

Woojong Koh

Curriculum Vitae

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 <http://wjkoh.com>

Work Experience

Software Engineer, Waymo LLC and Google Inc. (May 2016 – present)

Waymo, formerly known as the Google self-driving car project, is a standalone company that was spun off from Google Inc. on January 1st, 2017 and has been a subsidiary of Alphabet Inc. like Google and DeepMind since then. I'm a member of the Vision/Perception team and working on vision-based detection and classification for self-driving cars using various machine learning techniques, such as convolutional neural network (CNN), recurrent neural network (RNN), and so on.

Education

Ph.D. student, Computer Science, Aug. 2012 – May 2016 (on leave)
University of California, Berkeley
Advisor: Prof. James F. O'Brien

M.S., Computer Science, May 2016
University of California, Berkeley

B.S., summa cum laude, Computer Science and Engineering, Feb. 2012
Seoul National University, South Korea

Honors

- 11/2011 *Samsung Scholarship*
Awarded from Samsung Foundation of Culture in 2011
Formerly known as the Samsung Lee Kun Hee Scholarship Foundation (SLSF)
- 3/2004 *National Scholarship for Science and Engineering*
Awarded from Korea Student Aid Foundation (KSAF) in 2004

Publications

View-Dependent Adaptive Cloth Simulation with Buckling Compensation,

Woojong Koh, Rahul Narain, James F. O'Brien,
IEEE Transactions on Visualization and Computer Graphics (TVCG), October 2015.

- Demo video: <http://youtu.be/71TOPXD9j4E>
- Project home: <http://graphics.berkeley.edu/papers/Koh-VDA-2015-10/>

View-Dependent Adaptive Cloth Simulation,

Woojong Koh, Rahul Narain, James F. O'Brien,
ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), July 2014.

- Demo video: <http://youtu.be/MEkoUtRRWug>
- Project home: <http://graphics.berkeley.edu/papers/Koh-VDA-2014-07/>

Near-Exhaustive Precomputation of Secondary Cloth Effects,

Doyub Kim, **Woojong Koh**, Rahul Narain, Kayvon Fatahalian, Adrien Treuille, James F. O'Brien, ACM SIGGRAPH 2013, July 2013.

- Demo video: <http://youtu.be/PJ4dJgGE0rc>
- Project home: <http://graphics.berkeley.edu/papers/Kim-NEP-2013-07/>

Research Experience

Research Intern, Google Inc., CA (May 2015 – Aug. 2015)

Like the previous year, I worked as a software engineering intern in the Google Maps team at Google Inc., Mountain View. My intern host was Brett Allen (brettallen@), and we did research on removing shadows from building textures for Google Maps. We adopted an optimization-based approach similar to [Kwatra et al. 2012]. In brief, we first estimate an illumination image by minimizing our data term, which consists of multiple aerial images captured at different times of the day, with total variation regularization. Once we get the estimation of the illumination, we can remove shadows from the target texture by subtracting the illumination values from the texture when both are in log space.

- Images: <http://wjkoh.com/work-experience>

Research Intern, Google Inc., CA (May 2014 – Aug. 2014)

I worked as a software engineering intern in the Google Maps team at Google Inc., Mountain View. My intern host was Mark Duchaineau (duchaine@), and we conducted a research project on detecting reflective surfaces in cities, e.g., windows, using multiview aerial images. We first classify the surfaces by utilizing the differences between diffuse and specular reflections, and rendered dynamic reflections in them using environment mapping.

- Images: <http://wjkoh.com/work-experience>

Research Intern, Google Inc., CA (May 2013 – Aug. 2013)

I worked as a software engineering intern in the Personalization and Recommendation team at Google Research, Mountain View. My intern host was John Anderson (janders@), and we developed a visualization system for high-dimensional datasets. To display the high-dimensional dataset in 3D effectively, we explored various dimensionality reductions including varimax-rotated PCA and t-SNE [van der Maaten and Hinton 2008]. I built the back end by gluing my Python scripting system to Google's HTTP server using SWIG, because it allowed users to test their own dimensionality reduction codes interactively, and we wrote the front end in JavaScript with three.js to render the 3D visualization using WebGL.

Research Intern, Movement Research Lab, Seoul National University (Jul. 2011 – Jul. 2012)

Advisor: Prof. Jehee Lee

I worked as a full-time research intern in Prof. Jehee Lee's laboratory, and my research project was about large-scale human motion path editing.

Skills

Technical Skills

- C/C++ (C++11, Boost, Eigen), Python (NumPy, SciPy, SciKits), SWIG
- TensorFlow, Google's internal frameworks for machine learning and data processing
- OpenGL, OpenCV, Unreal Engine 2.5
- HTML, JavaScript (jQuery), WebGL (three.js), D3, Flask
- Zsh, L^AT_EX, SCons, MATLAB, Maya, Blender

Code Samples

- C++: https://bitbucket.org/wjkoh/koh/src/tip/koh_cpp/src/

Languages

- Korean, English

Course Projects

Graduate

- **FEM-based deformable body simulator**
This simulator is for simulating thin sheets of deformable materials using finite element method. It supports several constitutive models, such as linear elasticity, Saint Venant-Kirchhoff, and neo-Hookean models, and also several time integration schemes, such as explicit Euler, symplectic Euler, and implicit Euler methods.
 - Codes: https://bitbucket.org/wjkoh/koh/src/tip/koh_cpp/
- **Monte Carlo path tracing, shadow mapping, and progressive mesh**
 - Images: <http://wjkoh.com/projects>
- **Human motion recognition** (Dec. 2012)
 - Video: <http://youtu.be/61j1eUnHG3s>
 - Codes: <https://bitbucket.org/wjkoh/cs280-cv>

Undergraduate

- **Distributed ray tracer** (Jul. 2011)
I developed a distributed ray tracer based on stochastic sampling. The tracer renders 3D geometric primitives based on Phong illumination, supporting texture and bump mapping. The main features are recursive reflection, recursive refraction, soft shadows, depth of field, and motion blur. The tracer accelerates computations using binary space partitioning (BSP) and OpenMP.
 - Codes: <https://bitbucket.org/wjkoh/4190.410-cg>
- **C-like language interpreter with a static type checking system** (Sep. 2005 – Dec. 2005)
I developed a C-like imperative language interpreter with a static type checking system in nML¹, a dialect of ML. To be specific, I developed sound and static type checking system using the algorithm V and J. A. Robinson's unification algorithm [Robinson 1965]. My language was type-safe; it eliminates type errors from runtime because the interpreter statically checks types prior to execution. Also, I implemented Hindley-Milner style let-polymorphism using the algorithm W.
- **Automatic code generation** using C++ templates and macros (Jun. 2008)
Generally, to maintain consistency between a server and a client, packet classes and their serialization codes are automatically generated from common specification files by an external code generator. However, I tried to develop a more standard and internal way of code generation that removes the necessity of an external code generator. Using MPL and Preprocessor of the Boost libraries, I was able to implement automatic code generation at compile time using only C++ internal templates and macros.
 - Codes: <https://bitbucket.org/wjkoh/packet-code-generator>
- **Web search engine using Google's PageRank** (Jun. 2004 – Feb. 2005)
I implemented Google's PageRank algorithm following [Brin and Page 1998]. I implemented a crawler in Java, a repository using MySQL, and a Web front end in PHP.

¹nML, a dialect of Standard ML and Objective Caml. <http://ropas.snu.ac.kr/n/>

Employment

- 5/2016–present Software Engineer, Waymo LLC, CA
- 5/2016–present Software Engineer, Google Inc., CA
- 5/2015–8/2015 Software Engineering Intern, Google Inc., CA
- 5/2014–8/2014 Software Engineering Intern, Google Inc., CA
- 5/2013–8/2013 Software Engineering Intern, Google Inc., CA
- 9/2006–4/2009 Software Engineer, Nexon Corp., Seoul, South Korea
- 1/2006–9/2006 Software Engineer, Cybermed Inc., Seoul, South Korea

Bibliography

- BRIN, S., AND PAGE, L. 1998. The anatomy of a large-scale hypertextual web search engine. *Computer Networks and ISDN Systems* 30, 1-7, 107 – 117. Proceedings of the Seventh International World Wide Web Conference.
- KWATRA, V., HAN, M., AND DAI, S. 2012. Shadow removal for aerial imagery by information theoretic intrinsic image analysis. In *Computational Photography (ICCP), 2012 IEEE International Conference on*, 1–8.
- ROBINSON, J. A. 1965. A machine-oriented logic based on the resolution principle. *J. ACM* 12 (January), 23–41.
- VAN DER MAATEN, L., AND HINTON, G. E. 2008. Visualizing high-dimensional data using t-sne. *Journal of Machine Learning Research* 9, 2579–2605.

February 15, 2017