

Robot Futures: Vision and Touch in Robotics

Saturday 8 July 2017

Science Museum (Queen's Gate entrance)

165 Queen's Gate, Kensington, London, SW7 5HD

This symposium brings together engineers, scientists, cultural theorists and artists who work in the field of robotics to explore notions of embodiment, telepresence and virtual and augmented realities.

Humans are embodied in robotic explorers; endowing them with 'eyes' and 'hands' robots are able to relate perceptions and experiences of places and objects physically unavailable to us. Although such robots might not 'look' human, it is the desire to see stereoscopically, and to feel through all the senses that endow robots with anthropomorphic qualities; we see and feel *through* the robot. In this way robots enable a more embodied experience, which is nonetheless mediated. It is in the development of virtual reality technologies that is increasingly enabling us to see and feel *as* the robot in order to get us closer to a more immersive experience.

Programme:

8.30: Registration

9 - 10: Tour of *Robots* show

10 - 10.30: Break and demonstration of ROBOT DE NIRO by Imperial College Robotics Lab

10:30 - 12.30: Panel 1: Robotic Vision and Robotic Touch: seeing and feeling *through* robots

12.30 - 1.30: Lunch

13.30 - 15.15: Panel 2: Robot / Human Fictions

15.15 - 16.00: Break and demonstration of ROBOT DE NIRO by Imperial College Robotics Lab

16.00 - 18.00: Panel 3: Virtual and Augmented Reality: seeing and feeling *as* robots

Panel information:

10.30 - 12.30

PANEL 1 – Robotic Vision and Robotic Touch: seeing and feeling *through* robots

10.30 **Imperial College Robotics Lab, Dr Petar Kormushev**

Robot DE NIRO presentation (demo in break)

10.50 **Gregory Minnissale**

Nonlinear Vision and Touch in Art, Science and Technology

11.10 **Joey Holder**

Ophiux

11.30 **Nea Ehrlich**

*Envisioning 21st Century Techno-Vision: The Ethics and Aesthetics of Machine
Witnessing in Non-Fiction*

11.50 **Panel discussion co-chaired by Luci Eldridge and Nina Trivedi**

13.30 - 15.15

PANEL 2 – Robot / Human Fictions

13.30 **Bianca Westermann**

*Robotic Presences: Encounters with the Artificial between Social Companionship and
Embodied Representation*

13.50 **Ruairi Glynn**

Animacy Aesthetics

14.10 **Maya Oppenheimer**

*The Robotics Division of the Dramaco Instrument Company Introduces the
Ensocellorator Reliance Pro II*

14.30 **Panel discussion chaired by Dr Helen Hester, Associate Professor of Media and
Communication at the University of West London**

16.00 - 18.00

PANEL 3 – Virtual and Augmented Reality: seeing and feeling *as* robots

16.00 **Stephen Ellis** (via Skype)

On the character, scope, and meaning of the spatial user interface to Virtual Environments: its recent and deep history

16.20 **Simon Julier**

Title to be confirmed

16.40 **Nicola Plant**

Expressive movement in Virtual Reality: Touching sentience.

17.00 **Jeremiah Ambrose**

Systems of Seeing: Virtual Gaze Interaction

17.20 **Panel discussion chaired by Dr Ryan Bishop, Professor at the Winchester Centre for Global Futures in Art Design & Media, University of Southampton**

Abstracts:

PANEL 1 – Robotic Vision and Robotic Touch: seeing and feeling *through* robots

Imperial College Robotics Lab, Dr Petar Kormushev

Robot DE NIRO

Meet the robotics researchers from Imperial College London who built Robot DE NIRO to study how machines can learn. As artificial intelligence becomes more advanced, it's not enough to just pre-program a robot with rigid instructions to follow. Machines are increasingly able to learn how to recognise patterns in data, but learning how to interact with the physical world is a different matter. Robot DE NIRO is learning how to use its two arms and hands to manipulate objects and interact with people by observing and modifying its own behaviour.

Biography:

Dr Petar Kormushev is Director of the Robot Intelligence Lab at Imperial College London. He is also a Lecturer (equiv. to: Assistant Professor) in Robotics and Computing at the Dyson School of Design Engineering. He holds a PhD in Computational Intelligence from Tokyo Institute of Technology, an MSc in Artificial Intelligence, an MSc in Bio- and Medical Informatics, and a BSc in Computer Science. Dr Kormushev's research interests include machine learning and robot learning algorithms, especially reinforcement learning for intelligent robot behavior. His long-term goal is to create autonomous robots that can learn by themselves and adapt to dynamic environments.

Robot Intelligence Lab: <http://www.imperial.ac.uk/robot-intelligence/>

Personal website: <http://kormushev.com>

Gregory Minissale

Nonlinear Vision and Touch in Art, Science and Technology

As a product of logical and methodical programming 'machine vision' tends to scan the visual field in an efficient and purposeful manner. Art is important in teaching us that vision and touch are not just for logical and consciously-willed extraction of information from the environment. Vision and touch are also creative activities that function in meandering and improvised ways to enhance art making and immersive experience. This paper explores a multidisciplinary approach to vision and touch discussing the technology of eye tracking, the nonlinear dynamics of viewing art and aspects of perceptual psychology.

Biography:

Minissale is Head of Art History at the University of Auckland and specialises in critical theory and neuroscientific and psychological approaches to vision in art and design. He has led curatorial and pedagogical projects on vision science, eye tracking and art. He is author of *The Psychology of Contemporary Art* (Cambridge University Press, 2013) and 'Becoming-Cyborg' in L. Grabbe, P. Rupert-Kruse, & N. Schmitz (Eds.), *Cyborgian Images: The Moving Image between Apparatus and Body* (Darmstadt: Buchner-Verlag), pp. 164-185. He is currently completing a book manuscript on mind wandering in art.

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Joey Holder

Ophiux

For her presentation Joey Holder will talk about her recent project 'Ophiux', a touring installation and film (Wysing Arts Centre, Cambridge and Sonic Acts, Amsterdam). Ophiux gives a glimpse into a near future that whilst fictional, is not far from reality and is founded on current scientific research. The work imagines a future in which synthetic biology has been fully realized and applied to both advance human evolution and increase life expectancy, and where human biology has been computer programmed. To conceive the exhibition, Holder worked in close collaboration with scientists she met during her residency at Wysing in 2015 - Dr Marco Galardini, a Computational Biologist at the European Bioinformatics Institute at the Wellcome Trust Genome Campus, Cambridge, and Dr Katrin Linse, Senior Biodiversity Biologist at the British Antarctic Survey, Cambridge. Ophiux visualizes how current digital developments are used to extract data from DNA. The exhibition proposes that in the future the human population, and millions of other organisms, will have been genetically sequenced in order to extract data, with the aim of furthering life. Holder's work reflects on the reality of today's healthcare, in which our bodies are increasingly mapped and digitized. The installation includes larger than life-sized models of biological imaging machines as well as genetic sequencing equipment. It simulates not only the collection of data from our own bodies but also the sampling of data from other organisms by a speculative pharmaceutical company: 'Ophiux'.

Biography:

Joey Holder completed her BA in Fine Art at Kingston in 1998 and her Masters in Fine Art at Goldsmiths in 2010. Her artistic practice and research raises philosophical questions of our universe and things yet unknown, and poses open-ended questions about the future of science, medicine, biology and human-machine interactions.

www.joeyholder.com

Nea Ehrlich

Envisioning 21st Century Techno-Vision: The Ethics and Aesthetics of Machine Witnessing in Non-Fiction

How do contemporary technologies of image production shape the aesthetics, authenticity and ethics of non-fiction works? As computer-aided design and animation, robotic image recognition and machine vision (such as drones) proliferate, vision is relocated from the human observer to the machine. A new form of witnessing thus takes place: unmanned machine witnessing.

Whereas the camera used to be the extension of the eye, machine-vision does not necessarily resemble human vision. As these technologies develop, diverse imagery that breaks with photorealism becomes the norm in fields of non-fiction such as documentary, journalism and scientific contexts. Viewers thus become accustomed to receiving information in varied visualizations, expanding the field of non-fiction aesthetics. Are machine witnesses more trustworthy (even if extensive interpretation is required to decipher machine images)? What is the most credible form of imaging to evoke truth value? The presentation will explore how these contemporary technological changes influence documentary studies in an era of mixed realities

(that include the physical alongside the virtual). I will discuss how contemporary visualizations change scopical regimes, lead to epistemological shifts, raise ethical questions and influence the credibility associated with certain forms of imagery.

Biography:

Ehrlich completed her PhD in Art History at the University of Edinburgh in 2014. Her research straddles Contemporary Art, Animation, Media Studies, Film and Gaming. Nea co-organized the 2011 *Animated Realities* conference, has published articles in edited volumes and journals and is co-editor of *Drawn from Life*, the 2017 anthology about animated documentaries forthcoming by Edinburgh University Press. She is currently a Polonsky postdoctoral fellow at the Van Leer Institute in Jerusalem.

PANEL 2 – Robot / Human Fictions

Bianca Westermann

Robotic Presences: Encounters with the Artificial between Social Companionship and Embodied Representation

Robots increasingly start to populate the realm of social interactions. As a result social encounters with robots have them oscillating between being social surrogates and/or alternative companions, as they simulate the presence of a human other, while there is actually no one present. Be it in the sense of a telepresence device, which could be read as an embodied tele-representative (as in calling a distant relative or friend via social robot) or a corporeal, but artificial interlocutor (i.e. therapeutic companion robots like Alice or Paro). From a media studies scholar's point of view, the question of how social robots shape notions of presence and being present becomes pressing. My contribution will not ask whether or not social robots can be a meaningful replacement for social interactions, but to analyze how the encounters with artificial social machines reshape our concept of presence. In doing so, it is necessary to pay attention to the robot's strategies of embodiment: Not only in asking how s/he/it is situated, but how social robots contribute to the interacting persons' perception and constitution of embodiment. This not only means to ask how these robots can embody the presence of a distant person or simulate the presence of a social other, but also to ask how these encounters reshape our notion of interacting and communicating.

Biography:

Westermann received a doctor's degree in media studies in 2010. Her dissertation on anthropomorphic machinery was published in 2012. She worked as a Lecturer and Research Assistant (Wissenschaftliche Mitarbeiterin) at the department of media studies at the Ruhr-Universität Bochum (Germany) from 2003 till 2016. Her current research interests are centered on mobile media, social robotics and the medial constitution of prostheses, robots and cyborgs as well as the body as a medium. Other areas of interest include the medial construction of postmodern identity in digital media and sound studies.

Ruairi Glynn

Animacy Aesthetics

A robot "feels" nothing. It has no emotion, it has no concept of pain, or pleasure. Aesthetic experience is solely the property of the conscious. Yet robots, whether through their own agency, or a human tele-operated agency are full of personality. With even the subtlest of intentional movements machines become life, and with careful manipulation, complex and compelling performances emerge. There is of course a precursor to the tele-operated robot, the puppet. I have worked closely with puppeteers over the past decade exploring how we perceive the behaviour of machines and also getting to understand the intimate embodied relationship between puppeteer and puppet. I have examined the instinctual perceptual reflexes that structure the way we encounter animate motion and have written about the cartesian fallacy within robotics that dominates its practice and rational aesthetics of theory of mind. Robotics often seems to miss a deeper understanding of visceral aesthetic experience of robots because it comes from the irrational, instinctual and behavioural roots of human experience. My recent installations at the Centre Pompidou and the Tate Modern examine these ideas.

Biography:

Ruairi Glynn is Director of the Interactive Architecture Lab at the Bartlett, University College London. Alongside academic research he practices as an installation artist recently exhibiting at the Centre Pompidou Paris, National Art Museum of China Beijing and Tate Modern London. His interactive installations reflect on rapid developments in robotic technologies examining the emerging aesthetics of animate behaviour in art, architecture and design.

Maya Oppenheimer

The Robotics Division of the Dramaco Instrument Company Introduces the Ensocellorator Reliance Pro II

The Head of Research & Development of Dramaco Instruments Company would like to announce the release of their Robotics Division's newest innovation: the Ensocellorator Reliance Pro (ERP2).

In 2015, the first ERP was released to the commercial market as a gesture-tracking device in the Thaumaturgical Range (from the Greek word thaumaturgy, meaning the working of magical feats; thaumaturgical, meaning possessing the quality of wonder) of the Dramaco Instrument Company. Developed by in-house engineers and designers, the ERP's main application involved deception detection and translation via tracking and analysis of human gestures.

Now, after two years of wide application in job interviews, counselling sessions, professorial lectures and political campaigning, the new Robotics Division at Dramaco has invested invaluable qualitative data into the next frontier of embodied analytics applications: robotic empathy programming.

The new ERP2 auxiliary interface registers human gestures in real-time and matches possible response pathways based on contextual information pre-programmed into the robot's internal server. These include precedents from literature, legal cases and popular films as well as personality profiles previously uploaded to the ERP2's Ethical Appendix. Functioning like a black box of empathy, these processing capabilities frame the robot's responses making the

ERP2 an invaluable advancement in human-robot interactions.

Biography:

Oppenheimer is a writer, researcher, educator and sort-of-artist. Some days she teaches at the Royal College of Art across the History of Design and Critical & Historical Studies programmes, and some other days, she works as the Head of Research & Development at Dramaco Instruments Company, an on-going art project that critiques the transmission of laboratory technologies and activities into consumer markets. She publishes work, performs and lectures across topics of identity politics, histories of design, and sociologies of science and technology. She is one-third of Operating Manual, a research collective that investigates cultures of risk and a Trustee of the Design History Society.

PANEL 3 – Virtual and Augmented Reality: seeing and feeling *as* robots

Stephen Ellis (via Skype)

On the character, scope, and meaning of the spatial user interface to Virtual Environments: its recent and deep history

At the moment the general public may be surprised to learn that body worn user interfaces resembling what is now called Virtual Reality may be traced back at least to the time of Galileo! This talk will trace some of this history and briefly discuss why these systems have not yet changed the world as initially expected in the mid 1980's. The difficulties of their design challenges will be detailed through the development of a typology of spatial user interfaces which is derived from an analysis of the content, geometry and dynamics of the spatial displays used in virtual environment and augmented reality systems. In closing the talk will explore a possible deeper meaning of the development of this technology and why it is not accidentally associated with the major international crewed space exploration programs, i.e. NASA, ESA, RSC, and CNSA.

Biography:

Stephen Ellis is retired from NASA Ames Research Center (California) where he led the Advanced Displays and Perception Laboratory in the Human Systems Integration Division.

Simon Julier

Title to be confirmed

UCL's Virtual Environments and Computer Graphics group's research spans the range from real-time computer graphics rendering to human factors issues in virtual reality. A common theme is that we want to understand how to make virtual reality effective. We carry out experiments with participants, in order to examine just what makes a difference to their sense of presence in the virtual environment, and their sense of co-presence with other people. We research on the issues involved in populating our virtual environments with crowds. This is not only a technically interesting challenge, but we know from our experimental work that empty environments, places without people don't work. We are very interested in making our virtual

characters 'realistic', so that you will want to engage with them. But what does 'realistic' mean in this context? It does not mean photo or geometrically accurate realism. It does mean virtual people that carry out those tiny gestures and movements that we take so much for granted in everyday experience that we don't even notice them. Our ultimate goal is a theory of virtual reality: to make it 'work' in a given application context and with given resources, what is the best approach to take, what is the best algorithm, interaction and rendering style to use? We don't know if any group will ever have a solution for this, but the quest is a driving force.

Biography:

Dr Simon Julier is Reader in Situation Awareness Systems at the Virtual Environments and Computer Graphics group at University College London.

Nicola Plant

Expressive movement in Virtual Reality: Touching sentience.

This paper will discuss *Sentient Flux*, an Oculus Rift based VR installation that immerses the participant in an atmospheric reality of glowing particles that orbit the body; illuminating themselves only when disturbed by movement. Using a Kinect to track movement the viewer interacts by agitating the particle system, the particles react by performing complex expressive patterns, gestural movements and swarming behaviours. The experience intends to allow viewers to explore what qualities of movement convey a sense that something is present, how interaction by movement can evoke something intangible; an ethereal sentience. The piece extends the artist's academic research in human interaction, asking what interactions give the perception of intersubjectivity, that something is alive and sympathetic to your existence.

Biography:

Nicola Plant is a movement artist, coder and researcher based in London, UK. Having just completed a PhD in Media Art and Technology, Nicola's research interests span human movement and expression, embodiment, intersubjectivity and the vicarious experience of empathy. Nicola's artistic practice specialises in motion capture, producing movement-based interactive installations and experiences including VR. Nicola's work asks: What qualities of movement convey the intangible aspects of human experience? What does it mean to be embodied? How can technology augment or embody the experience of embodiment?

Jeremiah Ambrose

Systems of Seeing: Virtual Gaze Interaction

This paper – with an accompanying Gear VR app – practically demonstrates an application of virtual gaze interaction. Drawing from visual examples provided in Berger's *Ways of Seeing* (1972) the written and VR elements collectively present a historiography and associated praxis for virtual gaze interaction, while establishing a framework for digital futures pertaining to ocular interactions in media art and beyond. *Systems of Seeing* demonstrates how virtual gaze interaction can be used as an extension, deepening and reinterpretation of Berger's original discourse. By defining and evaluating virtual gaze interaction as both a conceptual model and as a practical process stemming from virtual reality, I explore and expand Berger's claim that "perspective makes the eye the centre of the visible world". Virtual Gaze Interaction is a term

used to conceptually frame the notion of the simulated gaze and its capacity to offer real-time interaction based on what the user chooses to look at. Given the rate at which metadata became one of the most valuable commodities of the 21st century, I contend that our ocular interactions will no doubt become subsumed into these digital economic systems. Currently, this type of human-computer interaction is a somewhat overlooked aspect of the production ethics of VR and VR studies. The gaze has been a site of theoretical discussion for many theorists, including Sartre, Foucault, Lacan, Said and Mulvey, yet the interactive gaze remains relatively under-theorised and underexplored. Perspective is no longer the only visual currency of VR: the medium affords new types of visual, and affective engagement opportunities which require both experimental and critical attention. The app is a demo piece that won't be available for download before the event, but the plan was to have it setup on my his device so people could trial it before or after my talk if they want. A supporting video will be shown during the presentation as well. The idea for the app is to introduce some of the paintings that John Berger uses in *Ways of Seeing*, but add an interactive element that is activated by what the user is looking at. These will most likely be databased text to speech components.

Biography:

Working in the areas of digital art, media futures and experimental practice, Jeremiah's research cements ideas explored in both his M.Sc in Interactive Digital Media and his M.Phil in Film Theory and History. As an exponent of the interaction models developed for interactive cinema, his PhD project consolidates a conceptual framework concerned with overcoming the immersive deficiencies of this genre. Using virtual gaze interaction, his practice explores the design, application and audience reception of real-time narrative decision points based on a user's ocular interactions. This process expands the discourse of cinematic language via interactive digital narrative systems, that exemplify the crossovers that can exist between the designer, the system and the end-user.