Mathematician meets Fashion designer:
The future of fashion will be multidisciplinary innovation!

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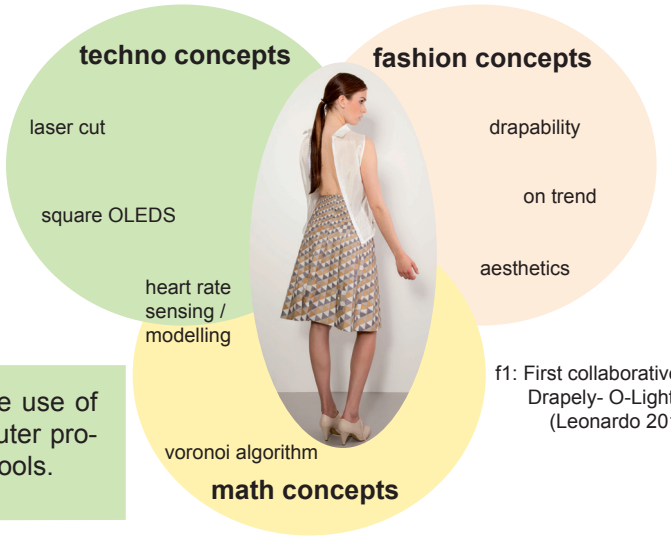
Abstract. The fashion system recycles the same ideas over and over again, with a very low rate of innovation. We found each other at the cutting edge of fashion innovation and claim that much, much more innovation is possible. We found it is time to analyse our collaborative work and put it in the global context of fashion innovation. The projects are summarised in the paper.
In each project we contribute new concepts from fashion, from technology and from mathematics.



f1: First collaborative project: Drapely- O-Lightment (Leonardo 2015)

new pattern aesthetics by the use of mathematical principles, computer processing and digital fabrication tools.

f2: Fractal PDP (Bridges 2013)

f3: Fractal Warp Knit (Bridges 2014)

f4: Fractal Line PDP (Bridges 2015)

Mathematics and fashion. It is essential that we come from complementary disciplines: math, fashion. Ligenza / De Comité is a similar combi. An example of a cooperation leading to beautiful results, we mention the work of hat designer Gabriela Ligenza (Ligenza 2015) who cooperates with mathematician De Comité (De Compité 2014). The 3D printed hats, based on the mathematical shape called cardioid, are futuristic and express simplicity and complexity at the same time.

For mathematicians these are exciting times. As Francesco De Comité (De Comité, 2014) writes “innovative programmable machines (laser cutters, 3D printers) allow the dreams of mathematicians to become real: imagine objects, build their representation, manipulate them.”
Regarding the question of beauty, Francesco De Comité (De Comité, 2014) writes: “It is often difficult to define what beauty or aesthetics is. In the light of this example (the cardioidal variations), an answer might be that the underlying simplicity of the definition, together with the complexity of the generated universe of shapes, could be an important part of what makes artistic appeal. Occam’s razor principle and Kolmogorov complexity might be called to the rescue.” This is also what we tried in the Pied-de-poule projects.

Promising shape-changing interfaces. (pictures in page 2) The topic of shape-changing interfaces is promising (Coelho, Zigelbaum, 2011), but there is a gap between what current technology can offer and what it takes to make it practical, comfortable and affordable. The topic is addressed in a European project GHOST (Kwak et al. 2014) and also in an area called “soft robotics”, see for example http://softroboticstoolkit.com/. In dynamic fashion, our hero is Hussein Chalayan.
He recently gave new form to the notion of transformation (again) in his SS16 Paris Fashion Week Pasatiempo collection with garments dissolving in water and then revealing a layer of 3D printed garments underneath. Chalayan often collaborates with Moritz Waldemeyer, who pushes the limits of technology.

At the same time we have common ground too which is technology (TU/e setting, by-wire.net company, networked organisations). See the work of Tomico, Wensveen, Nachtigall, Van Dongen et al. The cooperation itself is rewarding in itself because of the inspiration and the opining-up of possibilities. The results are distributed via teaching, small design or fashion venues for example (Coleman 2012, Ritsumei 2013, De Kantfabriek 2014, By-wire.net 2015), math/art conferences (Feijs and Toeters 2013, Feijs, Toeters, Hu and Liu 2014, Feijs and Toeters 2014, Feijs and Toeters Bridges 2015, Feijs and Toeters Leonardo 2015) and an art/techno journal (Feijs and Toeters Leonardo 2015).

Education The results did not reach "the fashion" system (yet), which is no surprise in view of the nature of the fashion system. We think that the teaching of new possibilities to design students is a good investment for a better creative system later. This examples also the work of Leonie Tenthof van Noorden (Tenthof van Noorden 2013).

Different time-to-market perspectives Different results have the potential of being practical, but on different timelines; the pied de poules (f1-4) are feasible now. During the symposium we can show you the examples in an exhibition setting. The dynamic projects (f5-13) might enter the market perhaps in ten years, but during the symposium but we can show some promising concepts on video.

shape changing garments and the use of and feedback loops.

f5: Toer de force (GFC 2014)

f7-12: 4 results out of the student module Actuating movement in wearables @TU/e (GFC 2014)

f6: Actuating a outfit: workshop @ ABWxD, USA

f13: Dynamic Knits (in development) exhibition setting during DDW15 in collaboration with JSSSJS Product Design

Loe Feijs has an M.Sc. in electrical engineering and a Ph.D. in computer science. In the 1980s he worked on video compression and telephony systems. He joined Philips Research to develop formal methods for software development. In 1994 he became part-time professor of Mathematics and Computer Science, in 1998 scientific director of the Eindhoven Embedded Systems Institute, and in 2000 vice dean of the new department of Industrial Design at TU/e, Eindhoven. At present he is professor for Industrial Design of Embedded Systems. Feijs is the author of three books on formal methods and of over 100 scientific papers.

Marina Toeters is educated as a fashion designer and holds a Master of Arts. She operates on the cutting edge of technology and fashion design. Through her business by-wire.net she stimulates collaboration between the fashion industry and technicians for a relevant fashion system and supportive garments for everyday use. She advises, amongst others, Philips Research and the European Space Agency on product development. As a teacher, coach and researcher, she works for the fashion department in the Utrecht school of Arts, Saxion University for applied science and the Eindhoven University of Technology.

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