



RESEARCHER PROFILE

IF YOU EFFICIENTLY BUILD INTELLIGENT 3D WORLDS...

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SYLVIE DANIEL is a full professor at Laval University, Canada. Her research projects focus on 3D modelling of infrastructure and urban environments, and on new edutainment tools based on augmented reality. In 2014, she was Acting Director of the Institute for Information Technology and Society, a key player in the field of smart cities.



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3D MODELLING IS a process whereby a mathematical representation of an object's 3D surface is created. 3D models are now widely used in a variety of different industries; building one of a city, for example, can be used in the development of a game, but is also of benefit to urban planners and engineers, or geographers wanting to gain insight into a city's demographic and sense of place.

However, as it stands, all 3D models that are built are done with one singular purpose in mind – one that is created for the movie industry, for example, is not reusable for other applications. In an ideal world, one model would serve a range of purposes, saving time, money and ensuring that every industry can make use of the same single model. For this to be achieved, research into the construction of a model – and the best method for serving several different contexts at once – must be performed. With this in mind, Professor Sylvie Daniel is working on designing a new methodology and processing solutions that enable intelligent 3D worlds to be built efficiently.

SPEEDING UP MAPPING

Point clouds are extremely large data sets composed of 3D point data. To collect these data, light detection and ranging (LIDAR) laser scanners are commonly used; however, the vast amount of data they must refer to reduces storage, archiving and processing capabilities. Daniel and her team are therefore investigating a means of speeding up the process of detecting and extracting significant structures to model geometric, structural and functional knowledge. By developing a new methodology, relying on 3D descriptors, the team is making the process of 3D mapping and infrastructure modelling more efficient. The researchers are also investigating the fusion of mobile laser scanning (MLS) data with complementary data sets to propose innovative outdoor augmented reality solutions and efficient solutions toward the update of urban geospatial databases.

To achieve this, the researchers are focusing on the concept of a 'point of interest' and related 3D descriptor, which display properties that enable them to carry out processing tasks. The team is working on defining the theoretical

principles of interest points and 3D descriptors adapted to MLS point clouds, which could facilitate image and point cloud matching, as well as interpreting the content of the point clouds (ie. main landmarks, objects and infrastructure in an urban scene).

AUGMENTED REALITY SOLUTIONS

The development of such 3D point clouds could allow for the efficient augmenting of the physical environment, which is of particular benefit to urban planners and engineers. Thus far, the team has shown that matching images and laser point clouds acquired in the same environment is a feasible and viable solution. Soon, Daniel and her team's ongoing research could make the building of efficient and intelligent virtual 3D worlds a reality.

A PARALLEL PROJECT

In addition to their work on building intelligent 3D worlds, Daniel and her team are working on developing games that use augmented reality. Entitled 'Parallel', the project aims to facilitate the learning of abstract and difficult concepts, such as physics.

Students go through a story involving a sealed Sumerian chest that has three secret inscriptions engraved on its inner walls. The aim is to open a mysterious door, but to do so, the inscriptions must be deciphered. This is achieved through the use of a charged particle beam that acts as a probe – the trajectory of which is controlled by applying electric and magnetic fields. To solve the puzzle it is therefore necessary to understand how charged particles travel in these fields.

You can find out more about Parallel here: http://bit.ly/youtube_parallel

