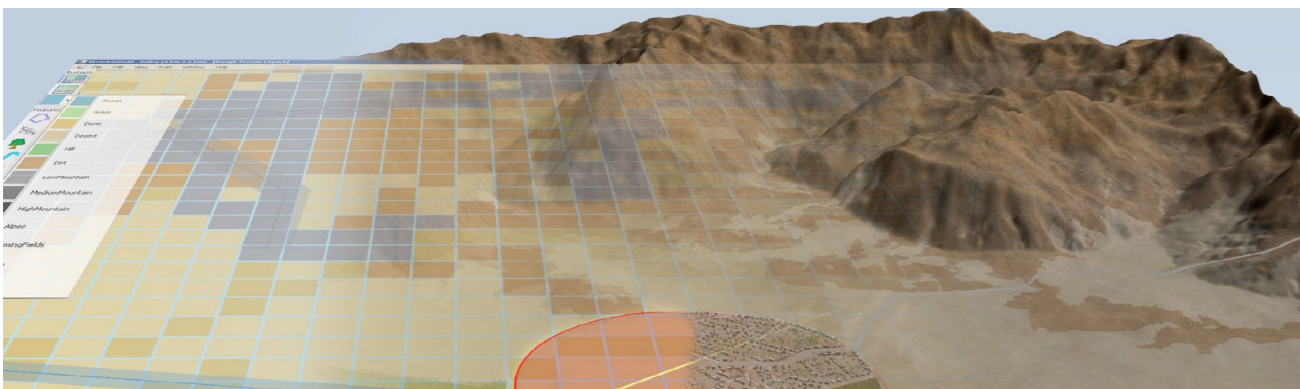




Game research
for training and
entertainment



Semantic Virtual Worlds

The GATE project is developing visions on research that is necessary to maintain a leading role of the Netherlands in game research for training and education. One of the research directions with high impact is into semantic virtual worlds.

Challenges

The GATE vision meetings have identified three main research challenges that lie ahead. (i) Find innovative methods and techniques that enable automatic matching of sensor data to semantically rich models. (ii) Find innovative methods and techniques that enable declarative generation of virtual worlds by capturing designer intent into semantically rich models. (iii) Find innovative methods and techniques that enable automatic transformation of virtual worlds into metaphor worlds to achieve a better (serious) gaming experience. Note the prominent role of the keyword semantics. The pivotal point of this research theme is the use of semantically rich models, which have not only physical characteristics, but also have meaning and behavior, and allow for proper interaction with other surrounding components in the world model. Reconstruction techniques and procedural modeling techniques meet on the pivotal point of semantics. When reconstruction techniques match and identify semantically rich model instances within an observed real world, they can be re-instantiated in a virtual world by using procedural generation techniques.

Impact

Innovation into the above directions will lead to new functionality and services, such as the following. **Automatic geometric reconstruction.** 3D point clouds are currently the number one data source for geometric reconstruction. Point clouds are either obtained from laser range measurements or from photogrammetric analysis of imagery. Innovations are still required in the processing of point clouds, reaching for faster algorithms, more accurate data, and better segmentation and model fitting algorithms. **Automatic semantic analysis.** More than just

a geometric reconstruction, innovation should head for true semantic analysis of data. Instead of fitting just geometry to the data, algorithms should be invented that decompose the data into a coherent set of semantically defined objects. This analysis should not only hunt for objects in isolation, but consider the full scene context and the relationships among all objects in it.

Seamless declarative modelling. Game world design environments shall strive after a full integration of procedural generation techniques and interactive editing operations. The tools shall more effectively translate high-level designer intent into adequate world characteristics, leading to more accessible tools with improved productivity.

Re-usable semantic object library. A key innovation lies in the development of a re-usable semantic object library. Such a semantic library provides the game designer with a large variety of generic semantic objects, each of which knows how it looks, how it behaves, how it relates to other elements of the game world and in which ways it can serve the designer's intent.

Metaphor worlds. Experiments with serious gaming over the past years have learned that game worlds do not need to resemble the real world at all times. On the contrary, some games demand for a metaphorical representation of the world. These metaphor worlds shall be designed to emphasize a certain key concept of the world, while de-emphasizing irrelevant details. Adaptive worlds. The final field of innovation we identify for procedural generation of game worlds is in the field of

adaptive worlds. As the methods for procedural world generation progress, opportunities open up to push these algorithms to the end of the pipeline: creating content at run-time. Game play and user customization can then steer the creation and fine-tuning of the virtual world, thus allowing adaptive worlds with endless possibilities.

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Education, and IndustRy. Many representatives from industry, government, and knowledge institutes have contributed to this innovation plan. The GATHER document was edited by Jan Willem Huisman (I|sfontein), Mark Overmars and Remco Veltkamp (UU).t

How to use mobile games to engage citizens with science

Citizen science for smartphones

This project investigates how games played on smartphones can be used to engage citizens with acquiring and distributing scientific knowledge and data through playful involvement.

Games played on mobile devices offer 'ordinary' citizens without a particular professional training or occupation great opportunities to become and enjoy being citizen scientists. It enables them to engage in the sensing and measuring of various environmental data, their dissemination to a broader audience of either fellow citizens or professionals, and in some instances to even act as 'professional amateur' interpreters of these data. Through the use of mobile technologies people can playfully move through their environment to acquire and distribute scientific knowledge. This knowledge transfer project (Mobile learning-Citizen science) explores how the 7scenes platform can be used for such purposes.

Citizen Science on the Move

Citizen science is a movement that propagates non-scientists to contribute consciously or unconsciously (e.g. crowdsourcing) to scientific knowledge and data gathering. It actually (re) defines science in terms of creativity. This opens up possibilities for connecting citizen science to notions of play.

Games played on mobile phones present

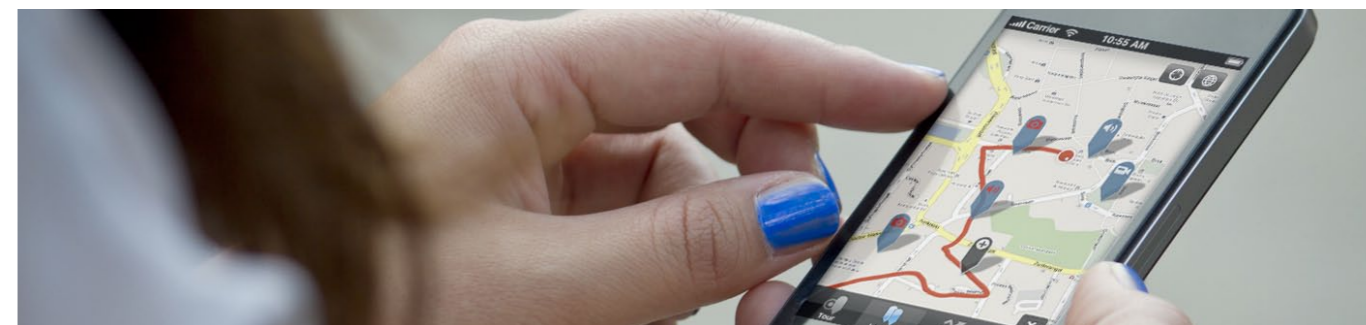
an excellent setting for exploring such possibilities. Technically, this may involve the usage of dedicated sensors designed to capture specific data. It can also comprise the use of one or more of the built-in sensors present in most high-end smartphones (positioning, accelerometer, compass, audio/video/still image capturing, proximity measurement via Bluetooth or RFID, light intensity). In both cases data can be uploaded in real-time or shared at a later moment. In organizational terms, a distinction can be made between institutional projects that tap into 'the power of the many' to harvest additional data, processing power or intelligence; and peer-to-peer projects initiated by 'networked publics'. The kind of data gathered can be about public issues or about private matters. Also, they can be made publicly available or kept proprietary.

Citizen Science and 7scenes

7scenes is a mobile publishing platform that enables organizations to develop and deploy location-based projects for smartphones. 7scenes allows museums and archives to publish their heritage collections beyond the walls and opening times of their buildings (e.g. Drents Archief). 7scenes makes real-world learning curriculum possible for educational institutions (e.g. Frequency 1550 mobile game).

7scenes provides a platform for community projects in the public domain so citizens can map their surroundings. All in all, 7scenes layers cities and landscapes with new meaning and play. 7scenes provides a number of different features that make it a powerful toolkit for citizen science projects:

Without any technical skills serious games can be created that not only link photos, video, notes and sound to locations but also make it possible to add specific interactive gameplay that encourage players to perform challenges and receive rewards. Keeping participants continuously engaged is an important factor. Additionally, alternative external data sources (with location-based scientific data) can be linked to the platform and can be directly used in the development of these serious games. The smartphone apps track the participants' activity in real-time while playing. Activity includes their GPS trace, interaction with locations and also the user-generated-content (photos, notes and reviews) the players produce. The notion of user-generated-content can easily be defined more broadly so it can include any kind of sensor data as well, making the smartphone into a powerful measuring device. 7scenes is also a community platform where all activities of players are published in order to make the accumulated results visible for anyone.



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The government has appointed a number of Top Sectors in the Dutch industries, one of which is Creative Industries, <http://www.top-sectoren.nl/creatieveindustrie>. Part of this sector the gaming domain. The working group on gaming has proposed the Innovation Network GATHER - GAMES for SafeTy, Health,