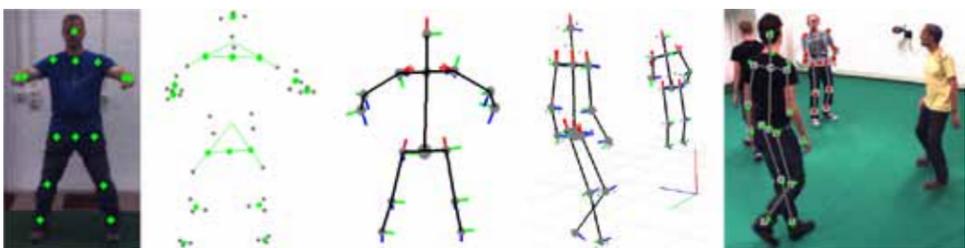




Game research
for training and
entertainment



The GATE research theme Interaction deals with developing new interaction technologies. Indeed, advances in building worlds, populating worlds with virtual characters, and learning with virtual worlds (other research themes in GATE), cause real and simulated worlds to merge, which asks for new ways of interaction between humans and these worlds. In these augmented worlds natural navigation and interaction is a real challenge due to limitations in multimodal control and feedback technology and due to limitations in the understanding and true-to-life modeling of physical, biological and psychological processes. The research theme Interaction studies new interaction paradigms like high-level steering and manipulation, the use of gestures, and brain-machine interfaces.

For example, we investigate grasp synthesis, computing finger placements needed to grasp or hold an object. Recently, we have been studying grasp synthesis to hold an object such that it does not fall. In order to achieve this, the hand has to be able to apply forces at the contact points, which balance the gravitational force on the object. In practice, there are limits on the magnitudes of the forces that a hand is capable of applying through a grasp. We believe that taking such limitations into account during grasp synthesis will lead to more realistic grasps. We developed various results on synthesising grasps capable of balancing a particular given force on an object, without having to apply forces greater than some threshold at the contacts. By focussing only on balancing one given force (for example, gravity), we were able to develop efficient algorithms to compute two- or three-fingered grasps of polyhedral objects.

Controller-less interaction has become popular, for example using the Kinect. However, it is still difficult to handle occlusion

between multiple persons. Currently we are working on multiple people tracking and pose estimation in 3D using multiple cameras. By selecting the distinctive 2D image features from different views, and by selecting the best visibility views, occlusions between persons are properly handled. The occlusion estimation is calculated for each individual and for all the views. 2D and 3D body models are then fitted to recognize the pose.

In our project "A Brain Connection Device for Education, Feedback, Gaming, Handsfree Interaction, Joy, Know-how, Learning and More" (ABCDEFGHIJKLM) we aim to enable more intuitive interaction, thereby alleviating the demand for cognitive resources. Current input devices are not always intuitive to use, while (serious) games themselves require full cognitive resources. This asks for a new generation of control devices that require as little cognitive resources as possible. Another important motivation, and reachable on shorter term is handsfree control. Most of the time we interact with systems using our hands, but in certain situations it may be convenient to have an additional control channel as illustrated by the development of eye movement and voice based control devices. And of course the fun factor should not be forgotten. The idea of controlling a game with the brain directly, intrigues many.

In all these cases, further innovation is needed. More insight into how to control motion and grasps, gesture recognition, and brain-computer interfaces are necessary to push the frontiers of the state of the art in interaction technology.



Remco Veltkamp **Utrecht University**

Game technology and health

Game technology has been applied in the health domain since long. Game technologies can improve health and the delivery of health care and, making it affordable and effective. There are numerous applications, including mental health, geriatric health care, rehabilitations, fitness, sleep coaching, pain distraction and stress relief, training and education of medical professionals. GATE is running a pilot project in the health domain, in order to show the potential and to create awareness, see also the GATE magazine at <http://gate.gameresearch.nl/>

The growing interest for game technology in health is also illustrated by the Games for Health Europe conference, held 24, 25 October 2011 in Amsterdam, <http://www.gamesforhealthurope.org>.

For seven years this conference was held in Boston, in cooperation with Harvard University and MIT, and now moves to Europe as well. The conference will provide technical presentations, demos, exhibitions, best practices, panel discussions, etc.

The combination of gaming and health is exploited in many other initiatives, such as the Network of Excellence GaLA, the Game and Learning Alliance, <http://www.galano.eu/>. GaLA aims to shape the scientific community and build a European Virtual Research Centre aimed at gathering, integrating, harmonizing and coordinating research on SGs and disseminating knowledge, best practices and tools as a reference point at an international level. Both GATE and GaLA will be present at the Games for Health Europe conference.

Intelligent Agents make games more interesting and natural to play Serious Games need Agent Technology

Agent technology can be used to create more intelligent and natural behaving characters in games. The CIGA middleware supports coupling agent technology to game engines for this purpose.

Games and especially serious games need intelligent NPC's to make the game realistic and train the user on the right skills. Agent technology provides intelligent agents, but is not ready to be incorporated in game engines straight away. In the KTP project CIGA, VSTEP and Utrecht University a middleware is developed to couple agents and games.

Games become more attractive when the NPC's are behaving more natural and intelligent. Many efforts are made in the gaming industry to create characters (also called agents) that look and behave more realistic. At the same time there is an AI community of researchers that has developed agent technology in order to create intelligent agents that can be used to solve complex problems ranging from logistics at big airports to (support for) electronic auctions. It seems natural to use this agent technology to create more natural

behaviors for NPC's in games. One of the main characteristics of agent technology is that the agents are goal directed and thus remember why they are performing their actions and can thus reason whether to persist with their plan or give it up and try an alternative plan.

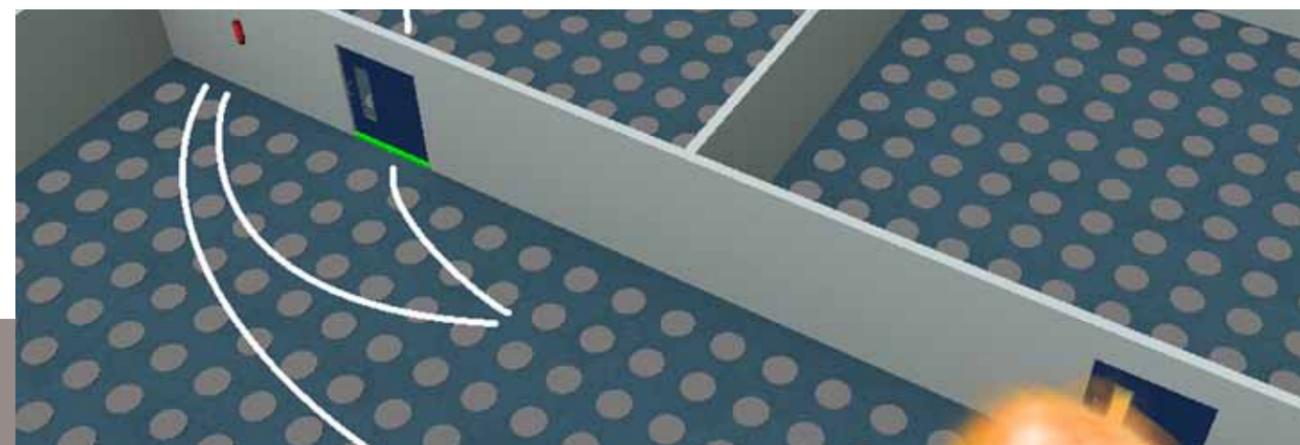
Coupling games and agents

Although intuitively it seems a perfect match to use this agent technology for programming the NPC's of games, in practice this turns out to be not that simple. E.g. an agent playing a firefighter is used to make plans at strategic level, having plans as: "get the victim out of the house" then "extinguish the fire" and finish by "clearing up the gear". The NPC, of course, acts on a much lower level of abstraction. Thus these high level actions should be broken down in executable actions for the game engine. The tricky part is to take care of failures of actions in the middle of the plan. E.g. what

to do if the firefighter cannot get to the victim and needs to get help?

Scenario needs intelligent agent

In our KTP (Creating Intelligent Games using Agents) VSTEP and the Utrecht University are developing middleware to couple agent technology to game engines. In this middleware there is support to specify the translation of agent level constructs to game level constructs and the other way around. We show the usefulness of agent technology in a simple scenario where an agent is located in a building while the fire alarm goes off. The agent then tries to go outside, but encounters the starting fire in the corridor, blocking his way to the exit. However, he sees a fire extinguisher on the wall and uses this to extinguish the fire, thus unblocking his way to the exit. However, he now realizes he does not have to exit the building anymore, because the reason (fire) is no longer present.



Frank Dignum is associate professor at the department of Information and Computing Sciences at Utrecht University. He has many years of experience in research in agent technology and its applications. He has been involved in many projects where agents have been used ranging from robotics to electronic commerce. In recent years he has become involved in using agents for games and is now one of the leading researchers in this area. He has set up

a successful workshop series on Agents for Games and Simulations published by Springer. This workshop is dedicated to applications of agent technology in games and the (technical) issues that are related to this.

The CIGA project is performed by Joost van Oijen from VSTEP under supervision of Pjotr van Schothorst from VSTEP and Frank Dignum.