

THE FUTURE BELONGS TO THE KNITWEAR

Valentina FRUNZE

Technical University of Moldova

Summary. *Your choice of garment is an honest reflection of your feelings in that particular moment. We have an emotional connection with some pieces because they are the representation of our soul. Knowing that you will be acquiring something that represents your feelings is an invaluable way of assuring its place in your life. When you think about knitting, you might picture grandmas clicking big wooden needles. However, knitting is everywhere, producing almost everything we put in contact to our skin each day, from socks and t-shirts to hoodies and beanies. Moreover, thousands of years before it was first invented, new kinds of knitting are invented and used to create new garments. Knitting is the process of using two or more needles to loop yarn into a series of interconnected loops in order to create a finished garment or some other type of fabric. The word is derived from knot, thought to originate from the Dutch verb knutten, which is similar to the Old English cnyttan, “to knot”. Its origins lie in the basic human need for clothing for protection against the elements. More recently, hand knitting has become less a necessary skill and more a hobby.*

Key words: *knitwear, technology, weaving machines, seamlessness, knitting technique, 3D scanning.*

Introduction

Most of us probably would not think of a plain, t-shirt as a piece of technology, but this is the result of thousands of years of engineering, which is shaped by repeated waves of technologies. One of the oldest surviving items of clothing is a pair of Egyptian socks, with an early form of knitting that used one needle[2].

Across the globe, there is a rise in demand for knitwear products. Globally, there has been an increase in sales of knitwear products, which are part of the fashion industry.

The global fashion industry is expected to increase from 408 Billion US\$ in 2017 to over 706 Billion US\$ in 2022, rising at a rate of 11.6%. In terms of product type, knitwear are classified into innerwear, t-shirts and shirts, sweaters and jackets, sweatshirts and hoodies, shorts and trousers, evening dresses, suits and leggings, and accessories. Based on material type, it is classified into natural, synthetic, and blended. Based on consumer group, it is segmented into men, women, and kids. [3]



Fig 1. A pair of Egyptian socks [2]

Study case

During the industrial revolution, knitting and weaving machines became automated. The first automated loom, introduced in the early 1800s, was the forefather to the modern computer, utilizing early binary code. When Silicon Valley was still farmland, innovations in the textile industry were shaping the globe, sparking revolutions across the world. [2]

In the near future, however, this largely invisible tech might soon be seen at the frontier of technology again as designers dream of new possibilities with electronically enabled textiles.[2]

The 21-st century has seen a resurgence of knitting. This resurgence can be noted in part to coincide with the growth of the internet and internet-based technologies, as well as the general "Handmade Revolution" and interest in DIY crafts [1].

Natural fibers from animals, such as alpaca, angora and merino and plant fibers, chiefly cotton, have become easier and less costly to collect and process and therefore more widely available. Exotic fibers, such as silk, bamboo, yak and qiviut are growing in popularity as well. The yarn industry has started to make novelty yarns, which produce stunning results without years of knitting experience. Designers have begun to create patterns which work up quickly on large needles, a phenomenon known as instant-gratification knitting.[1]

As time and technology change, so does the art of knitting. The internet allows knitters to connect, share interests and learn from each other, whether across the street or across the globe. Among the first internet, knitting phenomena was the popular Knit List, with thousands of members. In 1998, the first online knitting magazine, Knit Net, began publishing. (It suspended publication with its 54th edition in 2009.) Blogging later added fuel to the development of an international knitting community.[1]

On 14 January 2006, author and knit-blogger Stephanie Pearl-McPhee, otherwise known as Yarn Harlot, challenged the knitting world to participate in the 2006 Knitting Olympics. To participate, a knitter committed to casting-on a challenging project during the opening ceremonies of the 2006 Winter Olympics in Torino, and to have that project finished by the time the Olympic flame was extinguished sixteen days later. By the first day of the Olympics, almost 4,000 knitters had risen to the challenge.[1]

As another sign of the knitting's popularity in the early 21st century, a large international online community and social networking site for knitters and crocheters, Ravelry, was founded by Casey and Jessica Forbes in May 2007. At first available by invitation only, the site connects knitting and crochet enthusiasts around the world and, as of May 2016 had over 6.21 million registered users.[1]

According to Despina Papadopoulos, the founder of Principled Design, knitting also has special attributes that are particularly suited towards advanced applications. Principled Design recently collaborated with Ralph Lauren for the battery-powered, self-heating 2018 US Winter Olympic Team Jackets, and Papadopoulos described modern knit technology as an expansion of control over form, especially with the integration of conductive yarns. she also said that we have more control in terms of dimensionality than we have with woven fabric and that dimensionality gives us the ability to manipulate the structure of the fabric as well as to create pockets, to create layered structures that make incorporating electronics seamless, hidden, in a way that you cannot with other technologies.[2]

Thanks to the evolution of technology, the knitiing process had to evolve and for this, the re-evaluating of the most basic component of knitting like the needle, which had been used for more then 150 years, had to be done.

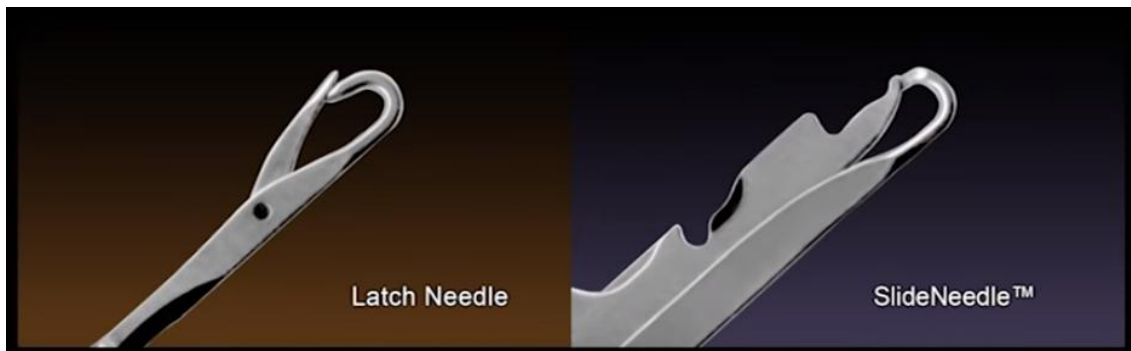


Fig 2. Re-evaluated needle [2]

For this the companies had examined it`s strengths and weaknesses, and reinvented it. They optimized the knitting machine by doubling the number of needle beds from 2 to 4 and improved the design system for easier-o-use programming software and 3D simulation capability.



Fig 3. 3D simulation

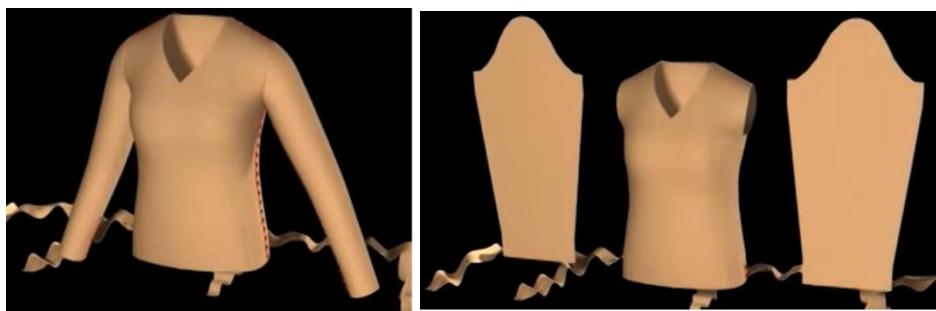


Fig 4. 3D knitting

Advanced knitting offers something past seamlessness approaching invisibility. Not only does it enable clothing makers to hide hard electronics, it even lets them create electrical components from the actual yarn—sensors that are an integral part of the garment and not tucked in or laminated on top.

For example, a knit machine programmer can create a small “patch” of conductive yarn, stack a non-conductive above it, and then another conductive patch on top of that to make a sandwich. As the two conductive sections get closer together, they make more and more contact through the non-conductive but porous sandwich “filling.” This increased conductivity can be measured by a microchip to create a pressure sensor which, when built into a sock, could measure stride and footfall for runners or balance indicators in elderly patients who are prone to falling.[2]

This knitting technique can also be used to create stretch, temperature, and humidity sensors and even begin analyzing sweatiness which can convey the stress level of the user—applications currently in development for consumer products. Ultimately, 3D knit structures can become a plethora of sensors and actuators, antennae, and even allow for computer interaction through soft, knit protrusions that serve as buttons, or planar pads for gesture sensing.[2]

One of the greatest challenges in the development of smart textiles has been making garments that are machine washable over time. The way most companies have tackled this problem is to include a removable “puck” (as it’s called in the industry), which contains the device’s battery and computer control. Lights, vibration motors, sensors, and the like remain in the garment and are either encased in plastic or laminate tapes for waterproofing, or are comprised of the conductive fibers themselves which are largely impervious to the washing processes.[2]

Companies like Sensoria are already selling clothing with smart sensors laminated onto their products, but, crucially, knit production technology may soon enable all of this straight from the machine, without the secondary process of lamination, resulting in a cheaper, more streamlined product that’s nearly indistinguishable from the knitwear we are familiar with today.

Yoel Fink, a professor of material sciences at MIT and the founder and CEO of Advanced Functional Fabrics of America (AFFOA), and his researchers were working on a battery-scarf knit from yarn containing lithium-ion components so that the textile itself stores energy, a fabric that changes colors with minimal power needs and a baseball-cap that translates light from common ceiling mounted LED bulbs into audio. They also work on some normal all-black yoga pants that come alive with miniature, green LED lights.[2]



Fig 5. All-black yoga pants with green LED lights [2]

The leggings are being developed through one of the techniques being pioneered at AFFOA for the fabrication of what is called “advanced yarns,” fibers containing conductors, insulators, and semi-conductors—the same necessary ingredients for a computer chip. To make the “yarn,” a cylinder of these three ingredients about 12 inches tall and six inches wide is heated and drawn out until it becomes incredibly thin.[2] In this case, a hair-like black yarn which is then knit into yoga pants. To make these leggings without such yarns, you’d need to manually laminate silicon-mounted LEDs onto the surface of the pants one at a time, creating something uncomfortable, delicate, and very expensive. AFFOA’s version, on the other hand, is nearly indistinguishable from standard, athleisure-style leggings—except they can light up for a night-time jog.[2]

Knitting has this exquisite control that you get along with the garment capability. There are many more degrees of freedom in knitting in terms of being able to build structures. Basically, we can have incredibly control over how a garment is shaped and where sensors and are placed on the body. This also means that garments can be extremely customizable at a low cost. Already today, designers have used 3D scanning to create clothing specifically tailored to its wearers. In the near future, customers could be inputting biological specifics to tailor their chosen suite of sensors and actuators to integrate seamlessly with their unique biology.[2]

The professionals agree that the costs will be coming down on technologically enhanced cloth, and this will fundamentally change the way in which we interact with technology—and hence, each other and our environments. Textile and humanity are inseparable, so it could become a perfect computing platform, and that’s part of the disruption we are trying to make.

In the end, the smart apparel of the future could fundamentally change how we think about clothing, shifting it from a good to service.

Conclusion

After 20 years of innovation, the revolution has finally caught on. Knitwear is no longer limited to the typical sweater. Knitting will always be a challenging project to look forward to. It is like a whole new world has opened, a world full of possibilities because there is endless thing to learn from and patterns to follow. More and more people are and will choose knitting because it is comfortable, fun and productive.

In fact, I can conclude that the story of knit and knitwear is far from over.

Bibliography

1. https://en.wikipedia.org/wiki/History_of_knitting [accesat 12.03.2019];
2. <https://gizmodo.com/the-future-is-knit-why-the-ancient-art-of-knitting> [accesat 08.03.2019]
3. <http://korlekie.com/2018/03/05/fabric-of-time-weaving-through-the-history-of-knitwear/> [accesat8.03.2019]
4. <http://arsutoriamagazine.com/knit-shoe-sport-shima-seiki-stoll-santoni/> [accesat 08.03.2019].