

Affective Haptics

Open workshop

Abstract

Affective Haptics is the emerging area of research which focuses on the design of devices and systems that can elicit, enhance, or influence the emotional state of a human by means of sense of touch. Human emotions can be easily evoked by different cues, and the sense of touch is one of the most emotionally charged channels. Affective Haptics is a wide interdisciplinary area, strongly related to such fields as multi-modal interfaces, affective computing, neuroscience, psychology, mediated communications, telepresence, robotics, etc.

There is a range of physical triggers for and manifestations of our emotions, including:

(1) physiological changes (e.g., heart beat rate, body temperature, etc.). Each emotion is characterized by a specific pattern of physiological changes. The emotion can be induced through the manipulation of false feedback of the physiological signals.

(2) physical stimulation (e.g., tickling). The affect is evoked in a direct way.

(3) social touch. Social touch (e.g., hug, handshaking, stroke, pat, squeeze, etc.) influences mood and provide a sense of physical copresence in computer-mediated systems.

(4) emotional haptic design (e.g., shape of device, material, texture). Recent findings show that attractive things make people feel good, which in turn makes them think more creatively.

The workshop will attempt to answer the questions: (1) how do the haptic stimuli influence the human emotions, (2) how does our brain handle the affective tactile stimuli, (3) which haptic technologies can elicit emotions, (4) what are the most promising applications of affective haptics technologies.

Motivation

Touch plays an important role in human social life. It communicates positive or negative emotions and is one emotional intensifier of interpersonal communications.

Tactile interfaces and devices could let users enhance their emotional-communication abilities by adding a new dimension to communication. Interpersonal relationships and the ability to express empathy grow strongly when people become emotionally closer.

There has been recent research on intelligent systems providing emotionally immersive experiences for online communication with rich haptic channels, and in the development of robotic companions that can simulate the emotional response through the haptic channel (vibration pattern, temperature, etc.), voice and gestures. Such robots can have positive therapeutic effect on the patients and improve their socializations.

Affective Haptics has a great potential to impact on the online environments that facilitate contact with others remotely, sense of telepresence, product design, healing and treatment of the mental, emotional, social and physical aspects of the person (e.g. depression, anxiety, autism, etc.).

Primary Objectives

The workshop will provide an overview of the recent achievements in Affective Haptics and bring researchers together to discuss how sense of touch can elicit our emotions and approaches to study such effects on the human. The Workshop speakers will discuss the aspects of Affective Haptics listed below:

- Robotics:

Haptic human-robot interaction, its therapeutic effect and impact on cognitive function.

Patient-specific prosthetics with lifelike warmth, softness and sensitivity.

Wearable emotional robots.

- Emotion elicitation:

Devices and systems for the emotion evocation.

Modulation of emotions by false physiological feedback.

Emotion elicitation in direct and remote social interaction through haptic channel.

- Applications:

Emotionally rich online communication, affective game, psychological testing, etc.

Affective haptics in medical care, treatment of anxiety, depression, autism, etc.

- Emotional design:

Emotional touch-friendly design for mobile multimodal interfaces. Influence of modalities (graphics, sound, touch) on

the overall user satisfaction and their correlation.

The measurable characteristics of the tactile perceptions that make pressing buttons, interacting with touch screens, etc. feel good.

Quantitative assessment of pleasantness and painfulness of touch.

Haptic perception of surface roughness and its connection to emotional state.

- Neuroscience and psychology:

Affective representation of pleasant, painful, and fearful touch in human brain.

Affective Haptics in understanding the role of the amygdala in emotional responses.

Affective Haptics and Theories of Emotions.

- Affective computing:

Detection and recognition of emotional information (skin conductivity measurement, natural and haptic language processing, facial expression detection, hand gesture recognition, etc.)

Target Audience

The target audience for the workshop will be students, researchers, academicians, who work in such fields as affective touch, emotional communication, human-robot interaction, neuroscience. The workshop promises to be very inspiring for attendees and covers cutting-edge research in Affective Haptics.

Speakers

Dzmitry Tsetserukou (organizer)

Assistant Professor

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Dzmitry Tsetserukou received the B.Sc. degree with honors from the Mogilev Machine Building Institute, Belarus, in 1999, the M.Sc. degree from the National Academy of Sciences of Belarus, in 2002, and the Ph.D. degree in Information Science and Technology from the University of Tokyo, Japan, in 2007. From 2007 to 2009, he was a JSPS Post-Doctoral Fellow at the University of Tokyo. His research interests include haptic interfaces and displays, affective haptics, human-robotic interaction. He is a member of the IEEE, VRSJ and the author of over 70 technical publications, 3 patents, and a book. He received Best Paper Award at Augmented Human 2010, and served as co-chair of the AH 2011.

Dr. John-John Cabibihan

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Dr. Cabibihan is an Assistant Professor at the Department of Electrical and Computer Engineering of the National University of Singapore. Concurrently, he serves as the Deputy Director of the Social Robotics Lab; Associate Editor of the International Journal of Social Robotics (Springer); and the Chair of the IEEE Systems, Man and Cybernetics Society (Singapore Chapter). He is working on the core technologies towards lifelike touch and gestures for prosthetics and social robotics. Their work has been featured in Nature Materials, Discovery Channel News, Popular Science, PhysOrg, NewScientist and MIT Technology Review.

Prof. Karon E. MacLean

University of British Columbia, Canada

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Karon MacLean is Professor in Computer Science at UBC (B.Sc. in Biology and Mechanical Engineering from Stanford (1986); M.Sc. and Ph.D. in Mechanical Engineering from MIT (1996)), with industry experience in robotics and interaction design. Her research interests are in ubiquitous haptic and multimodal interfaces, and affective, therapeutic human-robotic interaction. Charles A. McDowell Award, 2008; Assoc Editor of IEEE Transactions on Haptics; co-chair of the 2010 and 2012 IEEE Haptics Symposium.

Dr. Alexander Toet
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Alexander Toet received his Ph.D. in physics from the University of Utrecht in the Netherlands in 1987, where he worked on visual spatial localization (hyperacuity) and image processing. He is currently a senior research scientist at TNO (Soesterberg, The Netherlands) where he investigates multimodal image fusion, image quality, computational models of human visual search and detection, and the quantification of visual target distinctness. Recently he started investigating crossmodal perceptual interactions between the visual, auditory, olfactory and tactile senses, with the aim to deploy these interactions to enhance the perceived quality of serious gaming programs for training and simulation. He has published over 60 papers in refereed journals, 70 papers in refereed conference proceedings, was co-editor of a book on the mathematical description of shape in images, was Guest Editor of Special Issue of Optical Engineering on "Advances in Target Acquisition Modeling II", and is currently Area Editor of the ISIF Journal of Advances in Information Fusion. He organized and directed 3 international workshops on Search and Target Acquisition, Combinatorial algorithms for Military Applications, and on the mathematical description of shape in images. He is also Fellow of The International Society for Optical Engineering (SPIE) and Senior Member of The Institute of Electrical & Electronics Engineers (IEEE).

Chris Ullrich
Vice President of User Experience
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Chris Ullrich is responsible for ensuring that haptic products and technologies designed and developed at Immersion are highly valued by users, developers and OEM customers. Since joining Immersion in 2000, Mr. Ullrich has worked across departments to innovate, develop and bring to market a variety of technologies. He also directed software research and development in 3D, directed the medical simulation engineering team and led the design and development of next generation surgical instruments. Prior to working at Immersion, he held several research and engineering roles at Virtual Technologies Inc. and Telesat Canada. He holds a M.Sc. in Mathematics from the University of British Columbia and a B. Math from the University of Waterloo.

Prof. Francis McGlone
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B.Sc. (Hons) in Neurobiology and PhD. After postdoctoral positions at Manchester University he took up the post of Senior Neuroscientist at the Pain Research Institute, Department of Medicine, Liverpool University, investigating mechanisms of chronic neuropathic pain. This was the start of a realisation that research into the human brain/mind had to be multidisciplinary, and a fascination with c-fibres, which he was subsequently able to pursue with a move to industry (Unilever R&D), but then looking at their role in pleasure. He set up a neuro-consulting business in 2009, and is currently Professor in Neuroscience at Liverpool John Moores University, UK.

PhD candidate Bertina Lee and Dr. Carolyn G. MacGregor
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Bertina Lee received the BSc degree in Systems Design Engineering at the University of Waterloo in 2007. She is currently working towards the Ph.D. degree, under the supervision of Dr. MacGregor; and works collaboratively with the Human Factors Research Group at the University of Waterloo. Her research interests include the user experience of haptic interfaces, touch screens and tablets, as well as simulated touch systems. Carolyn MacGregor is an Associate Professor in the Dept. of Systems Design Engineering. She earned an Hons. B.A. (Psychology) from the University of Waterloo, as well as MSc and Ph.D. (Industrial Engineering) from the University of Toronto. She is the Director of the Usability & Interactive Technology Lab. which specializes in applying cognitive ergonomics and user-centred design to virtual environments and 3D simulations, transportation safety, and haptic technology.

Schedule		Description
13:00-13:15	Dzmitry Tsetserukou	<i>Welcome and Introduction</i>
13:15-13:45	John-John Cabibihan	<i>Patient-Specific Prosthetics with Lifelike Warmth, Softness and Sensitivity</i>
13:45-14:15	Karon E. MacLean, Steve Yohanan, Yasaman S. Sefidgar, and Matthew K.X.J. Pan	<i>Emotional Communication and Implicit Control through Touch</i>
14:15-14:45	Alexander Toet	<i>Towards Effective Affective Haptic Interaction</i>
14:45-15:00	Break	
15:00-15:30	Chris Ullrich	<i>Affective Haptic Technologies by Immersion Corp.</i>
15:30-16:00	Dzmitry Tsetserukou and Alena Neviarouskaya	<i>Emotion Augmentation through Affective Haptics and Visual Stimuli</i>
16:00-16:30	Francis McGlone	<i>Touching & Feeling: Discriminative & Affective Touch</i>
16:30-17:00	Bertina Lee and Carolyn MacGregor	<i>An Information Process Model of Emotional Response to Haptic Input</i>
17:00-17:15	Organizer, Participants	<i>Discussion: the biggest needs in Affective Haptics for the research, proposal for IEEE ToH Special Issue, plans for research and collaboration</i>