Ryan Kautzman
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Pixar Animation Studios | Senior Software Engineer | December 2005 - Present

- PhysBAM FEM based skeletal muscle simulation for Incredibles 2 | R&D Collaboration
  - Stable Neo-Hookean FEM constitutive model
  - Quasistatic and ballistic
- Skin simulators for Finding Dory and Incredibles 2 | Project Lead
  - Geodesic and raytracing sliding algorithms
  - Procedural constraints and sliding limits
  - Analytic inverse Phong projection
- Deformable simulation infrastructure for Finding Dory | Project Lead
  - Redesign of PhysBAM's deformables, focused on parallelism and flexibility
  - Lock free TBB concurrent force evaluation scheduler; CCD, force, and integration loop parallelization
  - Arbitrary and time independent meshes, bindings, and force topologies
  - Continual frame relative restaging
  - On-the-fly re-meshing
  - C++ JIT plugins
- Cloth/fluid feather, hair/fluid, and rigid body tentacle prototypes | Special Projects
- USD based sim pipeline | Software Engineer
  - Transitioned cloth, hair, flesh, rigid, and vegetation simulators to USD
- Procedural tetrahedral and triangular meshing pipeline | Project Lead
  - Tet mesh construction, refinement, culling, conforming, cutting, and cache coherency optimization
  - Multi-layer thin wall tet meshes
  - Stochastic and edge collapsing triangle mesh simplification, and hexahedral re-meshing routines
- AutoPAL: automatic bindings of the PAL scene graph into Presto | Project Lead
  - Reduced Presto prim specification from hundreds to thousands of lines of code, to about five to ten
- MPI distributed fluids for Brave | Project Lead
  - Houdini front end controlling PhysBAM PLS, running typically across 64 machines for extended time periods
  - Single phase, multi-phase, and viscoelastic
  - Comm layer built on custom HTTP server facilitated large data set transfer and distribution, coalescing, and compression, as well as monitoring and control
  - Implemented a generalized field API, a 'windowed' source, divergence fields, static and deforming colliders, etc.
- PAL Solids | Software Engineer & Project Lead
  - PAL based deformable and rigid body simulator built around PhysBAM
  - Designed skin simulator and oversaw implementation
- Physics Abstraction Layer (PAL) | Project Lead
  - Light weight scene graph for simulation, built in C++ with python bindings
  - Factory based contextual or manual scene construction, automatic multistep data type conversions, temporal and spatial interpolation, data and scene validation, serialization, integrated user documentation, logging, and statistic gathering
  - Simulator, front end (Maya, Houdini, Presto, Python, etc.), and execution mode (interactive, realtime, batch, etc.) agnostic
- FEM and rigid body simulators for Wall-e, Up & Toy Story 3 | Software Engineer
  - Co-invented rest state retargeting for finite elements
  - Articulated and force based angular rigid body constraints
- Kingpin 2 design | Architect
  - Requirement spec, design doc, and API spec for python based simulation infrastructure within Marionette
- Driving system for Wall-e | Software Engineer
  - Built a threaded, time budgeted path tracing widget in Marionette for all robots on Wall-e
- Wiggly splines | Software Engineer
  - Built a front end for a modal decomposition and subspace deformation experiment with Research

Industrial Light and Magic | R&D Software Engineer | June 2000 - November 2005

- Deformable simulation infrastructure in Zeno | Software Engineer
  - Mass-spring cloth and flesh systems
- Caricature flesh development for Van Helsing | Project Lead
  - Unconditionally stable flesh system developed with Prof. Ron Fedkiw
- Caricature cloth development | Software Engineer
  - Rigid and deforming volumetric collision objects, and geometric repulsion bodies
  - Integrated Bridson style continuous collision detection
  - Adaptive subdivision collision detection
  - Implemented an adaptive time stepping scheme and CFL conditions
- Real time previsualization | Project Lead
  - On-set previs system built on top of XSI game engine for Director Ang Lee
  - Built a camera capture system with a non-linear editor
- Timecard and M-Tools | Software Engineer
  - Web based timecard and production tracking system, with a Java backend

Publications

- Robust Skin Simulation in Incredibles 2 | SIGGRAPH 2018, Talks
  Authors: Ryan Kautzman, Gordon Cameron, Theodore Kim
  http://tinymonkey.org/publications/Incredibles2_RobustSkinSimulationInIncredibles2_SIGGRAPH18.pdf
- Finding Hank: Or How to Sim An Octopus | SIGGRAPH 2016, Talks
  Authors: Ryan Kautzman, Bill Wise, Meng You, Per Karlsson, Mark Hessler, Audrey Wong
  http://tinymonkey.org/publications/FindingDory_FindingHankOrHowToSimAnOctopus_SIGGRAPH2016.pdf
- Stable, Art-Directable Skin and Flesh Using Biphasic Materials | SIGGRAPH 2012, Talks
  Authors: Ryan Kautzman, Jiayi Chong, Patrick Coleman
  http://tinymonkey.org/publications/Brave_BiphasicSkinAndFlesh_SIGGRAPH12.pdf
- Simulating the Devolved: Finite Elements on WALL-E | SIGGRAPH 2008, Sketches
  Authors: Geoffrey Irving, Ryan Kautzman, Gordon Cameron, Jiayi Chong
  http://tinymonkey.org/publications/Walle_SimulatingTheDevolved_SIGGRAPH08.pdf
- Jiggly Bits and Motion Retargeting | SIGGRAPH 2004, Sketches
  Authors: Ryan Kautzman, Andrea Maiolo, Doug Griffin, Andy Buecker
  http://tinymonkey.org/publications/VanHelsing_JigglyBits_SIGGRAPH04.pdf

Patents

- US9251618B2 - Skin and flesh simulation using finite elements, biphasic materials, and rest state retargeting.
- US8847963B1 - Systems and methods for generating skin and volume details for animated characters.
- US8290757B2 - Method, system and computer readable media for deforming simulation meshes used in posing animated characters. (Rest state retargeting)
- US20140005994A1 - Windowed simulation in fluid flows.

Education

University of California, Davis
Degree: Bachelor of Science in Computer Science | June 2000
Major: Computer Science
Emphasis: Computer Graphics and Scientific Visualization

Programming Languages & Relevant API's
C/C++, Java, JSP, JavaScript, Python, SQL, PHP, HTML, CSS, csh & bash scripting (reluctantly)
PhysBAM (Fedkiw et al, dynamics libraries), STL, Boost, TBB, USD, MPI, and many more…

Film Credits

Pixar: Incredibles 2 (2018), Coco (2017), Cars 3 (2017), Finding Dory (2016), The Good Dinosaur (2015), Inside Out (2015), Monsters University (2013), Brave (2012), Cars 2 (2011), Toy Story 3 (2010), Up (2009), WALL-E (2008), Ratatouille (2007)

ILM: Van Helsing (2004), The Hulk (2003), Planet of the Apes (2001), plus lots and lots of uncredited work on Pirates of the Caribbean 1 & 2, The Chronicles of Narnia, The Island, War of the Worlds, Star Wars: Episode III, and Harry Potter 3 & 4.

Personal Mantras

- A good idea is a good idea no matter where it comes from
- Always give credit where credit is due
- Relentlessly take the high road
- If a job is worth doing, then it's worth doing right

And many others I'm continually trying to imprint on the psyche of my kids…