



Jun 27th, 3:40 PM - 5:00 PM

Playable Simulations: Use of Game Technology to support Environmental Planning

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Falconer, Ruth E.; Smy, Phil; Forbes, Paula; and Donald, Iain, "Playable Simulations: Use of Game Technology to support Environmental Planning" (2018). *International Congress on Environmental Modelling and Software*. 10.

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Playable Simulations: Use of Game Technology to support Environmental Planning

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Abstract: To date, there are few studies that have investigated the use of computer games and related technologies and infrastructure to promote an understanding of complex systems to aid environmental planning. This is surprising as computer game worlds share many properties with complex systems, including many agents interacting in space over time, agent- and system-scale responses to events and the 3D visual representation of large, data sets depicting the system or world state. This presents a unique opportunity to exploit characteristics that game technology offers such as model optimisation, customisation of data visualisation, interactivity and aesthetics in computational models of environmental systems. The type of game concepts and techniques utilised in environmental planning tools will be determined by the background, interest and commitment of the users to the issue under investigation. These techniques can range from sophisticated interactive visualisations of playable simulations, through to prototype games, with associated gameplay and mechanics, to promote wider engagement and raise awareness of the environmental system.

We present a diverse set of scientific models that employ game concepts and technologies to good effect, and discuss the factors and decisions that contribute to their success. Considering urban planning for the sustainable built environment, analysis of atmospheric pollution dispersal, regional planning for a sustainable water-energy-food nexus system, the problem of communicating and understanding complex (high-dimensionality) data within a spatio-temporal context is addressed. Often the multivariate data represent multiple, and often conflicting, system objectives that need to be considered and satisfied by a range of stakeholders. We demonstrate in each case that employing computer game technology is generally beneficial within the software development process offering optimisation via hardware acceleration and a route towards applications that promote good user engagement through aesthetically pleasing, intuitive and responsive interaction.

Keywords: Computer Games; GPUs; Environmental Planning; Game Technology