Smart Textile Classifications: The Smart, Smarter, and Smartest Textiles

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Introduction

Technology is getting more advanced every single day, over the past two decades the technological advancements have been very significant. Innovative technology is happening in every industry and the textile industry is no different. Regular textiles have become smart textiles, and there are currently three different variations of smart textiles: Passive Smart, Active Smart, and Very Smart. Passive Smart textiles are textiles that are aware of its environment and give off a consistent effect (no matter the environmental state and no switch activation is needed) such as thermal. Active Smart textiles are textiles that react if something in the environment triggers it (like a switch); for example, if someone wearing the Active smart textile pushes a button on the textile, that might trigger the textile to change color. Very Smart textiles are textiles that have a processor embedded that acts as a computer which can cause numerous actions when triggered by various factors; for example, a Very Smart textile can react by changing colors diversely depending on its trigger factor (Kettley, 2016, pp. 13-15). Examples of these smart textiles, in my opinion, are Bespoke Knits (Passive Smart), Active User-Controlled Color-Changing Fabric (Active Smart), and Jacquard (Very Smart).

Passive Smart

Ministry of Supply was created because the founders Arman Advani and Gihan Amarasiriwardena wanted to solve a problem they had with the clothes they were wearing. Advani and Amarasiriwardena got the company name inspiration from an inventor in a James Bond movie; Charles Fraser-Smith, AKA "Q" was an inventor that operated under a cover agency called "Ministry of Supply" during WWII that invented gadgets and garments to aid British soldiers their mission. They decided to operate the company undercover agency's name

and become the real-life "Q". The company uses scientific research and incorporates that research into clothing, making them technologically better (Ministry of Supply, n.d.).

Bespoke Knits are made by Ministry of Supply and the textile technology was developed by Self-Assembly Lab at MIT. The Bespoke Knits was actually created by mistake as Self-Assembly Lab's goal was to create a textile that would be able to reverse its transformation. The textile does have a battery or circuit board embedded, when exposed to heat, the knits will shrink and constrict, see Figure 1. Designs can also be made using a heat gun to make some parts of the knits shrink and other parts neutral (Schwab, 2018). I classify Bespoke Knits as a Passive Smart textile because of its awareness of heat in the environment and its respondence in one consistent way, which is shrinking/constricting. It also does not have any switch embedded to turn the shrinking effect on or off.

Figure 1

Bespoke Knits Before and After Heat Exposure

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https://images.fastcompany.net/image/upload/w_596,c_limit,q_auto:best,f_auto/wp-cms/uploads/2018/12/12-mit-and-ministry-of-supply.jpg

Active Smart

The Active User-Controlled Color-Changing Fabric is made by The College of Optics and Photonics (CREOL) at The University of Central Florida (UCF). The fabric was produced

by a team of UCF scientist and it has the ability to change color through the controls of a smartphone. Unlike other textiles that use LED lights to radiate color, CREOL's use very fine metal micro-wires attached to every single thread used to make the fabric. When activated by the smartphone to change color, an electrical current runs through the metal micro-wires and raises the temperature of the wire for it to change color; the colors can appear either solid or patterned, see Figure 2. This technology is dubbed "ChroMorphus" (Wearable Technology Insights, 2018). I classify Active User-Controlled Color-Changing Fabric as an Active Smart textile because the textile depends on a smartphone as a controlling switch to trigger the color/pattern either on or off.

Figure 2

CREOL's Active User-Controlled Color-Changing Fabric Handbag

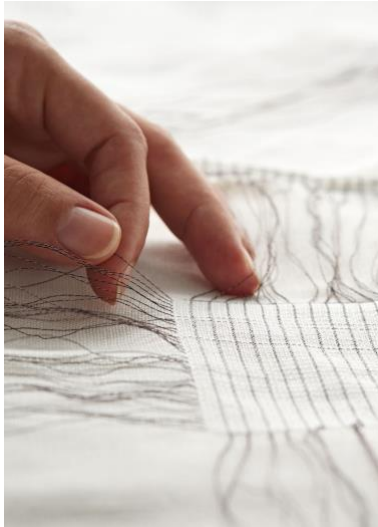Retrieved from https://www.screenprintindia.com/wp-content/uploads/2018/07/UCF-1-1300x691.jpg
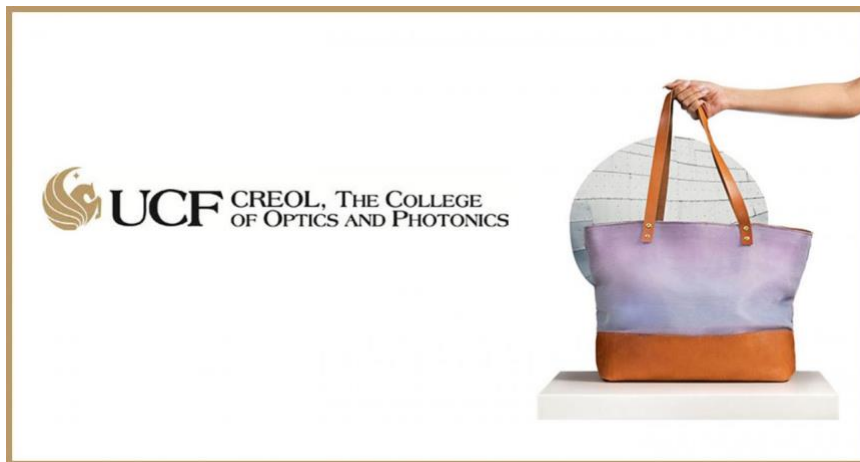
Very Smart

Project Jacquard is by Google, and the goal of the project is to make life easier by weaving technology into everyday things that people use; examples are jackets, backpacks, and shoes. Jacquard threads are weaved together to make fabrics that will be interactive and smart. These threads are not the everyday typical threads, these are special threads that are conductive metal alloys that will respond to gestures. When a garment or accessory is made from Jacquard

threads, there is a mini Jacquard tag that is like a powerful computer embedded in the fabric. The

Jacquard tag will connect the Jacquard app to the conductive threads (see Figure 3), and it will be

responsive to numerous actions, (Jacquard, n.d.). I classify Jacquard as a Very Smart textile

because of its attributes of having an embedded mini powerful computer that is used with the

Jacquard app to connect to the jacquard threads for a diverse number of actions depending on the

triggering factor.

Figure 3

Jacquard Threads with Conductive Metal Alloys

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Conclusion

Every single industry is getting more advanced and innovative as time moves along. The

textile industry is advancing in numerous ways, but one of the significant ways are making

textiles smart. I discussed three entities that created smart textiles (Ministry of Supply, CREOL,

Google) and classified each of them to either Passive Smart, Active Smart, or Very Smart. Each

of them are smart in their own way and serves different functions. Hopefully, we can continue to

see more innovative technological advancements in the distant future.

References

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Figure 1. Bespoke Knits Before and After Heat Exposure. Reprinted from 'Self-Assembly

    Lab/Ministry of Supply'. (2018). Retrieved from

    https://images.fastcompany.net/image/upload/w_596,c_limit,q_auto:best,f_auto/wp-

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Figure 2. CREOL's Active User-Controlled Color-Changing Fabrics. Reprinted from 'Screen

    Print India'. (2018). Retrieved from https://www.screenprintindia.com/wp-

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Figure 3. Jacquard Threads with Conductive Metal Alloys. Reprinted from 'Jacquard'. (n.d.).

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