FORMING VISUAL EXPRESSIONS WITH AUGMENTED FASHION

PRACTIONER'S ESSAY

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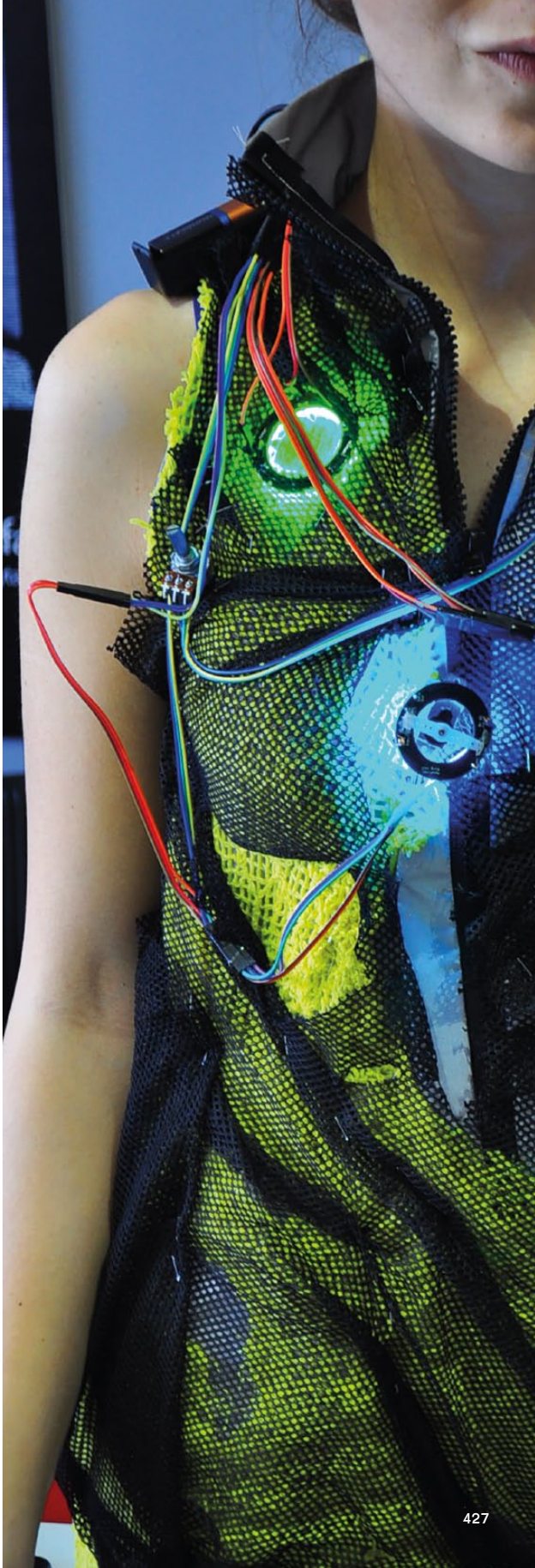
ABSTRACT

Wearable devices have a crucial impact on our bodies since they directly affect our appearance. However, wearable design practitioners focus more on the practical functionalities of the technology, leaving more investigation needed on what kind of visual expressions the technology might enable on wearable devices. With a critical approach on this functional perspective, the authors conducted a design workshop with fashion design and engineering students in which they first created art expressions and then wearable devices by using technological components. This practitioner's essay reflects on the resulting hands-on design experiences in new visual expressions that would not have been possible with just traditional materials.



1 While a participant was sketching their ideas.

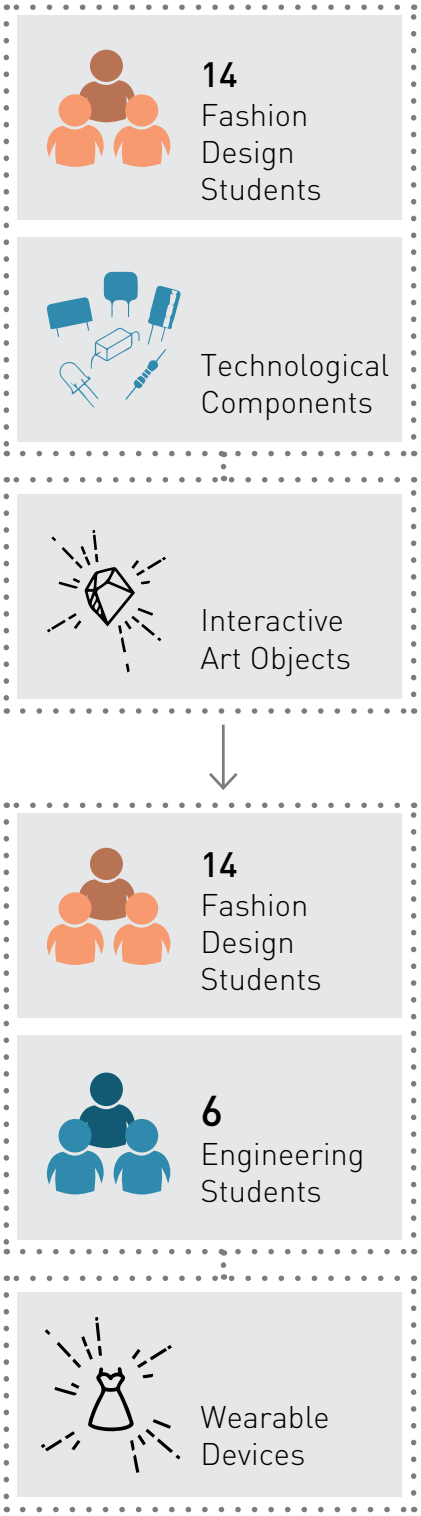
INTRODUCTION

Almost every morning, we wake up to a new world with new technological achievements that affect our lives in different ways. Among them, the evolution of wearable devices is giving birth to a common ground where the two notions, technology and fashion, coincide with each other. With the recent explosion in the use of smart bracelets, smart watches and wearable gadgets, we witness the evidence of this fusion more than ever in our daily life. Yet, from the first appearance of wearable technologies, they are mostly defined by the practical functionalities from a perspective where the formal and expressive qualities are underrated. This is apparent on the first theoretical underpinnings in which these kinds of devices are defined (Mann, 1996; Weiser, 1991). This can be said to be the output of 'the ideological legitimization of the technology' where the development of technology is seen as a rational problem-solving process that increases the efficiency of people beyond workplaces (Dunne, 2008: 2).

However, wearable technologies are sensitive in terms of their impact directly on our body and our appearance. Therefore, similar to our conventional clothes, expressiveness is also an important aspect for wearable devices (Seymour, 2009). This situation creates a need to examine approaches that see wearable development as a technical problem-solving process and raises the question: 'What kind of new visual expressions might technology enable on the body?'

Although there are many examples of technological garments that focus on expressive qualities, we have not found any analyses of possible visual expressions originating from technological components. Therefore, in this practitioner's essay, we explore the relationship between experimenting with technological components and the creation of visual expressions that the technology might enable on interactive garments. To investigate this from the critical point of view from the functional perspective of technology development, we conducted a design workshop with fashion design and engineering students in which we encouraged them to explore the expressive qualities of technological components (see Figure 1). By presenting the process and the outcomes of the workshop, which are different from the previous work on fashionable wearables, this practitioner's essay provides a thorough analysis of how utilizing technological components helps fashion designers to form visual expressions that would not have been possible to obtain without the existence of these technological materials.

The workshop was conducted with 14 fashion design students studying on the Fibre Art Course at İstanbul Mimar Sinan Fine Arts University and 6 engineering students from Koç University. The first part of the workshop focused on hands-on exploration of technological components such as electro-luminescent materials, LEDs, cables, motors, conductive threads and fabric along with conventional materials such as textiles in order to create art objects that were not concerned with the functional aspects of the technological components. In this phase, only fashion design students were included since we did not want to restrain them with technical concerns but wanted to give them an opportunity to explore the electronic components without any restrictions. However, two of the authors helped them to implement technological components into their design process. The second part of the workshop was aimed at designing fashion objects with the experience the students had gained from the first phase of the study. It also included engineering students to help fashion design students to implement their ideas. The aim of our workshop methodology was to overcome the fashion designers' lack of technological knowledge (Flanagan, 2015; Martin, 2008; Walker et al., 2015) by letting them explore and experiment with technological components in order to create visual expressions for wearable devices.



2 Structure of the workshop.

TRANSITION FROM FUNCTIONALITY TO FASHION DESIGN EXPRESSIONS

In this practitioner's essay, for the notion of expression, we refer to the definition of Hallnäs (2011) which considers how an object displays itself based on its formal qualities. This definition excludes individuals' experience with the object or how its displayed qualities are perceived by individuals (impression). Instead, it focuses on the intrinsic qualities of an object through which it presents itself. The reason for this was our intention to highlight the expressive qualities of the technological materials that formed the interactive garments, rather than focusing on the meanings those particular garments might evoke from the wearers.

The focus on expressive abilities of technology on the body needs special attention given to the material qualities of the technological components, and how they can contribute to the form of the wearable devices. This approach is highly visible in the research known as a 'material turn' in Human Computer Interaction design as an alternative perspective on designing computers (Wiberg, 2015). These researchers specifically focus on how computers can be redesigned by exploring the material qualities of technological components in the design processes. Tomico and Wilde (2016) apply this notion to wearables in their work. In their study, they discuss how experimenting with materials in an embodied and situated way might yield meaningful wearables by referring to design studies that they undertook with architecture, interaction and fashion design students. Although this study highlights the contribution of material explorations to defining meaningful wearables, it did not reflect the ways that material explorations contributed to visual expressions when technological components are used as design materials with their expressive qualities.

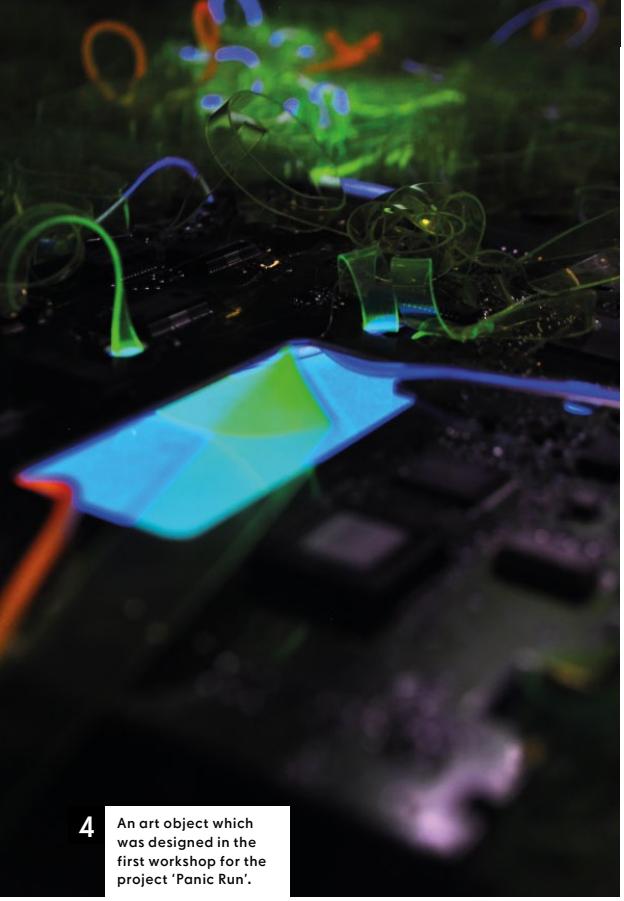
Fashion designers comprise some of the fundamental stakeholders when exploring expressive qualities of technology on the body. In modernity, while common usage of the term 'being fashionable' is seen as being appropriate for fashion trends, the creation and consumption of fashion has more to do with aesthetics and the symbolic meanings expressed through clothing in the social lives of human beings (Wilson, 2003: 9). Therefore, the most important role of fashion designers is to translate the most recent state of modernity into clothing through design processes (Blumer, 1969). To accomplish this role, they are not only trained to fulfil the functional needs of wearers, but also to supply garments that are suitable for a specific fashion consumer group's expressive and aesthetic needs (Lamb and Kallal, 1992). Moreover, the close relation of fashion designers with art potentially enables them to produce garments that challenge the current state of visual languages on clothes. These aspects of fashion design expertise differ from other design disciplines such as interaction design and product design, and make them valuable for wearable device design processes.

The engagements between technology and fashion designers yielded different design movements in wearable devices. Ryan (2009), in reviewing two of them (critical and positivist approaches), highlights the critical point of view of designers and artists on the design of wearable technologies. She mentions that designers who take this approach prefer to exaggerate the visibility of technology due to social and ethical concerns. These kinds of approaches are highly visible in the field of wearable devices and provide examples of how technology can provide expressive properties to the garments that would not be possible with traditional materials of fashion (see, e.g., Hartman et al., 2015). However, detailed examinations of critical fashion approaches to interactive garments that explain how 'mingling with technology might influence fashion designers to create visual expressions' is relatively under explored. Existing studies do not present any examinations of design processes where electronic components and textiles are combined nor has design knowledge about how electronic components can be used in forming visual expressions for fashionable wearables undergone any systematic investigation. Therefore, we aimed to provide design knowledge in this area by conducting a design workshop that combined conventional fashion materials such as textiles with electronic components.

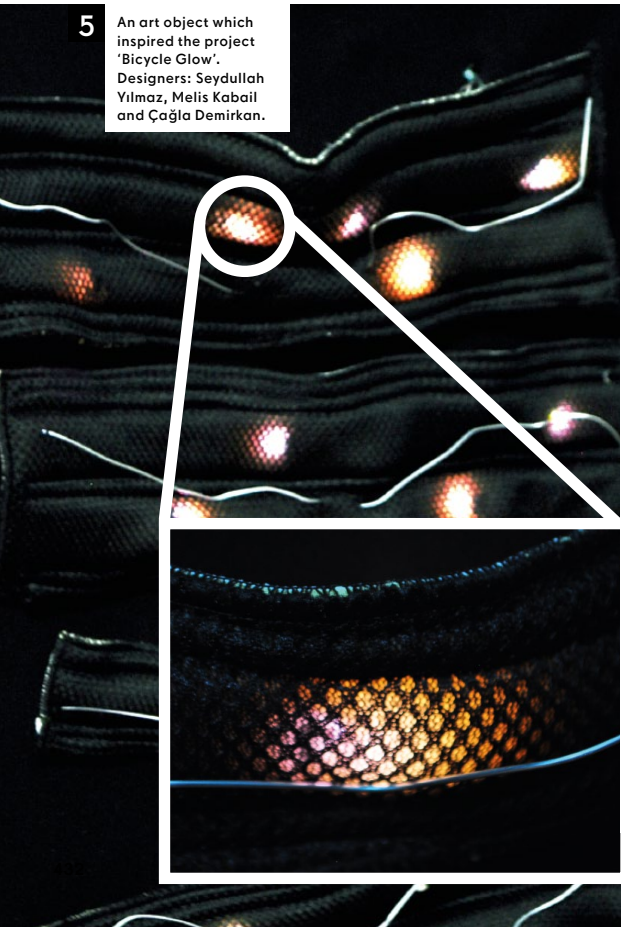
In our workshop, we found it was a fruitful starting point to primarily focus on designing art objects so that students could gain knowledge about how technological components might be used as design materials to form visual

expressions enabled by technology (see Figure 2). In this way, students engaged with technological components in combination with various fabrics and other fashion materials to create art expressions where practical functionality was not a concern (see Figure 3). Then, in the second part of the workshop, these experiences helped students to 'discover the functionality in given expressions' (Hallnäs and Redström, 2002) of the artworks that they created, while enabling them to gain knowledge of the expressive qualities of technological components for designing wearable devices. In what follows, we present our observations and reflections on both the process and the outcomes of the workshop. The examples presented here are used to illustrate the effect of discovering expressions via hands-on experience with technological components on the design of wearable expressions in three different ways.

3 A scene from the first phase of the workshop where fashion design students are exploring different kind of LEDs with different fabrics.



4 An art object which was designed in the first workshop for the project 'Panic Run'.



5 An art object which inspired the project 'Bicycle Glow'. Designers: Seydullah Yılmaz, Melis Kabail and Çağla Demirkan.

FORMING GARMENTS WITH LIGHT

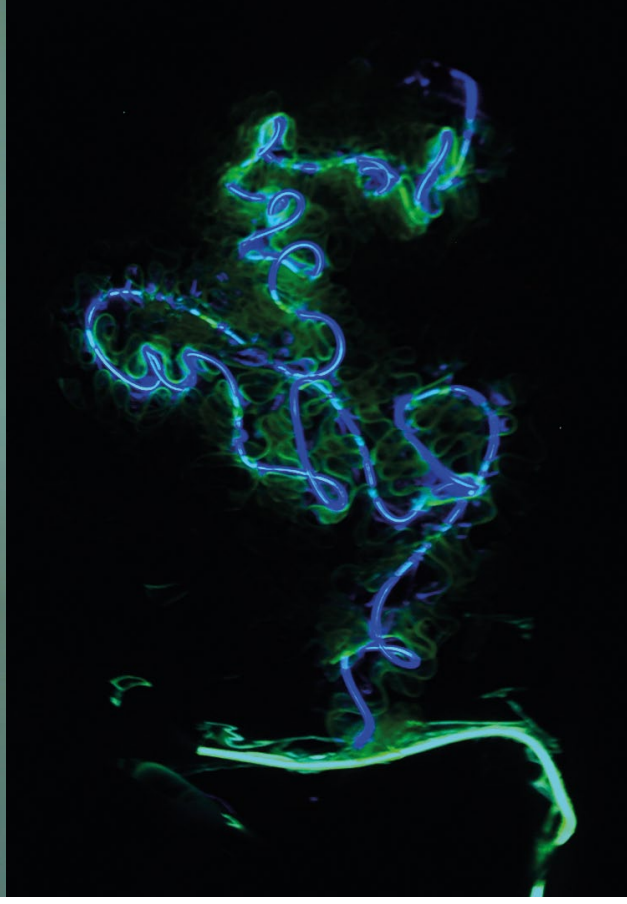
The use of light as a visual design element was a common pattern during the workshop. In the first phase of the workshop, the fashion designers explored the relation of light with non-interactive materials. The knowledge from the art object phase led them to use light to form interactive garments by creating a contrast to highlight details of the form, diffused light in combination with translucent materials and utilization of light in layers. In this way, they achieved new visual expressions that would not be possible by using only conventional materials such as textiles.

The designers of 'Panic Run' (see Figures 4 and 6), a rain coat for use by night joggers, started their design process by exploring the combinations of light with translucent shiny PVC material. At the end of the first phase of the workshop, they created a composition by using these materials. They explained how the high contrast achieved by electro-luminescent wires and plates, making a smooth interaction with the closest PVC parts, are meant to reflect the abstract concepts of the brain at times of stress. Visually, the use of light in this way helped them to create a contrast between the ground and the various parts, highlighting the active neuron-like details. In the artwork, the light is also scattered to the PVC parts creating a smooth interaction in low light conditions. In addition, they also explained that the overall composition gives the composition an urban look.

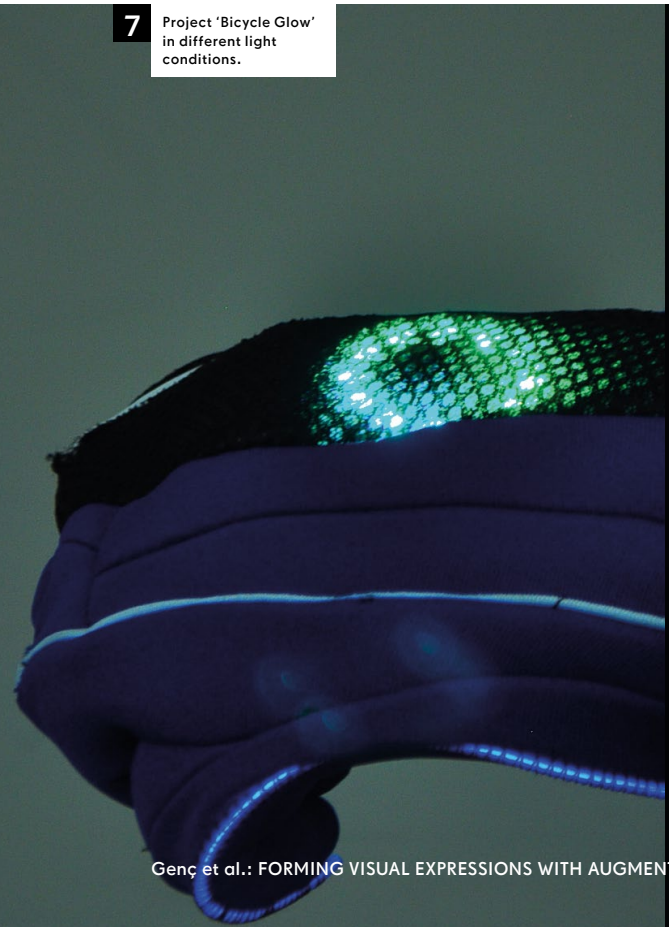
For the garment, the art expression that evolved had an aim of night joggers being visible for safety reasons. Here, the designers did not use light as a sole functional element in the garment design but starting by exploring the ways that it could contribute to the intended expression of a feeling of panic but that also increased its wearer's visibility. In addition, the meandering forms created in the art object gave them the idea of a dynamic coat that tightens while jogging but loosens when stationary. Here again, instead of trying to find a mechanism that might achieve this function, the designers realized that the density of moving PVC parts reflected that practicality. They speculated how changing shape occurs in a natural way which they had planned to achieve with shape-changing PVC-type pieces that tighten and loosen in order to alter the size of the coat.

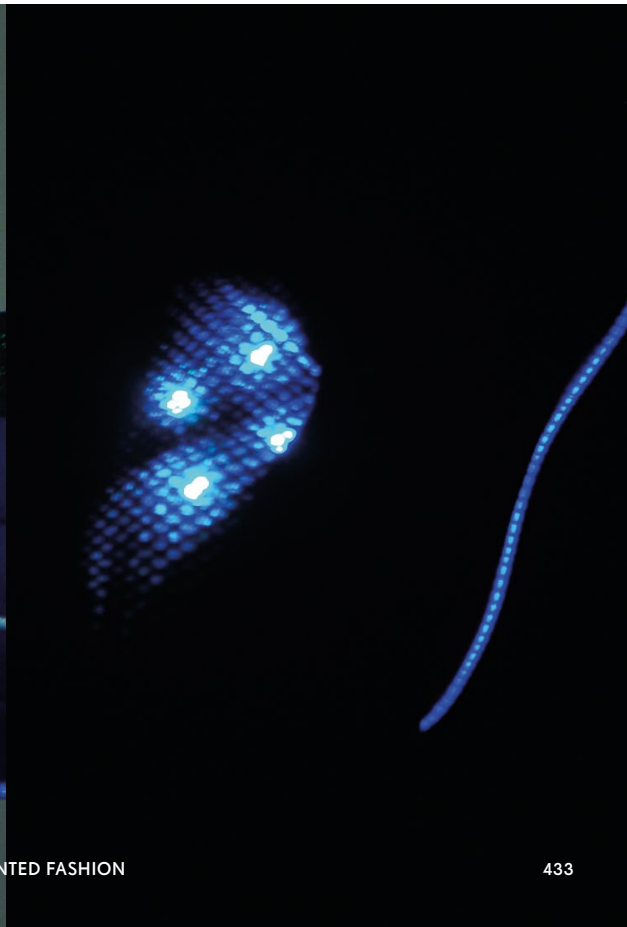
Another example for using light as a design material to form a garment was 'Bicycle Glow'. The group who designed the 'Bicycle Glow' first created a mood board on digital waves and said they were working on a garment for cyclists. They associated these two notions (digital waves and the identity of the cyclist) by focusing on the dynamism between them. In the first phase of the workshop, they experimented by creating different combinations of LEDs and fabrics in layers. In this process, they found that light in between the layers of fabrics reveals the unnoticeable patterns of the fabric on the top layer by creating a contrast in the pattern (see Figures 5 and 7). Then, by transferring the notion of digital waves into a glove for cyclists, they redefined the expression to provide navigational information and extra visibility for wearers while cycling. In the final design, an electro-luminescent wire used as an edge binding of the glove aimed to emphasize the wave form. Later, designers loaded a signal function to this part which could be used to sign that the rider is about to turn left or right, like a car direction signal

Almost all other projects in the workshop utilized light; however, these two demonstrated examples of how light and fabric yield to visual expressions that cannot be formed without the involvement of technological components. We observed that, with light, the invisible patterns of textiles can be revealed and, with different combinations of textiles, visual expressions that do not belong to fashion design activities with conventional materials can be created. Apart from that, we also noted that the sharp contrast originating from the extremely bright nature of light could create new opportunities for designers to play with in the shape/background relationship in their cloth designs.



6 Project 'Panic Run' in day and night state. Designers: Cemre Eren, İrem Öğütçü and Cansın Gürler.





7 Project 'Bicycle Glow' in different light conditions.

DYNAMIC EXPRESSIONS

Temporality is the most common feature mentioned when computers are interpreted as design materials (Vallgårda et al., 2015). By experimenting with technological components, fashion designers explored this quality in different ways while forming expressions of both art objects and interactive garments. One approach was to use the interactivity of those materials to achieve multiple expressions of the clothing. Moreover, the dynamism introduced by technological components was also used as a visual element to build up an expression as a reaction to an outside effect on interactive cloths.

'Reflect the Night' was one example of bringing multiple expressions into a garment through exploring the use of technological components. In the process of artwork creation, the designers focused on two notions: Cybersea and dynamism. They ended up with different artworks for these two starting points (Figures 8 and 9). For the concept of Cybersea, they scrutinized a relationship between a reflective surface and netted fabrics to reveal wavy patterns in cases with intense light projection. While presenting their artwork on this concept, they speculated that their ideas could achieve two alternative expressions in one dress: 'A garment constructed with this structure might look more like night attire in normal light conditions, but it can reveal a sportier look when light is projected on the garment.' The other focus of the artwork was on the exploration of the mechanical dynamism that motors and old electronic devices (PCBs, cables) might reveal. In their presentation, at the end of first phase of the workshop, we suggested to them that they could somehow connect these two notions from two different artworks. Thus, in the process of designing the interactive garment, they first explored the visual language of the reflective artwork. While implementing this style, they felt the need to use light sources facing onto a reflective surface to reveal the second expression without needing an outside source. Then they carried the concept of dynamism further by exploring the alternatives in which the servo motors could fold the fabric. The result was 'Reflect the Night' which is capable of revealing an alternative form when the wearer dances by activating LEDs facing onto the reflective surface. Moreover, the dress has two states which are 'Cluttered Top' and 'Flat Poncho' (Figure 10 and 11). In Cluttered Top, servo motors gather the pile of cloth to the neck part of the dress and create a swollen look. When servos release the cloth, a more flat and smooth character of the cloth presents the 'Flat Poncho' state. Two different states in one cloth is not a new thing and is even present in conventional fashion. However, here we emphasize how the dress form is shaped by the programmable and clearly defined temporality provided by servo motors. The spin motion and its manipulability led designers to the final form of the dress which embraces both curly and flat patterns.

The approach in 'Reflect the Night', revealing alternative expressions by using technology, is very relevant to wearers' daily practice of wearing fashion objects. Giddens (1991: 100) argues that people should adapt their attitudes and visual representations towards their sense of what is appropriate for that setting. On that subject, 'Reflect the Night' gives us clues about how technology on a body can contribute to changes in the visual representation of a particular dress.

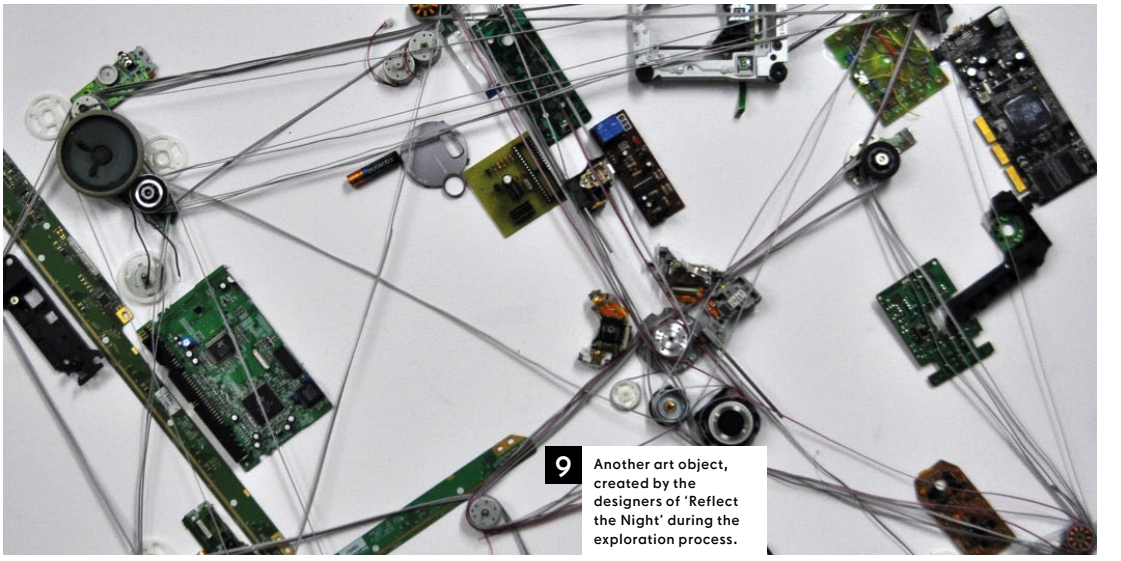
'Water Drop Bracelet' (Figure 12) is another example of how new dynamic visual expressions can be created on interactive garments. In the first phase of the workshop, the designer of this project experimented with LEDs placed on a patterned fabric. She explored the different effects of light on the fabric. Then, inspired by the colours and the dotted look of the LEDs, she created an installation which is a recreation of the painting of Henri Edmond Cross, 'Seated Nude', with pins, LEDs and dust paint (Figure 13). Although the time-consuming nature of connecting and programming multiple individual LEDs did not lead the designer to imple-

8 An art object which led to the project 'Reflect the Night', demonstrated under normal light and intense light.

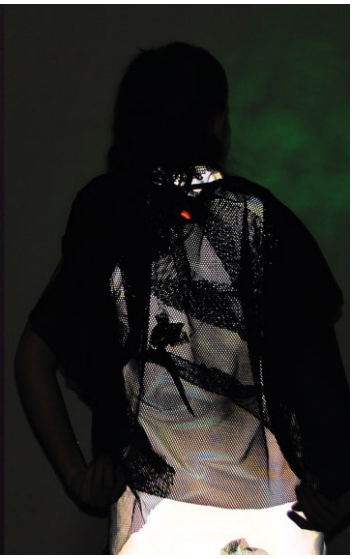
10 'Reflect the Night' under two light conditions. Designers: Muhammed İloğlu Yağmur Gevrek

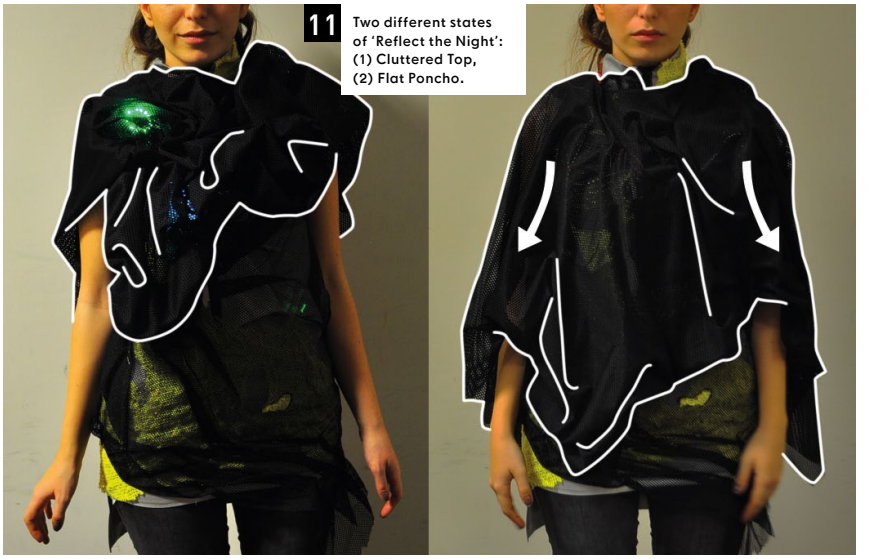
ment a whole working composition, she intended to create an interactive experience where the lights on the installation brightens depending on the position of the viewer. The aim here was proposing different expressions from different angles by highlighting the parts of the composition. In the second phase, inspired by the look and interactive possibilities of LED usage, the designer created a surface with bubble wraps which contains polymer spheres that swell when contacted by water. Moreover, she also implemented LEDs on the back side of the surface. She noticed that the diffused light enabled the water bubbles to turn into different colours and patterns. After experimenting with these colour and pattern changes by implementing a system that reacts to sound inputs from environment, in the end she designed the 'Water Drop Bracelet' which is a bracelet that could be used in open air activities like concerts. In her design, the LEDs on the backside of the surface react to the beats of the music, changing patterns and the colour of the water bubbles. The interaction of water bubbles with water in rainy environments also presents random and alternative patterns on the bracelet (Figure 15). Here, the designer benefited from the interactive use of light to define constantly and randomly changing wearable expressions according to the sound of the environment. Additionally, the designer proposed the use of this kind of surface on different parts of different kinds of dresses (Figure 14).

An alternative utilization of technology on the body was making use of dynamism as a visual element on the dress. One remarkable example from our workshop was the project 'Jellyfish'. In the first phase, the designers of this project were interested in the woven structure of the conductive fabric that is presented as a technological component that can trigger desired events in an interactive system. Keeping this in mind, they started to explore the material by tearing and loosening it. The shape they obtained recalled the contours of jellyfish. Inspired by the bioluminescent nature of these animals, they also experimented with light on these forms. At the end of the first phase of the workshop, they created a composition in which three-dimensional jellyfish forms react via light when somebody touches them (Figure 6). On the second phase, they also tried servomotors used behind the fabric to increase the 'alive' quality of the jellyfish form. At the end, they proposed a scarf that reacts to the invasion of private space (if somebody touches



9 Another art object, created by the designers of 'Reflect the Night' during the exploration process.





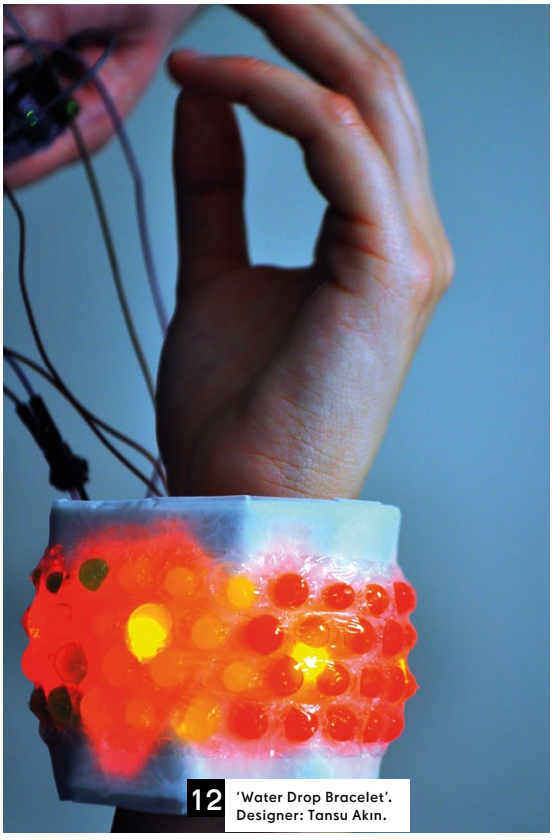
11 Two different states of 'Reflect the Night': (1) Cluttered Top, (2) Flat Poncho.

the scarf) by moving jellyfish-like patterns which are augmented with light (Figure 17). Here, the expression itself was formed by the movement of these pieces.

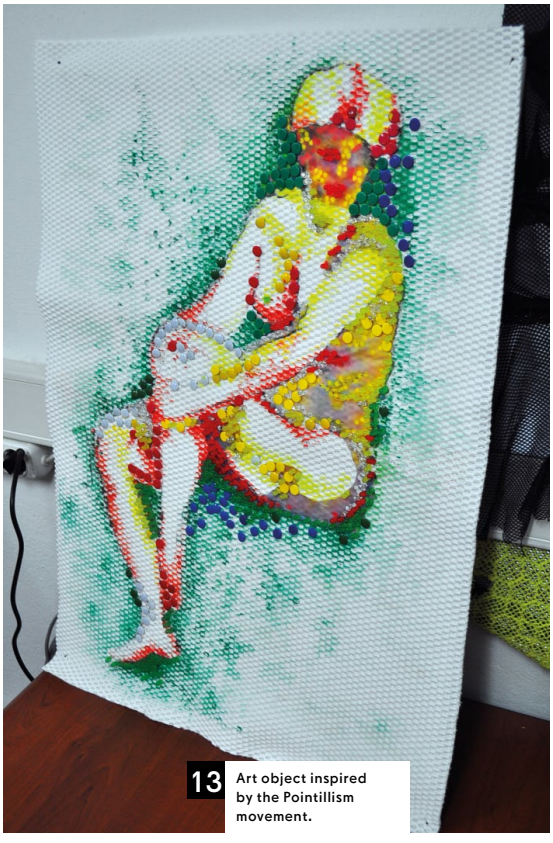
Drawing upon the projects in this section, we claim that temporality will be one of the remarkable sources for new visual expressions of the augmented fashion era. Our observations from this study also showed that dynamic patterns (as in 'Jellyfish), multiple states of dress (as in 'Reflect the Night') and randomized and unexpected forms (as in 'Water Drop Bracelet') could be some of the results sparked from this rich source of temporality.

VISIBLE ELECTRONIC COMPONENTS

Our choice of facilitating the workshop was the motivation of seeing possible visual expressions enabled using technological materials. Most of these electronic components that we gave the participants (such as wires, cables and chips) are hidden from view not only in wearable gadgets but also in other end-user products. However, in the workshop, a fashion designer was inspired by the form of these components and saw the opportunity of using these as a visual part of their designs.

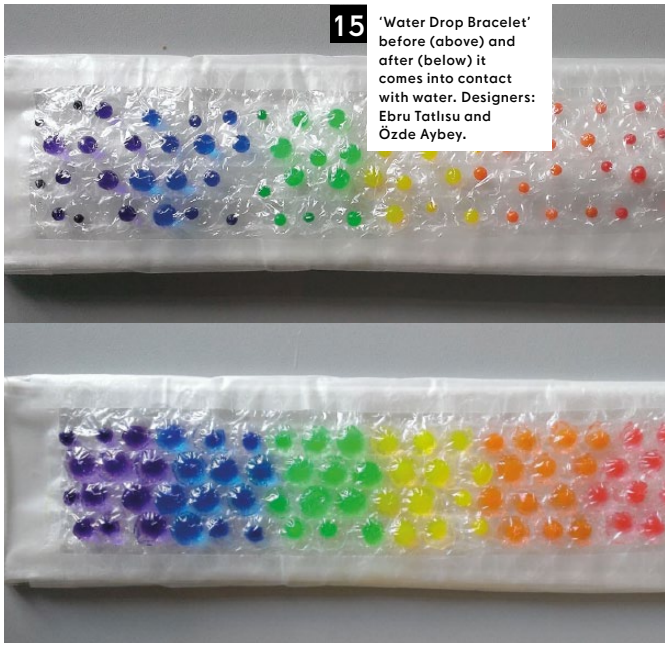


12 'Water Drop Bracelet'. Designer: Tansu Akın.



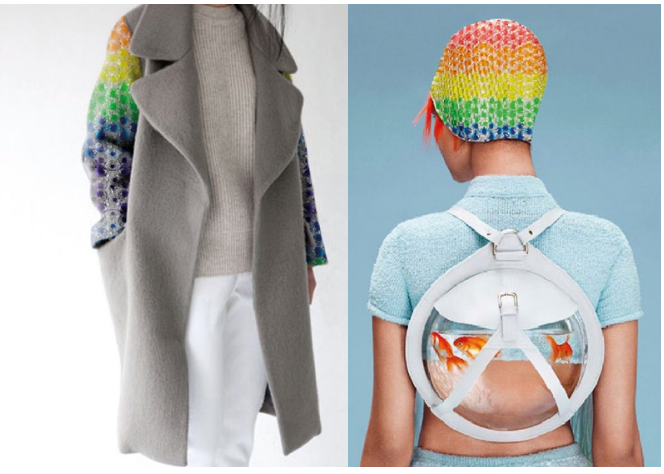
13 Art object inspired by the Pointillism movement.

14 Applications of 'Water Drop Pattern' on different clothes and accessories.

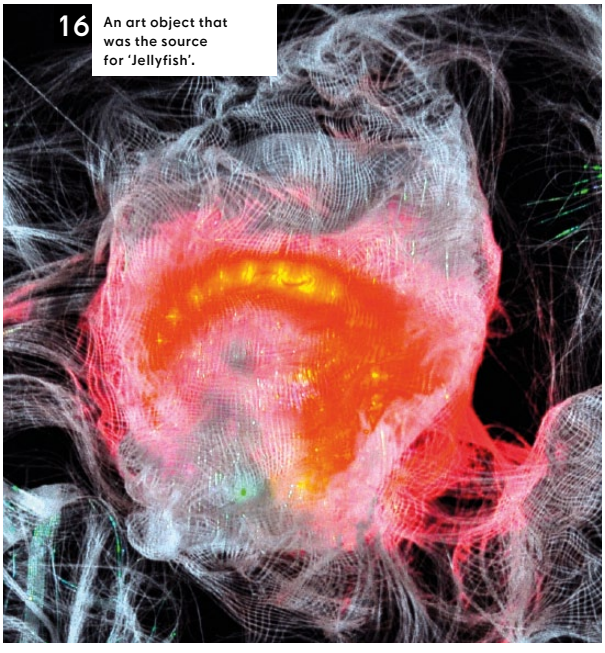


15 'Water Drop Bracelet' before (above) and after (below) it comes into contact with water. Designers: Ebru Tatlısu and Özde Aybey.

'Cable Bag' (Figure 18) was a good example of how the most basic electronic components such as cables can contribute to the visual expression of fashion accessories. The designer of the 'Cable Bag' tried using different weaving techniques by using cables and electro-luminescent wires. In the process of designing artworks, she found that the structures achieved by weaving cables are capable of providing a flexible form that expresses the given shape without needing an additional rigid structure inside. Moreover, she found the relationship between cables, wool threads and electro-luminescent wires interesting enough to use this relation in the final design. At the end of the first phase of the workshop, she presented different alternatives that she had achieved by weaving cables and electro-luminescent wires in combination with wool, metal wire structures and embroidery hoops (Figure 19). During the design process of the bag, she researched a material that can change shape to weave it with cables and electro-luminescent wires. Although we did not give her any, she experimented with shape-changing fibre in the final design of the bag. Her aim was to provide a practical functionality of the bag that could increase its capacity if needed, while keeping the visual expression that dangling cables and EL wires present (Figure 20). This project is a remarkable example of using a fundamental mate-



16 An art object that was the source for 'Jellyfish'.



17 'Project Jellyfish'. Designers: Ebru Tatlısu and Özde Aybey.

rial for achieving interactivity on any technological device, as the main actor in the appearance and the structure of a wearable garment.

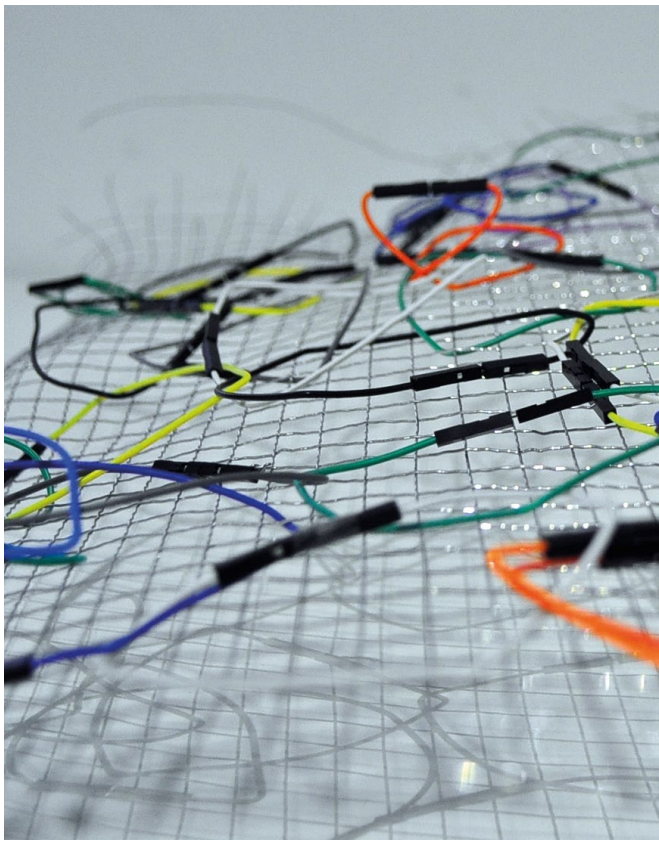
In addition to this project, 'Water Drop Bracelet' referred in the 'dynamic expressions' section demonstrates how electronic components can inspire designers to create forms even if they do not directly use the electronic components as visual elements. These two projects demonstrate that it is crucial to introduce electronic components to designers in the design process. This not only overcomes the struggles caused by designers' lack of technological knowledge but also provides new opportunities for the utilization of electronic components in different ways and styles.

CONCLUSION

In this practitioner's essay, we have presented an alternative approach to the design of wearable devices which prioritizes exploring expressive qualities of technological components as opposed to the common tendency of technology developers to focus on defining practical functionalities.

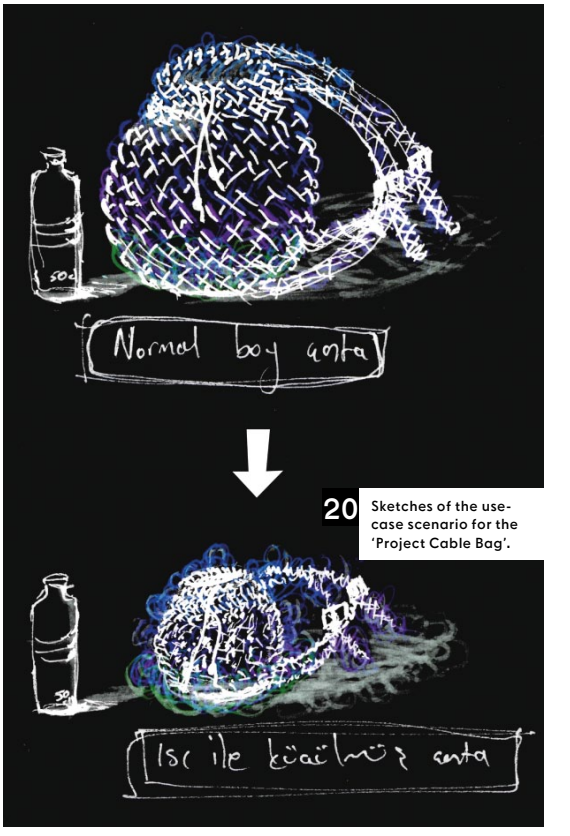
To critique this state of wearable device design, we presented our observations and the reflections on the workshop that we conducted with fashion and engineering students. During the workshop, we found it useful to lead students to create art expressions before designing interactive garments. By first focusing on the explorations with technological components, the students were able to extract and experiment with the expressive potential of these pieces. We also witnessed that these expressions reflected some practical functionalities in later phases of the design processes.

Our observations suggest that the contribution of the technological components to the expressions of the designed artworks and interactive garments presented different methods: using light as a formal element to create expressions on

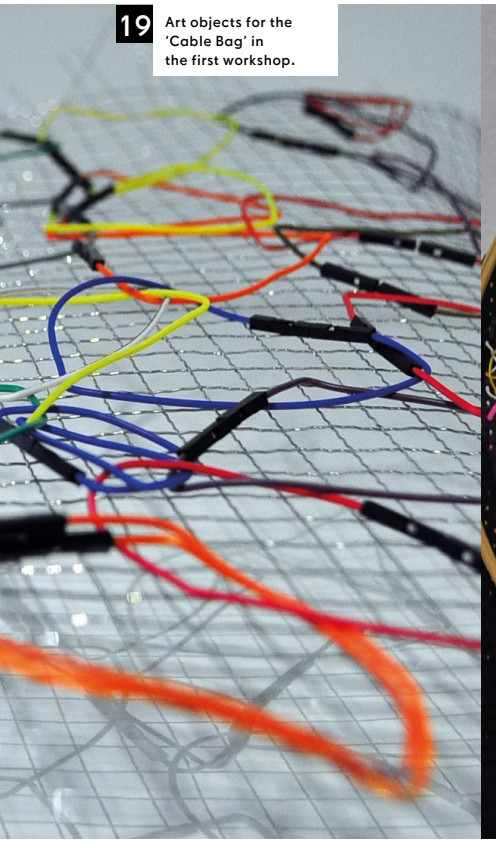


18 'Project Cable Bag'. Designer: Ezgi Tokgöz.

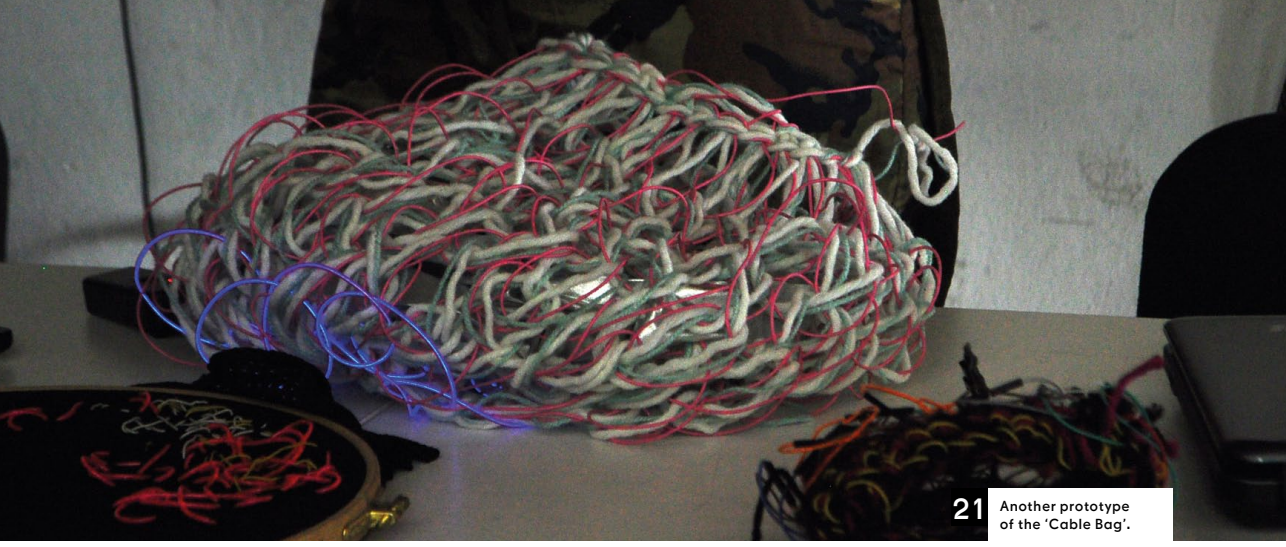
a garment, the creation of dynamic expressions and using electronic components as a visual element. In contrast to previous work on fashionable wearables, these results demonstrate possible design directions for forming visual expressions in a process that prioritizes the aesthetic opportunities that can be provided by technology. Moreover, our results are grounded on a detailed analysis of a material-oriented fashion design process. Although these results are limited to the projects in our workshop, more explorations in this area might offer more clues on how technology on the body might contribute to the expressions of wearable devices.



20 Sketches of the use-case scenario for the 'Project Cable Bag'.



19 Art objects for the 'Cable Bag' in the first workshop.



21 Another prototype of the 'Cable Bag'.

BIOGRAPHICAL NOTES

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