Sensory Augmentation Masterclass

Samen met de Universiteit Tilburg organiseerde het lectoraat Mensge richt Creëren een masterclass op het STRP festival 2017. Deze masterclass in zogeheten Sensory Augmentation vormde onderdeel van een langdurige samenwerking met de Universiteit Tilburg waarin wordt beoogd een dialoog te ontwikkelen tussen wetenschappelijk en artistiek onderzoek naar menselijke waarneming.


Case study: A sensory augmentation masterclass

To investigate the potential of the dialogue on perception research between the arts and sciences that we envision, we conducted a case study in which a creative dialogue on sensory augmentation interfaces is instigated between artists and scientists. This was done by organising a masterclass in which artists and scientists explored a selection of sensory augmentation interfaces that are commonly used in research related to the themes introduced in the previous section.

Participants

Besides two session leaders, 15 early to mid-career professionals participated in the masterclass (case study); an architect, a writer, a curator, a material scientist, a stylist, cognitive psychologists (2) and media artists and designers (6).

Masterclass

Held at the STRP Biennale in Eindhoven (NL) on March 28, 2017, the masterclass was structured on the basis of Wallas’ preparation, incubation, illumination, verification model. First, participants engaged in two preparatory activities:

(i) an introduction by the session leaders to the art and science of sensory augmentation interfaces and six pre-defined themes (test environments, new application domains, commercial potential, apparatus, mapping, and contingency learning), and

(ii) a demo session in which four participating researchers demonstrated four sensory augmentation interfaces (see Fig. 1):

(i) Inverted-vision goggles. Five goggles with prisms that invert the light projected on the retina;

(ii) Pupil dilation-auditory feedback interface. An eye tracker with software that maps pupil dilation to sound;

(iii) Haptic vision interface. An interface that maps camera images to the tactile sense via a grid of solenoids; and

(iv) Magnetic north interface. A vibrating belt that indicates the direction of the magnetic north.

These demonstrations were followed by the formation of breakout groups that each explored one or two of the interfaces. Each demonstrator chaired a breakout group and the remainder of the participants were distributed over the groups based on their individual preference. The two smallest groups (using the inversion goggles and haptic vision interface) were merged to create groups of similar sizes. Using the interfaces as discussion starters enabled participants to first-hand explore how such interfaces can influence how we experience the world. After being given ample time to explore the sensory interfaces and share initial thoughts amongst the group, participants took a lunch break of approximately 45 min. This enabled them to replenish and incubate, benefitting subsequent illumination. Third, the groups purposefully explored the interfaces to elicit ideas on (i) new research questions, and (ii) new concepts and prototype setups to gain insight into these research questions. Fourth, these concepts and prototypes were presented, demoed, and discussed in a closing plenary session. This allowed for verification and reflection of the research questions, concepts, and prototypes developed.

Documentation

The masterclass was documented photographically throughout the day. The plenary closing session was also filmed. On the basis of this documentation we were able to cite several key observations about the research questions and concepts developed in the masterclass, which we will discuss in the section here after.

Fig. 1. The sensory augmentation interfaces used in the case study:

(a) Inverted vision goggles, (b) pupil dilation-auditory feedback interface, (c) haptic vision interface, (d) magnetic north interface. (Photos by Stanley Obobogo Badoana)
What did the case study reveal?

The masterclass resulted in three new research questions and concepts. It also gave rise to several general observations regarding the interdisciplinary dialogues that led to those questions and concepts.

New research questions and concepts

Three new research questions and concepts resulted from the masterclass:

(i) Haptic Vision: Using haptic augmentation to support inverted vision. The group that explored the inversion goggles and haptic vision interface conceived and developed the research question: “Can one measure the effects of sensory substitution using an inverted vision task?”, thereby investigating the themes of contingency learning and test environments. The participants created a “competition” in which two participants compete to follow a zigzagged line with one hand, from top to bottom, as fast as possible. In the competition, both participants wear inverted vision goggles, yet one participant also wears the haptic vision interface. The contesteer that first reaches the bottom of the pattern wins. Performing the competition led to several interesting observations: (i) Re-learning hand-eye coordination under inverted vision can benefit from haptic vision substitution support when it is used strategically, e.g. as error feedback (i.e., “...if I am still on the line...”, as one contestant called it); (ii) Strong reliance on the haptic interface can also interfere with attempts to overcome disorientation (e.g., “...the haptics provide too much input.”); (iii) Repeat performance in the competition seemed to support a learning curve, which might indicate that participants improved their ability to interpret the distorted visual sense and haptic information simultaneously; and (iv) A hybrid interface which combines sensory substitution with other forms of sensory augmentation could be interesting to explore in future research.

(ii) The pupil DJ: Emotion regulation by sensing pupil dilation. The group that explored the pupil dilation-auditory feedback interface conceived and developed the research question: “Can sensing one’s pupil dilation be used to regulate emotion?” To this end, the group touched upon the apparatus theme. Although the interface was originally designed to translate pupil size to sound, after exploring it, the group decided to focus on the relation between pupil size and emotion instead. Based on the assumption that pupil size correlates with emotion, the group investigated the relation between music and emotional responses, for which purpose the interface was slightly adapted. Initial testing showed that a participant’s pupil dilation indeed varies between songs, and that some changes roughly correspond to the emotional reaction to a song. The group subsequently elaborately discussed the potential of selecting songs on the basis of pupil dilation, as a means to regulate emotion, and speculated on a novel apparatus to explore whether meaningful relationship could emerge from such a sensorimotor loop between pupil size and music selection. With this, the workshop revealed a potentially new application domain for sensory augmentation based on pupil dilation.

(iii) Spouse detector: A novel sense for the (un)faithful. The group that explored the magnetic north interface conceived and developed the research question: “Can a belt that vibrates in the direction of your spouse support a relationship?” The interface was conceptualised as providing location awareness of one’s partner, rather than the magnetic north. In this concept, a set of mappings, i.e. vibration patterns, provides a sense of objective computational support that “augments one’s ability to connect and stay faithful to a romantic partner, even in his or her absence”. Vibration patterns were elaborated to establish a sense of the other’s presence and tangibly convey their emotional states. The concept led to constructive discussions on (i) the usefulness of augmenting such directional awareness with a tactile representation of the other’s inner rhythms (e.g. breathing or heartbeats), and (ii) whether people could learn to interpret such patterns as meaningful information about the other or should rely on algorithms to classify such observations as for them. By exploring the possibility of a novel sense that is tuned to the consequences of one’s actions for romantic relationships, this concept illustrates how the dialogue we envision may break open unexpected new application domains for sensory augmentation interfaces.

General observations

Although each group followed its own unique trajectory towards the outcomes described above, several general observations can be made regarding their dialogues. The preparatory activities gave rise to highly divergent discussions in each breakout group. Although the interfaces and demonstrator’s practices were provided as a starting point for a dialogue, these almost instantly diverged in very different directions. Two general observations can be made regarding the dialogues overheard during this phase of the masterclass: First, discussions commonly veered towards the domains of practices of the participants in the group; and second, each group displayed a tendency to focus on the research question in which the interface is applied to ‘everyday situations’, such as listening to music at home or romantic relationships. The latter may indicate that the everyday makes fruitful common ground for researchers to explore when individual backgrounds vary.

After the replenishment and incubation during the lunch break, it took each group a relatively long time to transition towards illumination. In fact, most of the two hours reserved after the break to converge towards a research question and concept, was consumed by either exploring multiple ideas in parallel or by diverging even more by formulating yet more new ideas. Only when the session leaders announced that each group had 5 minutes left to finalise their presentations, groups converged rapidly through abandoning secondary ideas or combining several ideas into one presentable outcome. The importance of time pressure for divergence, can therefore be added as a third general observation of potential importance to the dialogue we envision.

The verification and reflection that followed during the plenary presentation and demonstrations of the outcomes revealed that the research questions, concepts, and early prototypes developed largely matched one or several of the themes identified in section 3. Furthermore, at least two outcomes alluded to the creation of novel kinds of stimuli, e.g., relative location to a spouse or sonified pupil dilation. A fourth general observation therefore is that the outcomes of the masterclass attest to the potential of the dialogue between the arts and sciences that we envision.

Conclusions

The findings above indicate how informative subjective experiences can be, strengthening our belief that a dialogue between art and science may help overcome the scientific limitation that the subjective is generally considered an ‘undesired variable’. Combining the inversion goggles and haptic vision interface (Fig 1), for example, led to intriguing insights with potential for scientific and artistic exploration: Inverted vision tasks could be an effective test environment for sensory substitution, an open challenge in sensory substitution research; and further suggested that such an environment can create conflicts in sensory information, a key topic in several artistic research practices.

Finally, at least two of the new concepts also feature some novel kinds of sensory stimuli for sensory augmentation research. This suggests that a dialogue between art and science can provide a basis from the broad imagination on the novel kinds of stimuli that is required to advance the field. Although future research should investigate the effect of the overrepresentation of creative practices amongst the participants in our case study, our overall conclusion is that its results attests to the potential of the dialogue between the arts and sciences that we envision; a dialogue that is mutually beneficial and required to advance the theory and practice of sensory augmentation.