INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN 2735-4342

Theoretical Study of Wearable Electronic Technology and its Applications in Fashion Design Field

Laila El-Maghraby
Apparel Department – Higher Institute of Applied Arts-
New Cairo Academy

Abstract:

Wearable electronic technology is a growing field at the intersection of fashion and technology. Apparel and technology designers are unsure of how best to merge the strengths of their independent fields to create products that can be easily integrated into an individual's lifestyle. The Aim of this research is to create a conceptual framework that combines apparel design values with interaction design values in a model that could theoretically be used interdisciplinary for the future development of both fashion and wearable technology products. The Framework was developed using theoretical-based approach to explore the phenomenon of creating electronic smart fashion by global design practitioners. That led to the conclusion of: The successful creation of wearable technology would expand the visual dimensions of fashion. Further investigation of electronic components & materials should be applied.

Key Words:

Theoretical Study- Wearable- Electronic Technology- Fashion- Design Field

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Introduction

With the development of computer science and digital technology, multimedia technologies have been incorporated into artworks which gaverise to new art forms, andas wearable technology becomes more common, itis changing our concept ofhuman subjectivity, creating new concepts of identity, new systems of behavior and extensions of the body itself. What is more, contemporary fashion has beenplaying an important role in enhancing socio-cultural communications betweendifferent people; this practice-based research study combined the theories ofwearable technologies, practical concept development and physical prototyping ofwearable technologies in creating high value fashion design.

Artworks frequently feature computers and sensors to respond to motion, heat, or other types of inputs to which their makers program them to respond. The use of interactivity as a communicative tool between artist and spectator as well as an art form originated in the late 1960s. In 1968, Jasia Reichardt arranged The Landmark Computer Art Exhibition Cybernetic Serendipity at the Institute of Contemporary Art (ICA) in London, which was the first exhibition ever to attempt to demonstrate all aspects of computer- aided creative activity: art, music, poetry, dance, sculpture, and animation. Since then, interactive art has gradually become an important expressive and communicative means of new art.

Ed Thorpe and Claude Shannon revealed the first wearable computer in1966. It was a cigarette-pack sized analog computer with four buttons to indicate the speed of a roulette wheel and the predicted results were transmitted by radio to an earpiece. In 1981 Steve Mann created a backpack- mounted computer to control his photographic equipment.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN 2735-4342

The term interaction design was first proposed by Bill Moggridge and Bill Verplank in the late 1980s. To Verplank, interaction design is an adaptation of what the computer science term "user interface design" is to the industrial design profession. Interactivity is broadly divided into three levels: non-interactive, reactive and interactive.

In our mind we think about three main research queries:

1. What the theoretical framework of wearable technology in the contextof fashion designing?
2. How do fashion designers apply technology in their artwork?
3. What are the major fashion design hits that included wearable electrictechnology?

The aim of this study is focusing on new concept fashion that is interactive between the clothing and the wearer and the context in which it is worn by which the role and values of fashion are redefined. This aim will be achieved by Specific objectives such as: Acquire an understanding of the concept and development of Interactivity in art and design which are the original background of this research.Study and understand the basic emotion psychology related to human interaction.Identify the theoretical framework of Interactivity in the context of design, technology, psychology and humanity.Characterizepotential technologies, materials and structures for creation of Wearable electronic technology.Expand the visual dimension and content of fashion across art, design, technology, psychology and humanities; and to disseminate the findings in both literal and product forms.Investigatethe latest illuminative fashion products in the market and those applications in visual expressions.

2. Materials and Methods:

The study involves art, design, fashion, electronic technology, psychology, humanity, etc. Therefore, comprehensive literature review, systematic theoretical research, was conducted.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

2.1. Theoretical Framework of Interactivity

Embedded technologies influence the wearability comfort and aesthetic of a fashionable wearable. The main technical componentsused for the creation of fashionable wearable are:Interfaces (connectors, wires, and antennas), Microprocessors, Inputs (sensors), Outputs (actuators), Software, Energy (batteries, solar panels), and Materials (electronic textiles, enhanced materials)

- The microprocessor is a single-chip computer that can run and store a program. It collects and computes data derived through various interfaces from the input sources. This computation is necessary to address the outputs on either the garment itself or to signal external devices. Cell phones typify external devices that are able to compute and deliver extensive data through diverse communication networks.
- Inputs: The required interaction with the fashionable wearable determines the input and output. Active inputs can be consciously controlled by a wearer using a tactile or acoustic feedback system that allows an intuitive use of the garment. Passive inputs are typically biometric data gathered from the body or automatic data feeds via wireless transmission using environmental data Origin Inputs (Examples)
- Person: pressure, bend, motion, biometric data, sound, visuals, humidity, proximity, orientation, displacement, smell, acceleration
- Environment: light, humidity, sound, temperature, smoke, micro- particles… etc.
- Textile Sensors: Body-sensing technologies must be close to the skin to be effective and are the perfect candidates for integration into a textile. ‘Fiber sensors, which are capable of measuring temperature, strain/stress, gas, biological species and smell, are typical smart fibers that can be directly applied to textiles.
- Embedded Sensors: Typical embedded sensors measure a varietyof data types ranging from proximity to smell. They can collect dataderived from the human body as well as environmental data.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN 2735-4342

▪ Outputs:The variables captured from the input sources are software- based data and consequently allow computation that in turn determinesthe output.

▪ Communication: The simple act of showing or sharing emotion takes on new meaning when two people are connected via a wireless network. If one thinks of the other the jewelry or garment can now react. This immediate feedback over distance can be achieved by wearable technologies and wireless communication.

2.2. Materials:

The use of enhanced materials and textiles in conjunction with current research in nanotechnologies, biotechnologies, and digital technologies will lead us to a fashionable wearable that is a true integration of essential function and aesthetic design. (Electronic Textiles-Nanotechnology & Microfibers-Biomimetic).

▪ Energy:

The computation of captured data through microprocessors on the body requires energy that today is delivered primarily by batteries. However, a battery's life is limited and its effects on the human body have yet to be evaluated in depth. The quest for alternative energy sources for fashionable wearables is essential. Developers of fashionable wearables will have to find new and improved solutions to acquire the needed energythat will allow microprocessors to operate reliably.

Garment Construction

The many considerations for the construction of fashionable wearables are based on body ergonomics, perception, functionality, technology, materials, energy and environmental impact. The table below can be used as a guideline for the construction of fashionable wearables.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Factor	Considerations
Body ergonomics/ wearability	placement, form language, human movement, proximity, sizing, attachments, weight, accessibility, heat, body shape, comfort, cut of the garment, compartments
Perception	aesthetics, look & feel, design, cultural and psychological functions
Functionality	usable interaction with the system (inputs & outputs), wearer's control, modular construction for multi-purpose
Technology	ubiquitous computing, sensor technology, embedded systems design, physical computing
Materials	interactive or reactive materials/textiles, electronic textile, washing/cleaning, shielding, durability
Energy	batteries, solar, kinetic, fuel cells
Recycle	ecological, biodegradable, modular construction for dissemble

Theoretical Results and Discussion of Fashion Design

1. Hussein Chalayan (London, UK):

Hussein graduated in 1993 from London's Central St Martins School of Art and Design and launched his own label in 1994. He uses film, installations and sculptural forms to explore perception and the realities of modern life,with particular interest in cultural identity, migration, anthropology, technology,nature and genetics. His work is presented at his shows and in art galleries, while his clothing is available in boutiques worldwide. Hussein has directed several short films. Sponsored by Turquality, he represented Turkey in the 2005 Venice Biennale with Absent Presence, featuring Tilda Swinton. In 2005 the Groninger Museum in the Netherlands hosted a ten-year retrospective of his work. In 2006 Hussein Chalayan was awarded an MBE in the Queen's Birthday Honour's list.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN 2735-4342

Soon after he was also awarded Design Star Honoree by The Fashion Group International in New York.

Hussein, 1993
With Swarowski, ShowStudio
(Keywords: light, laser, crystals)

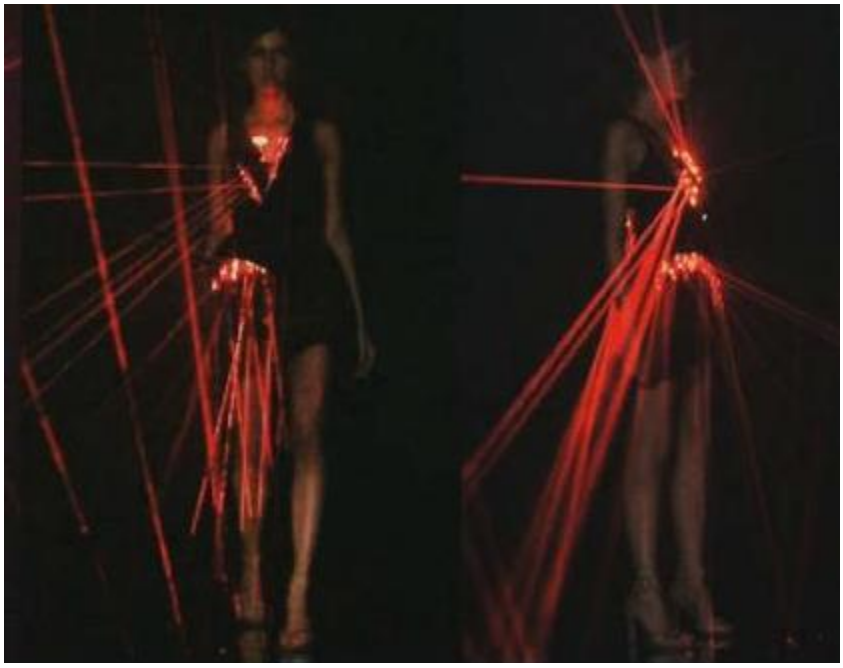
Readings is the title of the Spring/Summer collection and is also a film collaboration with leading crystal innovator Swarovski and Nick Knight's fashion broadcasting company SHOWstudio. The highlight of the collection is inspired by ancient sun worshipping and contemporary celebrity status. Laser lights are beamed through Swarovski crystals, reflecting light from the garment and bouncing it off mirrors surrounding it, thus representing theinterplay between the scrutinized figure and the audience.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY

Print ISSN
2735-4334

VOLUME 5, ISSUE 2, 2022, 110 – 20.

Online ISSN
2735-4342



Readings, Spring/Summer (2008)
London, UK

Hussein pushes the boundaries of fashion by integrating the latest LED technology into his fashion collection. The collection uses climate as a metaphor and reflects our primal feelings towards nature and the cycles of weather. An LED dress consisting of 15,600 LEDs, combined with crystal, displays short abstract films that correspond to the arrival of a particular season.

Airborne, Autumn/Winter (2007), London, UKWith Swarowski

(Keywords: display, LEDs, film)

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN
2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN
2735-4342

Hussein pushes the boundaries of fashion by integrating the latest LEDtechnology into his fashion collection. The collection uses climate as a metaphor and reflects our primal feelings towards nature and the cycles of weather. An LED dress consisting of 15,600 LEDs, combined with crystal, displays short abstract films that correspond to the arrival of a particular season. An association with Swarovski has led to a collection that transcends a 111-year history of fashion and reveals a modern and unique vision. Each of the five beautifully hand constructed, mechanical dresses, represents a particular period in fashion history, incorporating contemporary vision and complex engineering. 1895 is the starting point for the collection, consisting of a full-length skirt with a tightly pulled in waist on a gown with a high, frilled neckline. This transforms into a looser fitting dress with a hemline that rises to the calf reflecting the style of 1910. In turn, this seamlessly morphs into a 1920s flapper dress comprised of a loose layered knee length skirt with a plunging neckline. The metamorphosis continues right up to the present day.

One Hundred and Eleven, Spring/Summer (2007), London, UK
With Swarowski,

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY

Print ISSN
2735-4334

VOLUME 5, ISSUE 2, 2022, 110 – 20.

Online ISSN
2735-4342

Before Minus Now, Spring/Summer (2000), London, UK,
Keywords: remotecontrol, fiberglass

Echoform, Autumn/Winter (1999)
London, UK
Keywords: airplane, electronics, fiberglass

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 135.
Online ISSN 2735-4342

The collection focuses on the relationship between humans, nature and technology. A number of the dresses have irregular geometric shapes with stiffly protruding panels. The Remote-Control Dress is operated with a remote control that opens the fiberglass panels of the dress to reveal the tulle inside. The main theme of the collection was speed and its associated technologies. The Airplane Dress is a fiberglass construction with a flap that can be operated electronically and moves like an airplane wing.

1. CuteCircuit (London, UK)
Biography: CuteCircuit is a wearable technology and interaction design company, founded by Francesca Rosella and Ryan Genz. Francesca and Ryan both hold a Masters degree in Interaction Design from the Interaction Design Institute Ivrea. Francesca is a fashion designer (Valentino, Esprit) and architect and Ryan an artist and anthropologist. CuteCirucit products were featured at WIRED NextFest for two consecutive years. CuteCircuit was awarded the First Prize at Cyberart Conference in Bilbao, Spain and the Hug Shirt was nominated as one of the Best Inventions of The Year by Time Magazine. Many of CuteCircuit products have been featured in books, magazinesand newspapers worldwide.

Emotional Clothing: KineticDress(2004, 2007)
Rome, Italy & London, UK

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Keywords: emotionally responsive clothing, adaptive clothing, sensors, electroluminescent embroidery, movement. The KineticDress is made of an elastic textile embedded with sensors that capture the wearer's movements and interaction with others. The sensor data is displayed through the electroluminescent embroidery that covers the external skirt section of the dress. The algorithmic program that controls the KineticDress is designed to follow the pace of the wearer: a still pose, when sitting alone shows a black dress, when the wearerstarts moving and interacting with others the dress slowly lights up with a blue circle pattern.

2. XS Labs (Montreal, Canada)
XS Labs was founded in 2002 by Joanna Berzowska and is a design research studio with a focus on innovation in the fields of electronic textiles and wearable computing. Many of the XS Lab's electronic textile innovations come from combining the traditional techniques of textile manufacturing with contemporary materials that have various electro mechanical properties. This enables XS Labs to construct complex textiles with electronic properties. Joanna is an Associate Professor of Design and Computation Arts at Concordia University and a member of the Hexagram Research Institute in Montreal. She received her Masters of Science from MIT for her work entitled 'Computational Expressionism' and subsequently worked with the Tangible Media Group of the MIT Media Lab. She co-founded International Fashion Machines in Boston and holds a BA in Pure Math and a BFA in Design Arts. Her collaborators include Marcelo Coelho, Vincent Leclerc, and Di Mainstone. Vincent recently graduated with a Masters Degree from the MIT Media Lab and teaches Physical Computing at Concordia University. Di trained in fashion design at the Central Saint Martins College of Art in London. She worked with Sara Diamond at the Banff New Media Institute to create a series of electronicfashion garments.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Leeches (2004), Montreal, CanadaBy Joanna Berzowska

Electronic garments, smart clothes, conductive textile, power distribution The Leeches dress, constructed with stitched conductive organza stripes, functions as a soft, wearable, and reconfigurable power-distribution substrate for attaching individual silicone-coated electronic modules (the 'Leeches') that illuminate the dress. The Leeches can be attached in a varietyof positions and configurations. They are heldin place by magnetic snaps, which act both as mechanical and electrical connections. A single powermodule can be attached at the shoulder and can power up to ten Leeches. The red LEDs inside the Leeches suggest power-hungry creatures that, once attached, suck or draw power (the metaphoric 'blood') from your body. The Leeches dress provides comment on the potential dangers of electromagnetic fields emanating from electronic garments.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY

Print ISSN
2735-4334

VOLUME 5, ISSUE 2, 2022, 110 – 20.

Online ISSN
2735-4342

Constellation Dresses (2004), Montreal, Canada, By Joanna BerzowskaKeywords: electronic garments, smart clothes, conductive textile, power distribution The Constellation Dresses are covered with twelve magnetic snaps arranged over the torso and thighs and connected in pairs using a single line of conductive thread. LEDs are integrated into the dresses in a design that resembles a constellation. Sets of snaps act as switches that, when connected to the snaps of another dress, complete circuits that light up the LEDs. The magnetic snaps act as a mechanical and electrical connection between bodies. Their irregular placement induces wearers to create playful and compelling choreographies to connect their circuits.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Blazer (2003), Montreal, CanadaBy Joanna Berzowska

Retinal persistence, ubiquitous computing, light interface, electronic fashion, smart materials, conductive yarns, text-augmented garments Blazer integrates light emitting diodes into the fabric by employing existing textile construction methods, to create a simple emissive display. The system takes advantage of retinal persistence to make sense of an apparently random pattern of flashing lights. When the body is still, we see noise. When the body is in motion, the noise becomes a message: text is displayed. The snaps are modified snap buttons with a translucid cap prong. A small hole was drilled in thestuds and 3mm high brightness blue LEDs were added. The snaps also serve as a contact switch to start the flashing of the LEDs. When the buttons are snapped, they start to emit flashing light that appears to have a random behavior. Metallic silk organza is a great base for creating contact switches and grounding common elements of a circuit. Blazer is built with 4 layers of the synthetic fabric to isolate the various elements of the circuit.

3. Suzi Webster (Vancouver, Canada)
Suzi completed a BFA at Emily Carr Institute in Vancouver, Canadaand an MFA at the Slade in London, UK. She now teaches at Emily Carr in the Digital Visual Arts department.Technology enables us to listen in on the mysterious and invisible signals that emanate from our bodies. Mostly this data is used for medical purposes, but Suzi transforms this private bio information into a metaphoric, wearable display of color, light, sound or vibration. Recent exhibitionshave included Node London 06, How Smart Are We at the Royal Institute of British Architects, Artefactat the Foundation for Creative Art and Technology in Liverpool, and Cyborgs: Man or Machine at Dott 07 Design Biennale in Newcastle, UK.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN
2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN
2735-4342

To illuminate can mean to make something brighter and lighter, or it can mean to make something clearer or more understandable. ElectricDreams explores both of these meanings ofillumination and makes the relationship between light and thought tangible and visible. The private and fleeting daydreams of the dreamer are transformed into a shifting and ephemeral display of light and color.

EEG electrodes monitor the dreamer's brainwaves. This signal is read by a custom microcontroller circuit, which amplifies and interprets the electrical signals of the brain to control shifts of color via red, green, and blue light emitting diodes embedded in a hand-molded felt headdress. End-lit fiber optic cables transport the LED light through the headdress. This light and color becomes a visible extension of fleeting thought processes. Side-lit fiber optics carry these light impulses into the body of the garment to emphasize the distribution of thenervous system throughout the skin of the body. The design of the garment and headdress is based on the universal archetype of the tree of life.

Electric Skin (2006)
London, UK

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

With Jordan Benwick, K Patterson
Elumin8 printed LEDs, silk, sensors, breath, electricityThis bio-responsive garment turns the intimate breath of the wearer into pulses of electric aqua light. The inhalation and exhalation of the wearer activates a breath sensor that dims and brightens the printed LEDs of the garment. The wearer is connected to a power source by an umbilical cord/power cable creating a sense of danger and unease.

3. Barbara Layne, Studio subTela (Montreal, Canada)
Barbara is a Professor at Concordia University in Montreal and a member of the Hexagram Institute. She has lectured and exhibited internationally, including the Dorrego Gallery at the Metropolitan Museum of Design in Buenos Aires, the Ivan Dougherty Gallery in Sydney Australia, and the International Biennale of Design in St. Etienne France. Her work has been supported with numerous grants including the Canada Council for the Arts, SSHRC, Hexagram, and the Conseil des arts du Quebec. In Addition, she is the Principal Investigator of Hexagram's infrastructure grant from the Canadian Foundation for Innovation. Barbara is the Director of Studio sub- Tela, working with graduate student researchers on the development of intelligent cloth structures for the creation of artistic, performative and functional textiles.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY

Print ISSN
2735-4334

VOLUME 5, ISSUE 2, 2022, 110 – 20.

Online ISSN
2735-4342

Tunic and Vest (2005), Montreal, Canada, With Diane Morin, Hesam Khoshneviss, Jake Moore, Karine Allonce, Meera Patel

Wearable electronics, intelligent fabrics, handwoven cloth
The Tunic and Vest were early LED garments that used multi-strand, uninsulated wires in a unique wire-wrapping technique to create electronic circuits woven at the loom.

The LED array of the tunic can be triggered from a distance via a Bluetooth device. Electronic components were intentionally exposed to accent the relationship between weaving and technology.
Materials: linen, wire, Basic Stamp, Bluetooth

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY

Print ISSN
2735-4334

VOLUME 5, ISSUE 2, 2022, 110 – 20.

Online ISSN
2735-4342

Tornado Dress (2007)Montreal, CanadaWith Hesam Khoshneviss, DianeMorin, Meghan Price

LEDs, light, stormThe Tornado Dress features a Mimaki print of a tornado by Nebraska storm-chaser, Mike Hollingshead. The lining of the dress has been embroidered with conductive threads and electronic components including super bright white LEDs. Three small photocells have been embroidered tothe outside of the dress and detect the amount of ambient light. Depending onthe quantity of light that is sensed, different flashing patterns are triggered thatare reminiscent of lightning effects that can accompany severe weather situations.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

The Twining Vest (2006)Montreal, CanadaWith Diane Morin, Jake Moore,

Hesam Khoshneviss

wearable electronics, intelligent fabrics, handwoven cloth, performance This vest was created for the performance, Twining, by choreographerdancer, Yacov Sharir. Changing messages are transmitted wirelessly from offstage and displayed on the LED array worn by Sharir. Other dancers respond to the changing messages with improvisational movement in anexploration of new media communications. Materials: linen, wire, Basic Stamp, Bluetooth

4. Stijn Ossevort (Barcelona, Spain)
Stijn is a Dutch designer who studied both industrial engineering and art design. After completing his studies he worked as a free-lance designer for Ron Arad, Philips, Canary Wharf, the National Trust and as a tutor at Central Saint Martins College in London. His work is as diverse as his academic background and ranges from interactive jewelry to public sculptures. In 2001 he began to focus on wearable electronic devices and spent a year at the Interaction Institute Ivrea in Italy.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

While there he completed a project in creating user inspired wearable electronic devices. Soon after, he joined the Swiss Federal Institute of Technology (ETH) in Zurich as a researcher on wearable computing devices. He recently moved to Barcelona. Most of his work provides a critical view on the way we relate to our products.

Flare (2007)SOS Design Studio, Barcelona, Spain Dress,

experience, surrounding, wind, light

Imagine you are wearing a woolen coat outside in the rain. The coat will start to generate a distinctive smell or might even shrink a little. These reactionscan be used to give us a more comprehensive awareness of oursurroundings. The Flare Dress does just that by perceiving wind. The dress has two fabric layers. The outside layer is covered with 15 'Dandelions'. Each flower consistsof 32 LEDs that light up in a sequence that simulates dandelion seedlings being blown away. Only the flowers that face the wind become active. The windier it gets the more responsive the dress becomes.
Materials: silk, cotton, SMD LED's, microchips.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Compass Coat (2003)Interaction Institute Ivrea, ItalyWith Els Ossevoort

compass, light, orientation The Compass Coat is an extraordinary compass that indicates north by 'growing' plant shapes. In total 24 electro luminescent wires are embroidered, whichever points north starts to glow. The coat is inspired by the lack of natural elements in our urban landscape that we would ordinarily use for orientation. The Materials: wool, EL wire, magnetic resistive sensors, microchip

5. Maggie Orth: International Fashion Machines(Seattle, Washington, USA) Maggie is an artist and technologist who creates electronic textiles at her company, International Fashion Machines. Maggie is considered a pioneer in electronic textiles, fashionable computing, interface design, and art.

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Maggieholds a BFA in painting from RISD and a PhD from the MIT Media Lab. Herthemes include the interaction of technology and electricity with the body, andwhat happens when the decorative arts collide with computation. Today, herwork focuses on the development of electronic textiles as an artistic medium.

She creates programmable color change textiles that combine woven electronic circuits, printed thermochromic inks and drive electronics. She also creates interactive textile and light pieces that explore the electrical andtransmissive properties of textiles. In addition, Maggie acts as a consultant on fashionable computing to large fashion companies.

Firefly Dress & Necklace (1995)MIT Media Lab, Cambridge,Massachusetts,USAWith Emily Copper, Derek Lockwood

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Electronic textile, fashion, e-fashion)The dress is sewn with layers of conductive material separated by tulle and LEDs with conductive Velcro brushes are attached. As the wearer moves the Velcro contacts the conductive fabric and causes the LEDs to light. The necklace is powered by conductive tassels that brush an embroidered power plane on the dress. The materials used are,: metallic organza, conductive yarns, Velcro, LEDs, gold beads, silk, electronics.

6. Younghui Kim (New York, New York, USA)
Younghui teaches Interaction Design and is Chief Creative Officer of Missing Pixel, an interactive media company in New York that she co-foundedin 2000. Younghui's design projects have been recognized with several interactive design awards and presented at many prestigious international conferences. Merging her passion of design and technology, Younghui began to design interactive wearable projects. Her work was exhibited at the Emerging Technologies gallery at SIGGRAPH '04, FutureFashion, and the Gwangju Design Biennale and featured on Nippon TV, iChannel TV, as well as in various magazines and books. Younghui received her Masters degree from ITP at New York University and her BFA degree from the Parsons the New School for Design.

Stir-It-On (2007 - ongoing), New York, New York, USA & HongikUniversity,Seoul, Korea

INTERNATIONAL JOURNAL OF
MULTIDISCIPLINARY STUDIES IN ART AND TECHNOLOGY
Print ISSN 2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN 2735-4342

Wearable, touch, lights, LEDs, personal spaceStir-It-On is an interactive wearable skirt that reacts to any close encounter with its surface. The Stir-It-On skirt will has design patterns on the surface that will emit subtle light when stirred by a passing touch or rub. In crowded urban cities, many people pass near you or even touch you with their coats, jackets or bags. Stir-It-On skirt will have reactive lights that are subtle enough to be fashionableand beautiful enough to wear.

The pattern of lights will be made of LEDs that are integrated into the fabric surface using different materials such as fiber optic wires, Luminex or layers of textiles that transmit gentle light.

4. Conclusion and Recommendations

- It was envisaged that the successful creation of wearable technology would expand the visual dimensions of fashion which in turn, attributiveto the ultimate re-definition of art (fashion), humanities and technology by which our culture and lifestyle are re-shaped, and would further enhance research in this area.
- Further investigation of electronic components, materials to be applied,and electronic components for optimal fashion application.
- It is proposed that more sophisticated electronic components be developed specifically for IF by cooperating with some technologycompanies.

5. References

- Lam Chi Hin: Creation of illuminative smart fashion- Ph.D.- Hong KongPolytechnic University- 2012.
- Sabine Seymour: Fashionable Technology- SpringerWienNewYork-2008.
- Xia Wenjing: Creation of interactive fashion- Ph.D- Hong KongPolytechnic University- 2011.

Print ISSN
2735-4334
VOLUME 5, ISSUE 2, 2022, 110 – 20.
Online ISSN
2735-4342

- Riham Omran, The Benefit from the Broken Ceramic Products in Jewelry Design, International Journal of Multidisciplinary Studies in Art and Technology, Vol. (1), Issue (1), 2018, 24 – 26.
- Ruqayyah Abdo Mahmoud AlShnaoii, and Najia Abdul Razzak Omar, Heritage of Sculpture and Ceramics as a Touristic Medium to Protect Egyptian Plastic Heritage, International Journal of Multidisciplinary Studies in Art and Technology, Vol. (1), Issue (1), 2018, 27 – 39.
- Heba Mohamed Okasha Abou ElKamal, Effect of Implementation 5s Methodology in Warehouses at the Egyptian Textiles & Apparel Factory (Case Study), International Journal of Multidisciplinary Studies in Art and Technology, Vol. (1), Issue (1), 2018,68 – 81.
- Salwa Mahmoud Hanafy, Plastic Vision for Teaching Metal Works, International Journal of Multidisciplinary Studies in Art and Technology, Vol. (1), Issue (2), 2018,1-3.