MATTHEW D. FISHER

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Education

2007-Present Ph.D. in **Computer Science** under Patrick Hanrahan, Stanford University, GPA **4.15/4.3**
2003-2007 B.S. in **Computer Science,** California Institute of Technology, GPA **3.9/4.3**
2001-2003 North Carolina School of Science and Mathematics

Skills

C/C++, Java, DirectX, OpenGL, HLSL, GLSL, WinDbg, Assembly, C#, Mathematica, MATLAB, Python

Work Experience

Context-Aware Scene Modeling *Stanford ♦ Stanford, CA* **September 2009 – Present**

- Gathered very large scene databases from virtual worlds and online 3D model collections and analyzed this dataset to learn the contextual relationship between models
- This contextual information is used to assist both professional and casual artists as they model scenes by ordering the set of models based on how likely they are to appear given the surrounding environment
- Currently exploring other uses for this information, such as automatically decorating partially modeled scenes with relevant objects, and suggesting replacement models for an object that has already been placed
- Published a SIGGRAPH Asia 2010 and a SIGGRAPH 2011 paper based on this work

Japanese Text Translation for Tourists *Stanford ♦ Stanford, CA* **Winter 2009**

- Designed a program that uses machine learning to recognize Japanese or Chinese text in images and translate it into English, targeting mobile devices and cameras
- Allows users to correct character separation and transcription errors, focusing on users unfamiliar with Unicode input in these languages or other aspects that can complicate translation (一 vs. 一, 口 vs. 口, ヅ vs. ジ, etc.)
- Achieves better than 95% transcription accuracy on high-resolution input images (40x40 or larger pixels/character)
- Considers the full probability distribution over each character when translating to robustly handle misclassified characters

Camera-Only Robot Localization *Stanford ♦ Stanford, CA* **Spring 2009**

- Deployed a robot equipped with a three axis camera and both horizontal and vertical range scanners through a crowded laboratory environment
- Used the simultaneous localization and mapping (SLAM) algorithm on the horizontal scanner data to reconstruct a 2D map of the traversed environment and incorporated the information from the vertical scanner and cameras to create a fully textured 3D map of the building
- Designed an algorithm to enable robots that do not have range scanners and are equipped with only a camera to determine their position and orientation in this environment using the generated 3D environment map

Micropolygon Rendering *Stanford ♦ Stanford, CA* **August 2008 – January 2010**

- Modified the modern real-time graphics pipeline so that it scales better in the case of production quality scenes, which are often characterized by polygons which are less than a pixel in size
- Proposed and implemented a parametric patch tessellation algorithm that does not produce cracks, adapts well to changing surface complexity, and permits a simple parallel implementation
- Published the algorithm and presented it as first author at the SIGGRAPH Asia 2009 conference in Yokohama, Japan

Mesh Reconstruction from Images *Stanford ♦ Stanford, CA* **Fall 2007 – Spring 2008**

- Implemented an algorithm to reconstruct a 3D mesh from a set of 2D images of an object whose key feature is to iteratively project a candidate mesh back into the input images and converge to a stable and accurate result

- GPU implementation reduced computation time from 30 minutes per image to less than 5 seconds per image, and produces a fully textured and closed mesh
- Achieved over 99% accuracy using 47 images on the standard Temple and Dino datasets

Discrete Differential Geometry *Caltech ♦ Pasadena, CA* **June 2006 – June 2007**

- Collaborated with researchers from Microsoft Research and Caltech to develop a system for user-controlled design of tangent vector fields on a surface based on discrete differential geometry
- Uses texture synthesis as a compelling target application
- First author on the associated paper which was presented at SIGGRAPH 2007

DirectX SoftGPU Team *Microsoft ♦ Seattle, WA* **Summer 2007**

- Developed a kernel driver that implements the Windows graphics driver model entirely in software and mounts either on a VGA device or as a secondary monitor
- Integrated this driver with the Microsoft WARP software renderer to enable optimized 2D and 3D graphics
- Used this driver to test Windows driver model features, such as virtualized graphics card memory, that were under development and did not yet have existing graphics cards or drivers that support these features

DirectX Kernel Team *Microsoft ♦ Seattle, WA* **Summers 2005, 2006**

- Developed GPUView, a comprehensive tool for investigating graphics performance issues that is still in use by Microsoft and its hardware partners for the Windows Vista & Windows 7 Display Driver Model and ships with the Windows 7 SDK
- Wrote a patent called Kernel Event Visualization based around this work
- Investigated and resolved several performance bottlenecks in the OS
- Implemented a new kernel entry point for graphics drivers

Teaching Experience

CS148: Introduction to Computer Graphics and Imaging, Instructor **Stanford University, Summer 2009**
CS148: Introduction to Computer Graphics and Imaging, TA, Ranjitha Kumar **Stanford University, Summer 2008**
CS148: Introduction to Computer Graphics and Imaging, TA, Patrick Hanrahan **Stanford University, Winter 2008**
CS/CNS/EE 156b: Projects in Learning Systems, Lead TA, Yaser S. Abu-Mostafa **Caltech, Winter 2006**
CS/CNS/EE 156a: Learning Systems, Lead TA, Yaser S. Abu-Mostafa **Caltech, Fall 2005**

Publications

FISHER , M., SAVVA, M., AND HANRAHAN , P. Characterizing Structural Relationships in Scenes Using Graph Kernels. *SIGGRAPH 2011.*

FISHER , M., AND HANRAHAN , P. Context-Based Search for 3D Models. *SIGGRAPH Asia 2010.*

FISHER , M., FATAHALIAN , K., BOULOS , S., AKELEY, K., MARK , W., AND HANRAHAN , P. DiagSplit: Parallel, Crack-Free, Adaptive Tessellation for Micropolygon Rendering. *SIGGRAPH Asia 2009.*

FISHER, M., SCHRÖDER, P., DESBRUN, M., AND HOPPE, H. 2007. Design of Tangent Vector Fields. *SIGGRAPH 2007.*

FISHER, M., SPRINGBORN, B., BOBENKO, A. I., AND SCHRÖDER, P. An Algorithm for the Construction of Intrinsic Delaunay Triangulations with Applications to Digital Geometry Processing. *Discrete Differential Geometry Course Notes*, *SIGGRAPH 2006*.

Scholarships and Honors

Hertz Foundation Applied Science Fellowship **Hertz Foundation, Eric Wepsic**
Housner Award for Undergraduate Achievement **California Institute of Technology**
Upper Class Merit Award **California Institute of Technology**
Barry M. Goldwater Scholarship **US Government**
Bhansali prize for best undergraduate researcher in CS **California Institute of Technology, CS Faculty**
Fred V. and Marvis B. Maloney Scholarship **California Institute of Technology**
Richard Brewer prize for best physics research hurdle solution **California Institute of Technology, Physics Faculty**