# INTERROGATING FASHION: IS THE FUTURE OF FASHION DIGITAL?

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## ABSTRACT

This paper discusses fashion in the digital age and particularly the impact of emerging technologies, based on inter-disciplinary debates which have recently taken place within the Digital Fashion strand of *Interrogating Fashion*, a Designing for the 21st Century EPSRC/AHRC research cluster.

Fashion is one of the few remaining craft-based industries, relying on manual labour for manufacturing across its wide spectrum of levels from couture to mass production. The continuing impact of digital technologies for traditional skills and processes raises complex issues for the industry. Fashion is a fast-moving industry often condemned as frivolous and unimportant, but represents one of the major economic players on the global stage. Everyone has a strong personal relationship with clothes, one which is intimate and far from passive. Textiles and clothing are now the focus of increasing research as the carriers of ever-growing functionalities, from odour eating and moisture management to self-cleaning and therapeutic properties.

The integration of electronic responsiveness into fabrics via new technologies, materials and processes will render clothing more 'intelligent' and responsive to our needs for protection, care and wellbeing, in addition to its aesthetic qualities and will change our relationship with what we wear. If our intimate and emotional states can more easily be revealed through electronic textiles and programmable functionalities, will our clothes know more about us than we do? Can we be in control of our identity and social interactions when the environment is embedded with sensors, cameras and tags? In the foreseeable future, we will be able to walk into a service bureau with our scanned body measurements on a card and come away with a new outfit in a matter of hours. Could a paradigmatic shift to 'fashion on demand' be a partial solution to the waste and obsolescence inherent in the cycles of fashion?

## 1. INTRODUCTION

Interrogating Fashion: New Paradigms for Fashion in the 21st Century is a research cluster, led by the author, developed during 2005 under the Designing for the 21st Century initiative, jointly funded by two UK research councils EPSRC (Engineering and Physical Sciences) and AHRC (Arts and Humanities). The purpose was to establish a much-needed forum for the discussion of issues surrounding fashion today, and to consider new paradigms for design and manufacturing in the industry. It brought together a wide-ranging group of academics and practitioners: fashion and textile designers, artists, industrial designers, technologists, computer and material scientists, cultural theorists, design theorists, marketers, and researchers in industry in order to interrogate fashion, and challenge existing practices and processes within the textiles and clothing industries. The cluster aimed to identify key questions and develop research projects which would have genuine impact on both academia and the manufacturing sector, to develop products which are by design more sustainable.

There were three interrelated key discussion themes within the cluster:

- **Digital Fashion?** From craft to mass customisation
- **Fashion in Context**: presentation and display, audience and engagement
- **The Fashion Paradox**: transience and sustainability

This paper looks at the role and status of fashion for the new century from the perspective of the Digital Fashion theme, and particularly the impact emerging technologies are now having and will continue to have in the clothing, textiles and fashion industries. It presents some of the ideas and issues which were debated in cluster workshops and in public debate and performance at the Institute of Contemporary Arts (ICA), London in November 2005. All three themes, including the Fashion Paradox, concerned with the contradictions of the industry's economic importance versus the never-ending cycles of fashion itself, were also debated at a symposium at London College of Fashion. This aimed to raise awareness of the complex issues arising and set a research agenda for the next few years.

Fashion is one of the last craft-based industries, relying on manual labour for manufacturing across a spectrum of levels from couture to mass production. Fashion is also a fast-moving industry often condemned as frivolous and unimportant, but represents one of the major economic players on the global stage. It is multi-disciplinary, and has universal impact in its global context of design, production, marketing, distribution and consumption. The continuing impact of digital technologies on traditional skills and processes raises complex issues for the industry. Textiles and clothing are now the focus of increasing attention as the carriers of an ever-growing range of functionalities, from odour eating and moisture management to self-cleaning and healing properties, and there is much current research and experimentation underway into the integration of electronic responsiveness and delivery of therapies into clothing. Everyone has a strong personal relationship with clothes, and that relationship is intimate and far from passive. As we apply new ways of thinking, new technologies materials and processes we will, in the not too distant future, have more intelligent and responsive clothes. But we need to ask how might this affect or enhance our lives?

## 2. **DIGITAL CONVERGENCE**

The convergence of digital technologies across many platforms is having profound effects on lifestyle and breaking down divisions between previously separate areas. Data transmission and storage, music, still and moving images are all now effectively technically indistinguishable and can be combined at will to develop new and interactive or, increasingly, immersive experiences. The arrival of the information age and its enhanced communications through internet technologies, coupled with technological and scientific advances increasing in pace, has resulted in western lifestyles speeding up (including faster and faster fashion cycles), and globalisation of manufacturing and markets. People, goods, food and services travelling around the world has become the expected norm. Many issues were raised in discussions as to the future nature of fashion and textiles in this wider context, for example: Will we expect more help from our clothing in conducting our lives, to combat increasing fears, to sense hostile or polluted environments or to monitor changes in our physical condition? If we look to embedding into clothing more technological functions such as music and communications how can these be as flexible as current fashions? Why would we want wearable technology, when we don't yet know the long term effects of the gadgets we are currently using? If our intimate and emotional states can more easily be revealed

through electronic textiles and functionalities, will our clothes know more about us than we do? These future possibilities will all affect our relationship with clothes, but what are the opportunities created? Can we be in control of our identity and social interactions when the environment is embedded with sensors, chips and tags? How did Orwell's 'big brother' arrive without anyone seeming to notice?

## 3.**PERVASIVE COMPUTING IN SOCIETY**

As more and more functionalities are routed through mobile phones, ubiquitous computing may take away our freedom to choose whether to be "connected" – will we have a choice whether to engage in interaction with sensors embedded throughout our physical environment? There is a rapidly growing volume of research activity in the fields of smart textiles and intelligent clothing, accessories and interiors which will enable these functions in the near future.[1] Will we retreat into a 'digital bubble' as our own avatar, creating our own virtual reality? Ian Pearson, futurologist at British Telecom proposed this provocative concept in the first Digital Fashion workshop, and at the ICA. His vision is one in which the equivalent of your personal website, blog and organiser radiates around you and becomes a virtual world in which you can control your image (and maybe those of other people) especially those you like and want to interact with. You could show whatever persona you want from a 'library of potential virtual appearances' and interact with other digital bubbles, transferring personal date and other communications easily, with or without contact[2]. What are the implications for authenticity and security with 'augmented reality'? In a virtual world, who could be controlling your image? We may become a walking data bank, revealing our personal information to others (which of course is readily being done in public mobile phone conversations). The merging of the private and public spheres, the dissolution of clear boundaries between common knowledge and personal information is already very evident. Almost without comment, Britain has become the most widely 'surveyed' nation in the world with its ubiquitous speed cameras and CCTV cameras (though now the focus has shifted to balancing security fears and personal safety with civil liberty issues). The advent of satellite tracking technology and global positioning systems (as now used on public transport and especially mobile phones) enables those who wish to track our movements (and have access to the technology), to do so without difficulty. The implications are by turns threatening (Big Brother controlling mechanisms) or reassuring (monitoring the whereabouts and safety of children). Wearable computing has been under development for over 20 years, but successful clothing products are proving elusive, until the various elements, such as reliable conductive textile technology, power sources, performance reliability and washability are sufficiently synchronised. Estimates range from 5-15 years for the first 'killer application' in truly wearable technology. However, advances in research for the medical and healthcare sector have recently produced a number of wearable technology products launched onto the commercial market, such as the Numatrex heart monitoring sports bra, or the WarmX heated vest[3].

[1] See for example X Tao, ed (2005), Wearable electronics and photonics, Woodhead, Cambridge, and proceedings of numerous conferences such as the annual Avantex symposium within Techtextil trade fair, Germany and USA; *Wearable Futures*, UK 2005

[2] Quote from Ian Pearson's presentation at the ICA event *Is the Future of Fashion Digital?* 28th Nov 2005

[3] see Black S, 'A futuristic view' in LF Van Langenhove, ed (2006) *Smart Textiles for Medical and Healthcare: materials, systems and applications*, Woodhead, and www.numatrex.com, www.WarmX.de

The ubiquitous barcode, which provides sales, logistics and marketing information to retailers is being extended to electronic tagging of products such as food labelling, and is increasingly used in clothing. Radio frequency identification (RFID) tags should be removed at point of sale – but if they are not – who will be tracking their (and hence our) movements? How aware is the consumer when buying, that certain clothing may be tagged, and aren't they likely to forget to remove it? The greater implications of the new connected society must be considered, and good design is a mechanism which can provide choices and new solutions, balancing functional and logistical improvements and convenience with responsibility and forward thinking.

Like nanotechnology, RFID tagging – of products and people from clubbers to prisoners – has raised major issues and has both its champions and detractors.[4] Often artists are the first to highlight issues through experimentation with emerging technologies, such as the recent workshop for artists working with this technology held in Amsterdam, addressing the new 'Internet of Things' where objects can be connected to each other, read and recognised by computers[5]. Joanna Berzowska, co-founder of International Fashion Machines[6] and now researcher at Concordia University in Canada, raises many social issues, such as intimacy and privacy, related to wearable technology, through her experimental clothing prototypes and performances, several of which were featured at this Interrogating Fashion event.

If ubiquitous computing has the effect of embedding and distributing the processing functions into objects, and responding to stimuli such as movement and pressure, making the technology disappear, then how does that change our relationship with objects? Will we choose and judge products mainly by what they can do for us? How will we relate to clothing as it becomes smarter and more responsive? How can we choose not to participate if computer chips are embedded in our surroundings? Will the body become the computer interface, and the skin activated with implanted technology for uses from aesthetic appearance and drug delivery to surveillance? With a smart second skin, could we be buying identities on eBay? These may be far fetched ideas, but the negative implications are clear if they are not thought through.

## 4. NEW DESIGN AND MANUFACTURING PROCESSES – FASHION ON DEMAND?

### 4.1 Future fashions

The fashion industry operates on many levels. It is one of the few remaining industries to be heavily reliant on manual labour and skill in manufacturing, Despite bulk cutting, preparation and automatic handling of fabric in apparel production lines, the final product is an assembly of skilled labour with each garment being sewn individually. The spectrum covered by the fashion industry is very broad, with a hierarchical structure which correlates price with both exclusivity and production methods. It covers, starting at the haute couture level, hand-crafted complexity and unique pieces completely constructed by hand, using surface decoration and hand-embellished fabric

[4] See for example K Finkenzeller (2003) *The RFID Handbook*, , M O'Connor, *RFID and the media revolution* at www.therfidjournal.com 13th April 2005.
[5] workshop organised by Mediamatic, Amsterdam, 'Internet of Things' May 2006
[6] an experimental partnership with Maggie Orth, based in Canada, investigating electronic functionality in textiles and clothing

such as beading and embroidery; bespoke made-to measure tailoring and clothing; named designer level fashion, where emphasis is on innovation in cut and detail, quality of fabrication and exclusivity through relatively limited production; branded mass produced goods for the mainstream market, where quality is maintained at a level according to price points and market segment; and finally the value mass market in which volume at the lowest price (and reduced quality) is the driving factor. The industry has polarised in recent years between the two extremes of luxury and value fashion, as manufacturing sourcing has moved around the world and the consumer has become more design aware and demanding. The impact of the abolition in worldwide trading quotas is still being felt, and new responses to the future of the fashion and clothing industries are required.

A paradigm shift is taking place in the mainstream fashion industry in relation to pattern making and design development. Fashion is still a craft-based industry, relying on manual labour and the sewing machine for manufacturing individual items of clothing, for high level creative work in couture and draping of form, bespoke tailoring, and fabric embroidery and embellishment (particularly in India and China). Manual pattern making is gradually being replaced by computer drafting and grading systems at the commercial level of production, but design interpretation by sample pattern makers is still a necessary and highly respected manual skillset. The recent application of 3D body scanning technologies in a fashion context[7] points to the potential for individualised patterns and bespoke service for a new paradigm of customised 'fashion on demand', and its consequent major changes in existing processes and methodologies. Trials of 3D systems for fit and custom clothing manufacture are further advanced in the US than in Europe, but there is much research and design development work still to be achieved before 3D design systems can become commonplace.

Utilising new materials and methods, existing materials in new processes, or new materials with traditional processes can deliver benefits of more sustainable production by creating innovative products with less waste, and moving towards the new paradigm of fashion on demand. The use of rapid prototyping technologies and 3D printing to produce 'finished' products, allied to digital printing and image making, digital communications and 3D scanning technologies, points towards more customised and personalised products in the future. With globalised supply chains, and internet communication, location is theoretically less and less important, but being close to the customer and providing new services may provide new high value niche markets in declining manufacturing sectors such as the UK. The new processes have the added advantage of reduced labour costs and are by virtue of reduced stock holding, also more economical in their use of materials. In a similar manner, the ability of recently developed advanced knitting technologies to create completely finished items of knitwear straight from the machine, without costly making up processes, could offer new opportunities for customised production 'on demand', particularly in sportswear and medical applications. In Japan one leading knitting machine company Shima Seiki have already opened three boutiques for knitwear on demand, in which the customer can order a personalised knitted garment from a range of designs or develop their own design for delivery in 1 to 2 weeks[8]. Creative design thinking must underpin these developments, in order to maximise the potential to change the way fashion can be

[7] For example, Brooks Brothers and TC2 technology in New York, Bodymetrics virtual try-on for jeans in Selfridges London and Bon Marche in Paris

[8] Author interview with Shima Seiki April 2006

produced and consumed by offering innovation and flexibility, tailored to personal requirements, as a quasi-bespoke service. This indicates a return to smaller scale personalised production demonstrated by earlier notions of bespoke and couture, which underwent transition through small batch production to mass production and now on to potential mass customisation and fashion on demand. This provides once again for individual needs (eg fit) and desires (eg colour preference) with an updated service based on technology, whilst still benefiting from a cost-effective production process. How long before we have true 'fashion on demand' and be able to walk into a bureau with our body measurements on a card and come away with a new outfit in a matter of hours?

### 4.2 Digital printing

Digital printing technology is now beginning to mature, and move from a technology for just prototypes to a bulk manufacturing process, as new production scale machinery has been introduced in recent years, and adopted especially in Italian manufacturing, becoming a cost effective route. Digital printing technology creates new possibilities for engineered and bespoke clothing and fashion on demand, as there is very little difference between the unit costs and process for a one-off print and a multiple print run, a compete paradigm shift for the printed textiles industry. Any digital image can now be printed and applied to more and more unusual surfaces, as evident by the one – off banners and imagery which now adorn everything from buildings to buses. Traditional concerns of scale and repeat can be completely overturned, the number of colours is no longer restricted by the number of screens required, new types of imagery can be reproduced, abstract as well as photographic, and eventually it may be possible to print continuous imagery. However design and technology have to develop in tandem in order to avoid either gimmicks or low level designs. Questions still to be answered include: does the digital printing process have more or less environmental impact than traditional screen printing and how will bulk digital printing contribute to sustainability? Although intuition indicates that the use of water and inks is very different, these questions can only be answered by serious research.

Digital convergence now enables exchange of data between a range of functions, media and end uses stimulating new genres and connections, especially in artistic practice – envisage perhaps the use of real-time data as raw material for a visual performance, or musical sound as inspiration for fashion. However, digital technology and craft are not in fact polar opposites because humans still design and control every step of the process - the derivation of the word 'digital' refers to the fingers or digits of the human hand, used for counting and manipulating. Tacit knowledge and 'old' technology are still important in the design and production of fashion and accessories. Manual experiments play a significant part in the ideation and development of many products, through sketching, sampling and manipulation of materials. However, as software become more and more sophisticated, and three-dimensional representation in the virtual world reaches ever-greater realism, the development of fashion will undergo a compete shift from current mainly two-dimensional processes to conquer the complexities of three dimensional design for soft products.

### 4.3 Future Fashions and the role of design

Fashion itself in terms of silhouette and form may not be too different in the future but fabrics will be expected to perform more in a range of ways such as by 'self cleaning' through protective nano-scale coatings and requiring less laundering, or 'smart' and 'feelgood' fabrics which can monitor environmental conditions and respond to needs by delivering therapies or even raising the alarm. Perhaps as a consequence, the 'freshness' feeling of newly laundered clothes, which has become a pleasurable expectation may have to be simulated in another way – perfumes released on contact perhaps.

The significant convergence of material and biomedical sciences, nano- and micro-technologies, electronics and computing with textiles and clothing as the interface is quickly leading to new paradigms in function and purpose of clothing and accessories. The increasing use of electronics and merging of data processing functionalities into textiles and clothing raises new issues about the meaning of clothes and the socio-political issues of control and the questioning of cultural norms. There may be many benefits especially in medical and healthcare applications – remote monitoring of patients, early warning systems and self-diagnosis are some of the potential benefits.

The role of the designer carries with it crucial responsibilities for choices in materials and processes, which inherently means ethical and environmental implications. Materials are changing and developing at a fast pace, and the role of the designer is changing to embrace more technological issues. Designers are often inspired by starting to work with new materials, but, there can be a danger in being technology led - although this can excite and inspire when it is new – sometimes leading to short term superficiality (think of tee-shirts with colour changing motifs). Instead, design needs to define a problem or need as a starting point. Serious research is underway in Asia, Europe and North America into colour and pattern changes in fabrics, for example the 'Electric Plaid' from International Fashion Machines. The surface of our clothes has the potential to become a constantly changing interface, when current research by technology companies such as Philips (Holland) and Cambridge Display Technologies (UK) is fully realised. As new ways of thinking, new technologies, materials and processes are applied, we will undoubtedly have more intelligent and responsive clothes.

## 5 DEBATE AND EXPERIMENTAL DEMONSTRATIONS

To bring to life such a large agenda, a day of events discussing and demonstrating some of the issues arising from the Digital Fashion theme was staged at the ICA, consisting of five speakers and a panel debate, followed by experimental demonstrations of concepts utilising emerging technologies in practice. Members of the public joined an academic and industry audience to add their views on the issues surrounding technology and fashion. This was the first day of a two day event - the culmination of the year's activities during 2005 of the Interrogating Fashion project. In case the audience, and ourselves, should forget the reality and scope of the fashion business today with all the future gazing, above the heads of the panel was shown a simultaneous screening of actual retail activity in Top Shop, Oxford Circus, on a busy Saturday afternoon, contrasted with the more rarefied activity in the Savile Row shop of cool urban designers Oki-ni, transmitted live by webcam. The audience and the panel were able to observe shopping as anthropologists might study behaviour, and see the huge difference

in pace relating to the different market levels representing both ‘fast’ and ‘slow’ fashion.

Figure 1 Panel for ICA debate showing screen projections of retail activity in Top Shop

The panel (Fig 1) was chaired by Sandy Black, and its members were (left to right) :
**Philip Delamore**: designer and research fellow at London College of Fashion who presented fashion using engineered digital printing processes
**Helen Storey**: designer, artist and research fellow at London College of Fashion who spoke of her journey through fashion to public engagement with science and emergent social issues.
**Del Stark**: CEO of the new **European Nanotechnology Trade** Organisation who spoke on future nanotechnology applications in textiles and fashion.
**Janne Kyttanen** : of **Freedom of Creation** design consultancy Amsterdam, showed direct manufacturing of products using 3D printing processes
**Mark Eley**: one half of the **Eley Kishimoto** fashion label (known for prints) who took a sceptical view on digital futures
**Dr Stan Swallow** of **Intelligent Textiles** whose UK based company produces innovative woven electronic circuitry for products and clothing for wellbeing
**Sue Jenkyn-Jones**: Senior lecturer and consultant for online fashion
**Ian Pearson**: **BT futurologist** and author who spoke on future technology and lifestyle scenarios such as the ‘digital bubble’, skin-based delivery technologies and virtual identities

### 5.1 Discussion

Questions addressed by the panel included: What technologies will most impact the future of fashion and clothing? How will the convergence of digital technologies affect our relationship with clothes, and what are the opportunities? The panel discussed the impact of emerging technologies on the role and status of fashion in the 21st century from their different perspectives and answered questions from the audience. Some comments raised the issue of fear of new technologies, which comes up regularly when discussing nanotechnology – a broad term referring to technologies at the atomic scale - which encompasses many disciplines and activities from pharmaceuticals and cosmetics to biosensors, organic electronics and protective coatings for textiles. If nanotechnology is able to purify water for developing countries as well as screen us from harmful UV sunrays, and provide new means of delivering medications, then the benefits may outweigh the fears. The funding driving this research has mainly derived from military and governmental sources, for soldier protection, but now has other commercial and medical drivers. One area of particular military interest is the concept of 'chameleon outfits' – within which one could become invisible, taking on reflections of the surroundings, or choose to stand out or blend in. However, with a digital outer layer, others may be able hack into your appearance for their own use. Identity fraud is already an increasing issue which could be exacerbated by the growth in digital data available for harvest. It is worth noting that real money is already being made from the sale of virtual clothing for avatars, or internet persona, especially in Asian markets such as Korea, and that adopting a digital disguise via the internet is likely to develop.

The market for fashion and consumer products has become increasingly fickle – loyalties have broken down and the consumer purchases on a complex mixture of factors including aesthetics, novelty, performance, value and recommendation. Market forces are no longer as predictable, traditional marketing no longer applies – peer perception and recommendation of a viral nature on the internet are highly influential, demonstrating a new consumer power, where new value systems can lead the way, for example in environmental awareness or ethical practices. There is a new form of tribalism in the market, where fashion trends emerge from the ground up. Consequently greater pressures are exerted on the fashion supply chain to supply the right products at the right time, and product data management systems become vital in tracking global production. Local versus global has become an issue that cannot be ignored – with the new mantra 'think global, act local'.[9]

### 5.2 Performance Demonstrations

These demonstrations were designed to bring to life some of the research and development activity discussed in the Digital Fashion workshops and were evolved in response to the cluster agenda. All work shown was work in progress, prototypes developed as part of ongoing research projects. The purpose was to engage the audience and the academic community directly in the issues arising from the research, through a performative interaction.

[9] 'Think global, act local' - original concept based on Scottish town planner Sir Patrick Geddes 1915 text *Cities in Evolution*, and title of recent book on the life and legacy of Geddes by W Stephen, Luath Press, Edinburgh. This phrase is now widely used particularly in reference to internet marketing and contemporary business practices

First **Joanna Berzowska**, director of **Extra Soft Labs** from Concordia University, Montreal, Canada showed films of several of her 'Memory Rich clothing' - dresses and clothes which respond to intimate interactions, such as touch and whispering, with lights and colour changes which fade over time. (see also www.berzowska.com) There was then a live demonstration of three 'Constellation dresses' which lit up when the wearers connected to each other through metal snaps, which was followed by the 'Slow moving flowering dress' (Fig 2) where the flowers made of shape memory fabrics including nitinol, opened and closed when powered with electricity. Joanna is an artist working in wearable soft computation, and these pieces are all prototypes for the purpose of raising the socio-cultural issues revealed through emerging technology. Berzowska's work was recently featured in the 2005 V&A *Touch Me* exhibition and she gave a full keynote presentation at the Interrogating Fashion symposium.

Fig 2

The second demonstration was from **Thomas Kitazawa**, intermedia architect, with his **Rythmi-city** project, an interactive installation sound and visual concept which will highlight the urban heart of London represented by Oxford Circus with the artery of Oxford Street feeding it. London College of Fashion is situated right at Oxford Circus, and Interrogating Fashion collaborated with Thomas and London College of Fashion graduate **Georgie Ichikawa** to realise designs and make two outfits for modern 'urban angels' street wardens which incorporate programmable displays with input from interactions with the general public. (Fig 4) In turn this data would feed into the larger architectural system, interconnecting people through colour and sound tapestry. This was a demonstration of prototype outfits incorporating LED display technology supplied by **Nyx** USA. The work is currently being developed further.

The third demonstration was by **Sarah Kettley** who is completing her PhD at Napier University in Edinburgh. Sarah is a practicing jeweller, and has investigated the interface between jewellery and electronics from a crafts practitioners approach, focusing on social interactions and display, and the relationships between individuals and the group, through wearing specially designed jewellery objects. She demonstrated 5 necklace pieces made by herself which incorporated colour coded lights powered with miniature 'speck' processors which flashed at varying rates according to proximity, and explored the potential for this work both aesthetically and socially. (Figs 5 and 6)

Following this demonstration, a short film was shown: 'Sometime' by researcher **Jayne Wallace**, from Sheffield Hallam University, who is working with concepts of responsive jewellery objects. The film envisages the evocation of personal memories triggered by the jewellery and fleetingly displayed in public places as the wearer moves through their environment.

The final demonstration was 'Miriorama' by **Jeremy Radvan** and **Stuart Smith** of **Laptop Jams** based in Brighton. This was a very different piece form the previous demonstration, based on movement and drawing. Pre- recorded video loops of a model's body movements are projected and played back randomly creating a surreal 'doll-like' movement which Jeremy used as inspiration for linear drawings on the computer. These were superimposed and gradually merged and followed on to a second body dressed in extraordinary clothes by **Jessica Bugg** (Fig 3). This prototype will be further developed as a new inspirational tool for design.

## 6. CONCLUSION

This live event was very well received by the audience, animating some of the issues involved in the digital fashion future, and raising awareness as a stepping stone to further research in these areas. Unless we harness the digital landscape to create less but smarter fashion more sustainably so our clothes perhaps last longer than one or two seasons, don't need washing so often, can have multiple formats, or change their shape, pattern or colour in response to changing requirements, then the mountains of fashion waste will never be reduced. Perhaps we will take our clothes in for service and repair and renewal, much as we expect to with cars, low maintenance clothing will become a reality. Whatever the outcomes of current research, as more responsiveness and intelligent performance is inbuilt into fabrics and clothing we will undoubtedly develop a fundamentally different relationship with our clothes and with fashion itself.

A new role for designers and creative individuals has emerged in spotting new opportunities by looking at things in new ways – design thinking is at last becoming more central to the business agenda. It is vital to remember that ongoing research is not an end in itself, but is ultimately about developing real products and processes for real people. These products must reconcile the economic imperatives of fashion with sustainability at the same time meeting our personal and symbolic needs. It is hoped that this goal and its research agenda, has in some way been facilitated by the activities involved in Interrogating Fashion.

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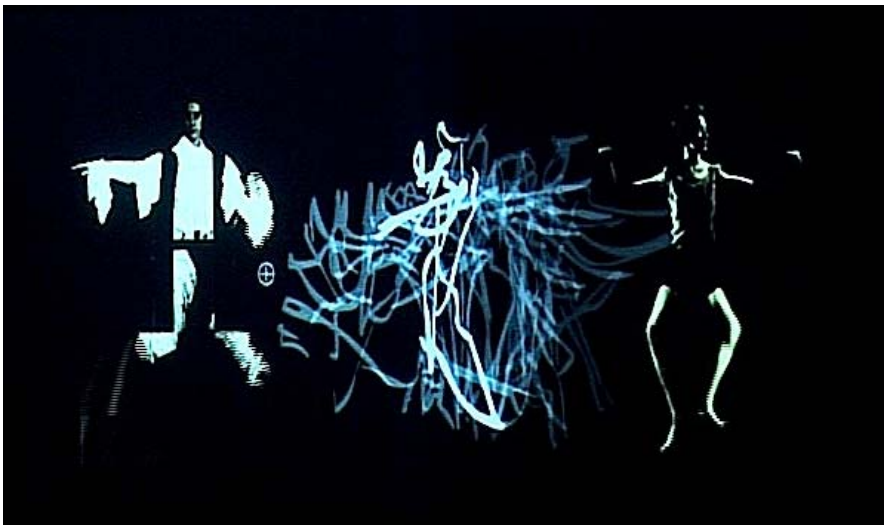

Fig 3
Miriorama by Laptop Jams

Jeremy Radvan and Stuart Smith

Fig 4
Design for Urban Angels by Georgie Ichikawa
Rhythmicity project by Thomas Kitazawa

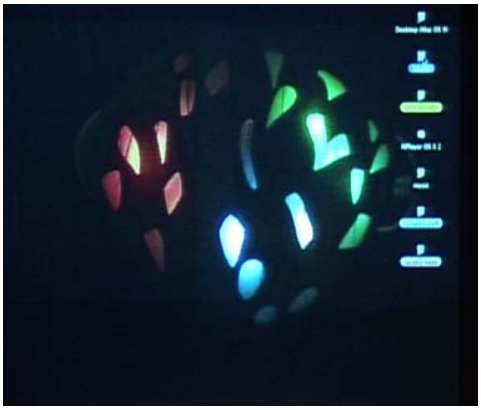

Fig 5 and 6
Interactive jewellery by Sarah Kettley featuring speckled computing