textile casings preferably that would easilty fit with our sensors/actuators.
Finally(with the pre-information gathered during my visit) we discussed the roadmap for Smartseam proposal and further research projects within textiles and higher education field.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

- The general Introduction gave me a wider perspective of what we can do better as a team within the textile field, in addition to the SmartSeam Project.
- The training on Clothing Production Machinery and actual production of a suit component enhanced my knowledge in garment making technology.
- Trying various pieces of fabrics of different parameters on the type HM 835 by Habraken based on an M-type sewing machine gave as an idea of the challenges we would face while developing our SmartSeams. Therefore from this pre-process, we could already identify a few settings and parameters that we should watch out while dealing with some types of fabrics.

- Brain storming sessions, created a more clearer path towards achieving our project idea in the event that funds are granted to the project.
- Carrying out a few physical test measurements on the trial SmartSeams re-assured as of our excellent proposal. Therefore we look forward to execute the project.
- I had a chance to learn firsthand the working principle of double needle lock stitch machine, type HM 835 by Habraken, prior to the project and explore together with Niederrhein partners the possibilities we have of developing sensor and actuator seams within our proposed project framework. This has also informed the type of hybrid functional yarns that we would develop in HoGent.
- We also discussed possibilities of other project proposals based on the upcoming project calls especially in capacity building.

FUTURE COLLABORATIONS (if applicable)

We submitted the project proposal SmartSeam, together with Hochschule Niederrhein, FKT and other companies in the user committees. If the project is granted, we will definitely work together in the execution of the project accordingly. The project will further foster the transfer of knowledge between University College Ghent (HOGENT) and Hochschule Niederrhein University of Applied Sciences and eventually the targeted SMES in the project. Working together and knowing each other better in the team will bring fouth other ideas and project proposal hence future collaborations.