UNIVERSITY OF CALIFORNIA MERCED | SCHOOL OF ENGINEERING

Electrical Engineering and Computer Science Seminar

GPU-based methods and representations for path planning and multi-agent navigation

Renato Farias

Friday, March 20, 2020

12:00 PM – 1:20 PM online via Zoom
https://ucmerced.zoom.us/j/301704609

Faculty Host: Prof. Marcelo Kallmann

Abstract

Efficient path planning is crucial in various applications from planning motions for robots to controlling autonomous agents in virtual environments. This talk will focus on our published work on path planning using GPU-based methods. Our approach relies on shader programs which are executed by the GPU's graphics pipeline. In the first part I will describe our GPU-based method for computing Shortest Path Maps (SPMs) in generic 2D polygonal environments, which allow for the efficient extraction of globally-optimal trajectories for agents placed anywhere in the environment. The produced maps offer new capabilities not explored by previous representations, such as polygonal sources and vertex weights for modeling velocity changes. In the second part I will present our solution for computing Continuous Max Flows in polygonal environments. We have applied extensions of our SPM construction method to allow us to compute Max Flow Maps, from which we extract lanes of maximum flow to guide a large number of agents through an environment from source edges to sink edges. The approach leads to a max flow representation stored in the frame buffer of the GPU, and the produced lanes accommodate the maximum number of agents that can traverse an environment without creating bottlenecks.

For additional information contact Prof. Carreira-Perpiñán <mcarreira-perpinan@ucmerced.edu>

Renato Farias

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Biography

Renato Farias received a BSc degree in Computer Science in 2011 from the Federal University Fluminense, Brazil, and a MSc degree in the area of Computer Graphics from the Federal University of Rio de Janeiro in 2014. He is currently working toward his PhD degree at the University of California, Merced, on the topic of GPU-based methods and representations for navigation. His research interests include computer graphics, path planning, and GPU programming.