ORIENT: interactive agents for stage-based role-play

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ABSTRACT
We present a demonstration of the intelligent agent-based system ORIENT (Overcoming Refugee Integration with Empathic Novel Technology). We summarise the application domain: education for inter-cultural empathy; the technology used and the innovations this involves; and finally interaction with ORIENT.

Categories and Subject Descriptors

General Terms
Design, Experimentation, Human Factors

Keywords
Artificial Intelligence, Applications, Virtual Agents (Models of personality, emotions and social behavior)

1. INTERCULTURAL EMPATHY
ORIENT (Overcoming Refugee Integration with Empathic Novel Technology) was devised as a semi-immersive interactive graphical system for educating 13-14 year olds in inter-cultural empathy [1]. The overall aim is to improve the experience of school students who move into a new culture as refugees or as immigrants by making the students of the home culture more responsive and sympathetic to them. Drawing on educational theory, a stage-based role-play approach was chosen in which a small group of role-playing adolescent users are equipped with innovative interaction technology and are asked to carry out story-based problem-solving activity within a culture alien to them.

In order to avoid issues of gender and existing cultural stereotypes, an imaginary culture was designed populated by a people called Sprytes (see Fig 1). These are autonomous affective characters with individual personalities able to express emotions and select culturally-specific behaviours that will generate a story-experience. The believability of the Sprytes is key to achieving the desired educational outcomes.

The users' task in ORIENT is to prevent a catastrophe in the form of a meteorite that is on destruction course with the planet. During the mission, the users will have a chance to witness the Sprytes eating habits, life cycles – recycling the dead, educational styles, family formation and value system – trees are sacred. This general story framework allows the users to appreciate cultural differences by trying to integrate themselves into an alien culture in order to gain the aliens' trust and eventually work together with them to save the planet. They can achieve this by empathising and exhibiting acceptable social conduct at different stages of the interaction to help and avoid enraging the Sprytes. Once a positive relationship is established between agents and users, motivation and interest are enhanced, hence constructive learning is possible

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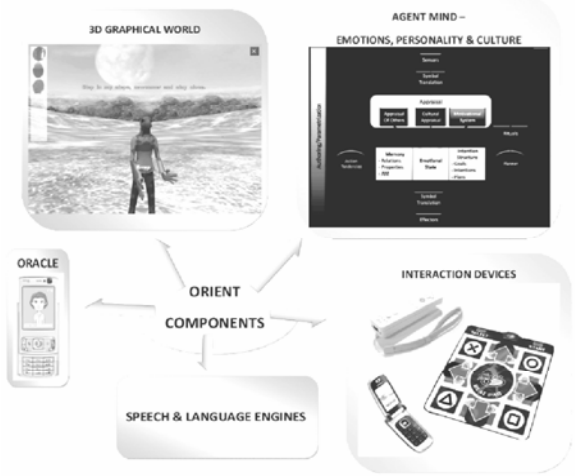
2. TECHNOLOGY USED
Pervasive gaming takes virtual narrative elements out into the real world but its focus is on introducing game elements into the everyday life of players using interaction devices such as handhelds to display virtual world elements [2] and technology support through which human game-masters can exercise higher amounts of control over the game experience [7]. It is this technology that was applied to ORIENT as shown in Figure 1. An agent architecture drives the 'minds' of the individual Sprtyes [1] who select actions autonomously and are equipped with a language and real-time speech synthesis engine; the virtual world and the Sprytes are shown graphically on a large screen; the users interact through a set of devices described in section 4; a special agent, the Oracle, runs on a mobile device and includes some of the functions of a human role-play facilitator.

3. ORIENT INNOVATIONS
3.1 Agent minds
A novel agent architecture has been implemented for the Sprytes that combines a cognitive appraisal approach derived from the earlier FearNot! demonstrator with a lower-level needs- and motivations-based approach derived from the PSI architecture. Please see [6] and in particular the complementary AAMAS 2009 paper [1] for more detail. The motivational system serves as a quick adaptation mechanism of the agent to a specific situation and may lead to a change of belief about another agent [6], important for conflict resolution among ORIENT characters. The

Figure 1: ORIENT technology components



architecture also incorporates specific mechanisms for dealing with cultural content including symbols and rituals [1].

3.2 Emergent narrative

The ORIENT experience is decomposed into episodes, each relating to a specific aspect of Spryte culture and organised around specific locations linked by lighted beacons as is standard in many computer games. Four episodes have so far been implemented.

Compared to most commercial computer role playing games the story is more driven by autonomous character behaviour than by an underlying script. In order to provide this emergence, the system does not limit the user's interaction possibilities to the current context (as seen in most story games with multiple choice dialogues) but affords users a range of gesture-based social interaction possibilities that are applicable in multiple situations. As a result mistakes by the user are allowed and they may carry out actions that offend the Sprytes (for example picking pods from trees or trampling on plants). The user may need to cope with the consequence of making those mistakes, as in giving a formal apology, or may ask for help from the autonomous ORACLE agent. This reinforces the cultural learning experience.

Evaluation runs have included a human facilitator, required to support the target 13-14 age group, and also used to establish the storyworld and brief on roles at the start. The Oracle, implemented as a rule-based system behind a graphical character on a mobile phone is used to provide context-sensitive help during the experience.

3.3 Culturally-specific behaviour

Sprytes have a set of culturally-specific behaviours defined within an overall cultural framework [1]. Gesture plays a very large role in Spryte communication, and a language system based on communicative acts allows gesture to be selected on an equal footing with verbal utterances and physical actions.

4. INTERACTING WITH ORIENT

[5] argued that a positive effect on collaboration in RP can be achieved through an appropriate distribution of interaction devices. Clear evidence was found that a setting in which each user was assigned a role via an interaction device with a dedicated function balanced the level of interactivity and avoided dominant users. Overall, there is empirical evidence that learners seem more engaged and more active when playing on a computer with multiple input devices than when using a computer by themselves.

Based on these studies, ORIENT's user interface is designed to be physical and tangible. Full body interaction and movement in the physical space, particularly important in social behaviour and culturally specific interaction are supported. Each user is assigned a role relating to a specific interaction device with unique functions: a mobile phone, a Dance Mat and a WiiMote. All are necessary to achieve the overall goal of the game. Bluetooth communication is used for mobile phone and WiiMote while the Dance Mat is connected to the computer through USB.

The interaction techniques supported by the mobile phone, a Nokia NFC 6131 include RFID-based input and speech recognition. RFID tags are embedded in real world objects that also have existence in the virtual world. The user who is assigned the mobile phone selects objects by touching them and uses "magic words" (character names) to grab a character's attention. In response, the Sprytes speak an alien *gibberish* language, which is generated on the fly by a speech synthesizer and appears as translated subtitles on the screen. Navigation in the virtual world is achieved through the Dance Mat, operated by a second user. The user can move forward, backward and turn left or right allowing them to explore the virtual world.

The WiiMote is used for three-dimensional gesture recognition based on motion data derived from accelerometer sensors. To avoid natural language complexity, the Sprytes are gestural creatures (as in Figure 2), and the third user performs different gestures expressing communicative content. With interaction supported through large and micro screens, physical interfaces and multi-modal interaction devices, it is hoped that the users' motivation to learn about the Sprytes' culture, their engagement in the interaction and collaboration between them can be enhanced.

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