

# Brochure AGS

## Layout overview



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# Advanced Gaming and Simulation



Universiteit Utrecht



Utrecht School of the Arts



The Center for Advanced Gaming and Simulation (AGS) is a leading edge research center that advances the state-of-the-art in gaming, simulation and virtual reality. The goal of AGS is to create technology for highly effective learning and training experiences. For this purpose Utrecht University, the Utrecht School of the Arts and TNO will combine their creative talents and unique professional skills in the fields of computer science, information science, psychology, liberal arts and game design.

Experience learning systems have applications in professional education and training, decision support, as well as in prototyping and leisure.

The ambition of AGS is to be the most productive and most cited research center in Europe and to be the preferred supplier of knowledge for companies dealing with gaming and simulation for education, training, and entertainment.



## Gaming and simulation – Exciting challenges

An ongoing, mostly silent, revolution is taking place in our culture and society. The realms of gaming and simulation have become rapidly important for work and leisure, innovation, business and economics, law and ownership, ethics, family life, and last but not least for professional training and education.

The research field of gaming and simulation deals with modeling virtual worlds, creating characters and behavior, generating effective scenarios, building multi-sensory interfaces and redesigning didactic concepts but also deals with drama, style and emotions (the X-factor). Simulating the physics, biology and psychology of the real world and bringing it to life in multi-sensory simulations are major challenges on their own. Adding the X-factor has substantial impact on user experience, learning and training transfer, but is generally insufficiently incorporated. There is so much to gain!



# The preferred supplier of knowledge for companies for education, training, and entertainment.

## National and international developments – Momentum

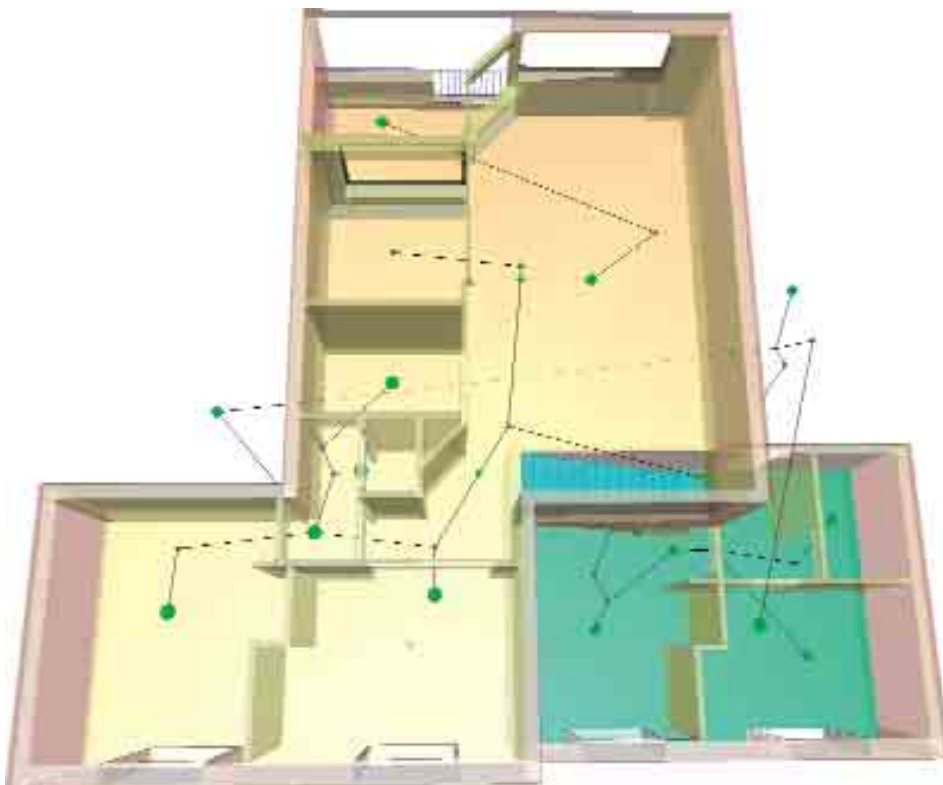
In the USA the synergy between gaming aspects and simulation technology is structurally organized. For example at the Institute of Creative Technologies, which is part of the University of Southern California. Other interesting combinations are the collaboration of screenwriters with the Washington, D.C. intelligence community on war gaming and the collaboration of Paramount Digital Entertainment with the US Department of Defence on crisis-management simulation. Gaming has become an important research field with a high societal and economic impact; its degree of international organization is rapidly maturing (e.g. through the Digital Games Research Association). Europe is becoming aware of the importance of gaming and simulation. In the

Communications from the European Commission it is suggested to mobilize funding tools to help realize the knowledge economy, with a high priority for a new generation of education and training programs (life-long learning).

The Netherlands is developing a strong international position in the field of gaming and simulation. However, pieces still have to be put together. In the process of defining the National Research Agenda ICT (NOAG-ICT), NWO and IPN have launched the theme *Digital Experience* as one of the focus areas for the coming years. Further, the Innovation Platform has identified the *Creative Industry* as a key area strongly related to investments in *innovative ICT applications*.



## Commercial applications – Growing market



Application of advanced knowledge in the field of gaming and simulation is expected to strongly innovate professional education and training, and increase motivation and training effectiveness. The estimated current market size for gaming and training in the Netherlands alone is about Euro 600M. Important sectors are healthcare, energy, defence, urban planning and the emergency services. Instrumented board rooms are an emerging market.

The defence organization applies advanced gaming and simulation for doctrine development and for training and instruction, for example operations in urban areas (group performance, asymmetric warfare, cultural diversity). Other applications are gaming and simulation tools for crisis management support, process control, public inquiry procedures, prototyping infrastructures, etc. And of course the use of gaming and simulation tools in the professional education and entertainment sector increases rapidly.

# dealing with gaming and simulation

## Utrecht and TNO – A winning team

Utrecht University is the centre of gravity in academic gaming research, with strong ambitions to further concentrate education and research on this theme by combining gaming research with human-computer interaction, liberal arts and artificial intelligence. Current research themes are multimedia and geometry, virtual environments and games, cognition and communication and intelligent systems.

The Utrecht School of the Arts (HKU) will be a partner in AGS with a strong emphasis on game design and art. Utrecht University and HKU are concentrating related educational programs in *UPGEAR* (Utrecht Platform for Game Education and Research) in cooperation with the Hogeschool van Utrecht ([www.upgear.nl](http://www.upgear.nl)).

TNO has a strong international position in simulation technology and human factors and applies this knowledge in particular in the areas of Defence, Security and Safety. TNO has a substantial research program on tactical

gaming, world modeling, simulation based design, soldier and crowd behavior, distributed simulation, virtual instructors and virtual teammates, simulator effectiveness and human modeling. The combination of expertise of the partners makes AGS a unique

center that creates synergy between fundamental and applied research, concentrates research talent and attracts excellence. The broad spectrum and quality of the researchers involved will give AGS a top position in Europe.

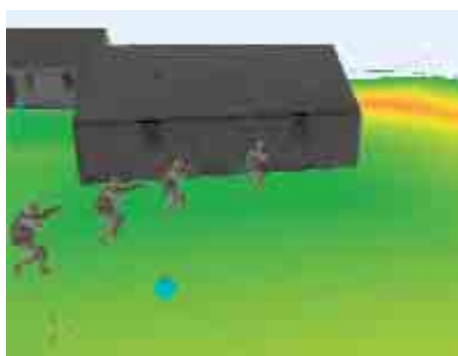
## A scenario – Disaster training 2015

A.G. Sims is a fire fighter in the Utrecht fire brigade. Today he has to do his monthly training with some of his teammates. While putting on his tactile suit and VR helmet, A.G. thinks about the old days when training mainly consisted of reading books and watching movies with only very rarely a small 'real' training. Simulated trainings as done nowadays are much more fun and make it possible to train highly complex situations, thus preparing him much better for what to expect and how to react. Of course his progress will be monitored constantly and failure can have important consequences, so this is clearly a serious game to play.

There has been a terrorist attack on the Galgenwaard soccer stadium and he is called into immediate action. He runs to his simulated fire truck, waits for the other simulated fire fighters to arrive and drives his way through the busy traffic in a virtual model of Utrecht. A few police cars with loud sirens pass him and on the radio the situation is explained. People on the street are nervous. Clearly something big is happening. Getting closer to the stadium a large crowd has gathered and only with great difficulty A.G. manages to steer his fire truck amidst them. Reaching the destination he sees black smoke above the stadium and smells the fire. A large number of police cars, ambulances and other fire trucks are arriving and rescue workers run around attending to victims. Most of the workers and all victims are computer-simulated autonomous agents but some workers are actual people, taking this test together with him. A.G. does not notice any difference.

He is ordered to enter the stadium to search for other victims. Together with his simulated team he enters the building. People are running around him, most in blind panic. When he reaches a stairway there is a sudden explosion; he feels the heat and the pressure wave. This seems to be the wrong direction to proceed in. He briefly discusses the further strategy with his computer teammates before continuing. They reach a room filled with smoke and he shouts for survivors. He hears a faint reaction and enters the room to search further. Smoke reduces his visibility and he is using tactile information to find his way. After a while they find an injured victim who needs medical attention. After calming the person down and applying first-aid, he orders two of his team members to carry the person outside the stadium. Together with his other teammate he continues. Then he makes a fatal mistake. He opens a door without feeling its temperature. A huge explosion follows.

Fortunately it is only a simulation. A.G. removes his helmet and suit. He is shaking and sweating, not only because he failed the test but because the experience was so real. He will never make that mistake again.



# Scientific program – Research themes

The scientific program of AGS concentrates on advanced research in gaming and simulation, with a focus on the application fields of training and education. Success factors for effective gaming and training transfer are:

- Realistic and challenging problem situations and scenarios.
- Realistic behavior of computer controlled entities.
- Realistic modeling, visualization, and simulation of the environment.
- A high level of interaction.
- Analysis of skills, and effectiveness of procedures, in correspondence with the training goals.
- Excitement for creating intrinsic motivation to try and learn.

The following eight research themes will be central in AGS:

**I Modeling the world.** This theme involves all that is required to create and visualize realistic models of the world. The challenges are to create digital models of real-world objects, both natural objects and man-made objects. Typical techniques to be investigated are reverse engineering and automatic scene generation from geographic information systems.

**II Virtual characters.** This theme deals with the modeling of the characters that will inhabit the virtual worlds. Virtual characters can be either software driven autonomous agents or avatars driven by instrumented humans.

Challenges are the true-to-life modeling of the human body, posture and physical movements. Agents must show convincing cognitive behavior and autonomously sense their environment, respond and plan their actions.

**III Simulating the world.** This theme studies the (physical) simulation of the virtual world. It includes real-time simulation of the dynamics of moving objects but also the simulation of changes in clouds, flames, and liquids. Besides the visual aspects it is also important to simulate other sensory data, like sound, temperature, and tactile experience.



**IV Interacting with the world.** This theme studies the high-level interaction between the user and the world, including navigation, manipulation, and multi-sensory interfaces. The study of next generation interfaces includes torso mounted tactile displays and head mounted visual displays for multimodal feedback, brainwave driven devices and body instrumentation for intuitive control, automatic sensing of natural user behavior and cognitive user interaction models. Further, we want to create experiences that go beyond the physics of the simulation (cross-modal sensations and perceptual illusions).

**V Affective appraisal.** The term affective appraisal in the context of gaming and simulation refers to the influence that a simulated environment has on the mood and level of responsiveness of the subject experiencing the simulation. We want to investigate the main factors contributing to the involvement and emotional reactions, that are evoked by a virtual environment, and to the effectiveness of simulations and enjoyment of serious gaming.

**VI Adaptive game play.** This theme deals with the high-level behavior of the simulated environment in response to user behavior. The environment should automatically adapt to the capabilities and reactions of the user and to the learning experience required. This poses for example challenges in deducing intentions, goals and emotions from the actions of the user, balancing local autonomy of the elements that interact with the user and the global goal of the system, and context and expectation management.

**VII Learning with simulated worlds.** This theme studies how to use virtual environments and games for learning and training purposes most effectively. Training scenarios, including multiple participants and cooperating teams, are extremely complex. This complexity not only entails the building and management of training scenarios, but also how to monitor scenario progress, when and how to make interventions and freeze scenarios, and when and how to provide additional instruction and feedback.

**VIII The X-factor.** This theme involves the artistic design aspects and user experience factors (challenge, fantasy and curiosity). These make an application fun, enjoyable, rewarding and motivating, but are poorly understood. Knowledge from the areas of cinematography, drama and story understanding will be used to better understand the emotional effects of narratives, pace, identification and involvement with characters that occur in games. Theoretical and empirical studies of the effects of emotional and cognitive interest are crucial in creating the right experience of users and learners in games and educational software.



