Conductive Skin

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Background

In an era when life is increasingly regulated by gadgets and machines there is a drive towards the miniaturisation of electronics for the purpose of portability on and around the body. With modern technology there is no reason why the functionality of a mobile phone could not now be included on the surface of body. Current trends towards a post-desktop model of computer interaction suggests that information processing will become more integrated into everyday objects and activities.

The concept of printing electronics onto the body or using the skin as a substrate for transferring information, fits with this model. It would allow an individual to engage with computational devices and systems through gesture, movement and touch, in an intuitive fashion. It would also allow the creation of new methods of human-computer interaction and the augmenting of the body with new functionality.
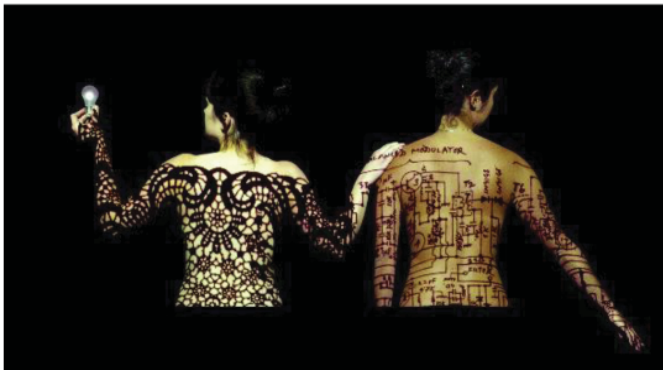

Figure 1

Description of Interactive System

Bare is a conductive ink that is applied directly onto the skin to bridge the gap between electronics and the body. It is the result of an experimental graduate project at the RCA, which started with the concept of 'Parasitic Technology'. The material allows users to create custom electronics and interact with technology through intuitive gesture. It also allows information to be sent on the surface of the skin from person to person or person to object. Bare is skin-safe and non-invasive. The formulation is carbon based and water-soluble and may be washed off the skin and reclaimed as a sustainable product. It may be applied in a number of ways including brushing on, stamping or spraying and has future potential for use with conventional printing processes on the body.

Through experimentation, the following potential application areas have been identified: dance, music, expression, computer interfaces, audio/visual communication and medical devices. Currently, skin-safe conductive ink is best suited to low power, information-lean applications. Throughout the project a series of experiments were conducted to explore the capability of the ink.
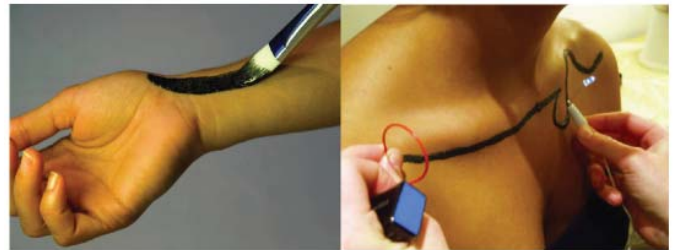

Figure 2

The video attached details one such demonstration, The Music Box, which involves combining sound and music with music and touch. This was a creative space constructed to test the conductive ink and interactions with the body. The functionality of a midi keyboard was mapped onto the surfaces of the space with a matrix of resistance switches that input signals to a computer. A professional dancer was invited to interactive with the space and the conductive ink was applied to different parts of her skin in an iterative process. As different parts of her body touched the surfaces different switches were closed as electrical signals passed over her skin, creating musical notes and patterns. The auditory and visual performance resulting from this 'reverse choreography' is emotionally captivating. It is anticipated that by covering larger surfaces and with the interaction of several dancers, more interesting cumulative effects may be established.

Figure 3

Future Potential Applications

The ability to transfer data and electrical signals on the body provides some exciting opportunities for future product and interaction design. Some of the applications currently being investigated are as follows:

Communication: new way to access/ transfer data from person to person, person to computer or vice versa.

Security: affording access to restricted areas in the form of a temporary RFID stamp, for example, to create new form of passport or Oyster card.

Design for disability: as a sign language aid to provide 'sign' to voice translation by interfacing ink applied to hands with a computer.

Sustainable energy: harvesting human body power in conjunction with micro power-generators to provide energy to hand held electronics, eliminating batteries.

Medical: networking sensors onto the body for monitoring vitals.

Military: dematerialising devices onto the body in order allow soldiers to move more freely, for example antenna that can be painted on the body or buildings.

Fashion: a form of interactive body decoration using jewellery-type interfaces with the computer.

Non-skin applications: the ink may be applied to other surfaces to replace conventional wiring of building.