Preface

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Biographical notes: Anton Nijholt is a Chair of the Human Media Interaction Group of the University of Twente. He received a PhD from the Vrije Universiteit Amsterdam and since then he held many positions in different countries before establishing the Human Media Interaction Group at the University of Twente. His research interests include multimodal interaction, virtual reality and embodied conversational agents and the corresponding application domains such as affective computing, entertainment computing and social computing.

Dennis Reidsma is a Researcher at the Human Media Interaction Group of the University of Twente. He did his PhD working on different aspects of natural interaction systems. He worked, among other things, on problems of annotation and reliability in large multi-modal annotated corpora. In addition, he worked on research and development of new interactive systems with virtual humans. His current interests are in exploring continuous interaction with virtual humans in conversational settings.

1 Background

This Special Issue of *IJART* is devoted to the 3rd International Conference on Intelligent Technologies for Interactive Entertainment (INTETAIN 09). This 3rd conference was held in Amsterdam, the Netherlands, in June 2009. It was organised by the Human Media Interaction (HMI) Department of the University of Twente in the Netherlands and the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering (ICST), Ghent (Belgium). The global theme of INTETAIN 09 was 'Playful interaction, with others and with the environment'. Authors were asked to contribute to this theme by focusing on intelligent computational technologies used to build interactive systems, by discussing interactive applications for entertainment or by focusing on supporting device technologies underlying interactive systems.

Previous INTETAIN conferences were held in Madonna di Campiglio (Italy) in 2005 and in Cancun (Mexico) in 2007. The 3rd conference saw the gathering of a diverse audience with broad and varied interests, not only with a certain focus on topics such as emergent games, exertion interfaces and embodied interaction, but also it covered

important topics of the previous editions, such as, affective user interfaces, storytelling, sensors, tele-presence in entertainment, animation, edutainment and (interactive) art. During the conference, there were special activities on game design, demonstrations and excellent invited speakers. Matthias Rauterberg of Eindhoven University, in his contribution titled 'Entertainment computing, social transformation and the quantum field', took a broad view as he discussed positive aspects of entertainment computing regarding its capacity for social transformation. Michael Mateas, of the University of California, Santa Cruz, talked about his work in interactive art and storytelling. Antonio Camurri, of InfoMus Lab, Genova, discussed an approach to Human Music Interaction that assigns a more active role to users listening to and interacting with music, in his contribution titled 'Non-verbal full body emotional and social interaction: a case study on multimedia systems for active music listening'.

2 This special issue

For this special issue of *IJART*, we invited a selection of the INTETAIN 09 authors to submit revised and extended versions of their papers. All papers had in common that they addressed physical movements in the interaction with an application. In addition to the INTETAIN 09 authors, we invited a few other researchers to contribute. After an additional reviewing process, we selected four papers for inclusion in this special issue.

The papers that have been selected for this Special Issue cover topics such as interactive toys, open-ended play, game experience, exertion interactions, bodily interactions, shared experiences, affective interactive art, emotion visualisation and interacting with 3D game environments. From the titles of the papers, it already becomes clear that the intelligent technologies for interactive entertainment that are discussed here go beyond the traditional mouse and keyboard. Nowadays, home and office environments are becoming equipped with sensors and actuators that can detect activities in the environment, that can collect data about what is going on and that can give feedback. Sensors can contain embedded intelligence, they can be connected and they can be backed up by computers that provide computing power that integrates and interprets this data. Hence, we have environments that can observe their human inhabitants, can interpret their behaviour and actions, and reactively and pro-activity support them in their activities and in the achievements of their goals. Sensors can be (infrared) cameras or microphones, embedded in the environment or in objects, but they can also be concerned with location, proximity, acceleration or tactile input. Sensor readings can be sent over wireless channels or they can be processed locally. Humans are among the sensor-equipped 'objects' in these environments. The sensors and actuators can be in their clothes, on or in their body, and users can choose to pick up and carry smart physical objects to interact with the environment.

The interactive entertainment and play environments that are discussed in this Special Issue all assume multimodal input and/or output, where the input is obtained from (infrared) cameras recording human physical activity, manipulation of tangibles measured by accelerometers, pressure sensors and handheld devices for pointing or issuing commands. As mentioned, the focus is on playful interaction using physical movements performed by the human actors. The physical movements in these interactions can be intended to display commands, for example, moving around (communicating) tangibles or shifting a person's weight from one pressure sensor to

another pressure sensor. Using appropriate sensors, a particular environment can interpret physical movements that are natural in that environment. In a virtual training environment for boxers, for example, punching, dodging a punch or making a feint are naturally occurring physical movements. Measuring the effects of a physical movement (force, impact, speed, etc.) is yet another source of input for sensors in an environment that adapts and reacts to this information.

The first paper in this Special Issue by Tilde Bekker et al., 'Creating opportunities for play: the influence of multimodal feedback on open-ended play', is on interactive toys that react to children's physical behaviour. In open-ended play, game rules and goals are not pre-determined. Different rules and goals, hence, different plays can emerge inspired by the play objects that are available and the interactions they allow. In an open-ended play, children can assign their own meanings to the different interaction possibilities. In their paper, Bekker et al. discuss the design considerations and the characteristics of an open-ended interactive toy with various output modalities, including the ability to communicate with other toys through an infrared signal. Among the modalities are changing colours, flashing and vibrating. Children can walk around with these toys, squeeze them, roll them, point them at others and invent games where such actions have particular meanings. Bekker et al. report about experiments where they compared the effect of using one output modality vs. multiple output modalities on the diversity of games that were created and the children's enjoyment.

The second paper, 'Experiencing affective interactive art', by Leticia Bialoskorski et al., is on affective interactive art installations. In these installations, the affective state of the users or emotions that are otherwise expressed by the users are interpreted and taken into account in the interaction and the feedback that the system provides. It means that sensors are needed to detect the affective state or the emotions that are expressed. The authors present a survey of affective interactive art installations and then they focus on a particular interactive light installation that was designed during their research. This installation, called Mood Swings, consists of eight luminous orbs that react on movements and take on certain colours with distinct movements. The colours are meant to express emotions associated with the movements. Starting point of their investigation is the two-dimensional affect representation model of Russell with its valence (pleasure–displeasure) and arousal axis. In other research, movement characteristics (velocity and smoothness) have been mapped to this model, associating emotions and movements. Similarly, there are theories that associate colours with emotions. This allows the authors to transform movements to colours that are meant to express certain emotions. Results of an evaluation are presented. In addition, there are interesting observations on how users perceived the installation as a game and on how various phases in the so-called 'trajectory of interactions' could be distinguished.

In the third paper, 'Fun and efficiency of the Wii balance interface', Wim Fikkert et al. report on experiments where a balance board is used to navigate in a virtual game world. A balance board has pressure sensors at each of its corners. The user stands on the board and shifts his centre of mass to navigate an avatar through a virtual world. Apart from navigating, the user can also control the speed with which he moves through the virtual world. A possible advantage can be that the user can use their hands for other tasks. Moreover, there can be applications where this way of interacting is more enjoyable and engaging. Various experiments are reported in which balance board navigation is compared with other types of interaction devices or combinations of different interaction devices, including the mouse, the joystick and the Wiimote. Task

completion time, error rates intuitiveness and enjoyability were among the parameters that were rated. Among other things, it turned out that users had no problem using their hands for controlling an input device while navigating the balance board with their body.

The final paper in this Special Issue, 'Considerations for the design of networked exertion interactions' by Florian 'Floyd' Mueller et al., deals with physical movements in the context of exertion interfaces. Exertion interfaces are designed in order to elicit exertion from the user. They can be used to improve health conditions, sports performance or for therapeutic physical rehabilitation. But clearly, as in recreational sports and in games, exertion can be fun, increase engagement and, as a shared activity, stimulate social interaction. Depending on the kinds of physical behaviour that need to be interpreted, exertion interfaces require sensors that detect particular movements (inform a virtual fitness trainer whether a physical exercise has been performed in the right way by the user) or the effects of particular movements (tracking the ball after it has been hit by a player and determining its velocity and the coordinates where it hits a wall). In their paper, Mueller et al. discuss networked exertion interfaces. These interfaces support exertion interactions between geographically distant participants. The authors, drawing from their extensive experiences in designing, implementing and evaluating networked exertion interfaces, provide the reader with several guidelines for designing networked exertion interfaces. They include observations on physical effort and promoting emotions and engagement, on shared experiences and readiness for further communication, on the use of artefacts, on competition and on social interaction. All observations are illustrated with examples of existing exertion interfaces.

All papers that have been selected for this Special Issue focus on new, advanced and sometimes yet unexplored ways of interacting with entertainment devices and environments. We hope this Special Issue will stimulate further research along these lines.

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