NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

C S   S E M I N A R

Title: **Data-driven Fluid Simulation**

Speaker: Assistant Professor Nils Thuerey
Technical University of Munich

Date/Time: 9 March 2017, Thursday, 02:00 PM to 04:00 PM

Venue: Video Conference Room, COM1-02-13

Chaired by: Dr Low Kok Lim, Senior Lecturer, School of Computing
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Abstract:

Physics simulations for virtual smoke, explosions or water are by now crucial tools for special effects. Despite their wide spread use, it is still difficult to get get these simulations under control, and they are still far too expensive for practical interactive applications.

In this talk I will present recent research that aims for solving and alleviating these issues. A central part of this talk will be devoted to methods to enable the data-driven synthesis of fluid effects. I will describe a method that uses 5D optical flow to register two space-time volumes of simulations. Once the registration is computed, in-between versions can be generated very efficiently. Additionally, I will explain a neural-network-based approach that learns to generate a second level of deformations for refinement. In combination, these deformations can capture large spaces of complex non-linear fluid behavior.

I will show several examples of smoke and liquid animations generated with these deformations. In addition, the neural-network approach makes it possible to generate highly reduced representations of liquid flows. I will demonstrate this with a proof-of-concept mobile version, which makes it possible to interact with complex liquid effects on a regular cell phone. The talk will be concluded by discussing limitations and future directions.

Biodata:

Nils Thuerey is an Assistant-Professor at the Technical University of Munich (TUM). He works in the field of computer graphics, with a particular emphasis on physically-based animation. One focus area of his research targets the simulation of fluid phenomena, such as water and smoke. These simulations find applications as visual effects in computer generated movies and digital games. Examples of his work are novel algorithms to make simulations easier to control, to handle detailed surface tension effects, and to increase the

amount of turbulent detail.

After studying computer science, Nils Thuerey acquired a PhD for his work on liquid simulations in 2006. He received both degrees from the University of Erlangen-Nuremberg. Until 2010 he held a position as a post-doctoral researcher at ETH Zurich. Subsequently, he worked for three years as Research & Development lead at ScanlineVFX, developing large scale physics-simulators for visual effects. He started at TUM in October 2013.