



## PAUL ALEXANDER WELCH

3D Engine Programmer.  
OpenGL, DirectX, WebGL,  
CUDA, OpenCL.

Main Languages: C, C++, C#,  
Javascript, Python, Bash

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<https://github.com/blockulator>

About:

<https://blockulator.github.io/>

Twitter:

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### Boston Consulting Group Digital Ventures/Mulight Berlin,Germany —2019- 2020

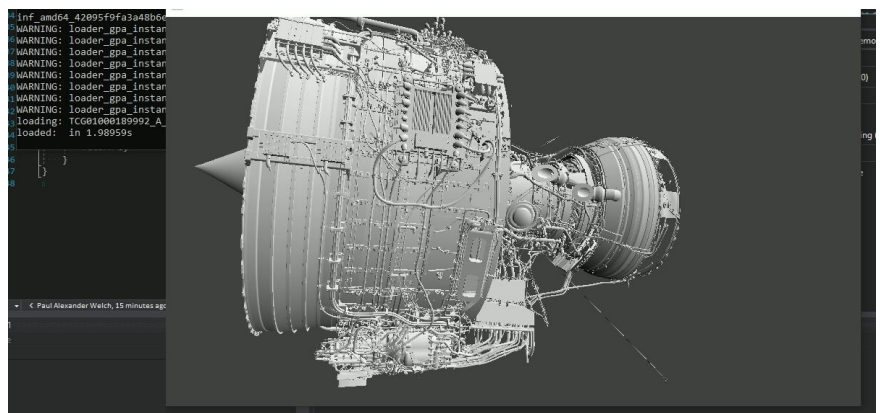
- Implemented Physically Based Rendering, Clear Coat shading, subsurface scattering and anisotropy for AR application using Google Filament as a guide.
- Manage asset production pipeline from outsourced company for virtualized AR products being sold through Android and iOS app.



### VR CAD Company

West London,United Kingdom — 2019

- Designed and implemented Vulkan renderer for CAD models, using parallel hot loading. Loads a 90m triangle model with 200k parts in 1.1 seconds, compared to 1hr in Siemens's NX.
- Implemented application streaming with WebRTC.

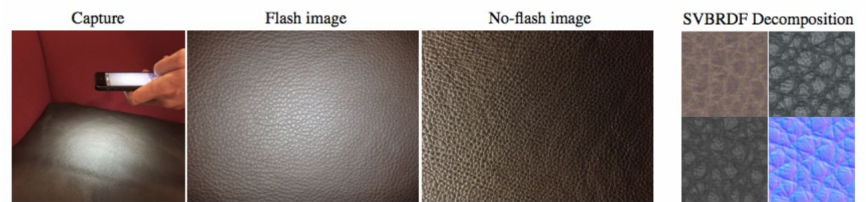


**Senior Software Engineer, Samsung Electronics Research Institute**  
Staines-Upon-Thames, United Kingdom — 2017-2018

SERI research is confidential so not all details can be given here.

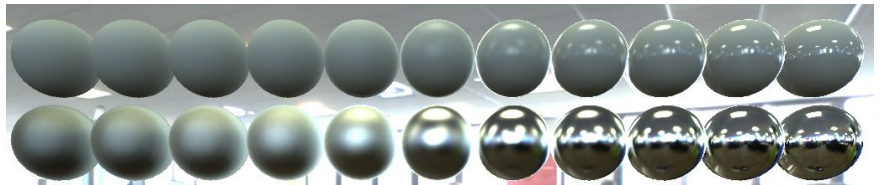
- Deep learning with Keras and Tensorflow. GANs/CNNs
- Q-Learning
- ARCore modification and integration.
- Realistic rendering.

Optimized CUDA parts of paper [Two-Shot SVBRDF Capture for Stationary Material](#), achieved 1000-5000 times performance improvement over original implementation. Started on replacing traditional numerical optimization methods with GPU accelerated simulated annealing with Tensorflow.



**Figure 1:** Given an flash-no-flash image pair of a "textured" material sample, our system produces a set of spatially varying BRDF parameters (an SVBRDF, right) that can be used for relighting the surface. The capture (left) happens in-situ using a mobile phone.

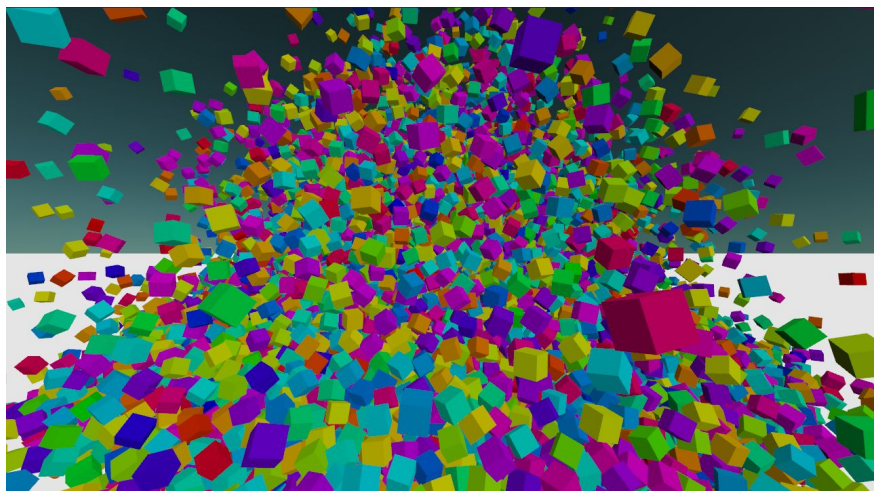
- Fixed Samsung's metal/roughness materials and Cook-Torrence split-sum approximation shader.



**Research Project: Parallelism**

Stable Stacking of Rigid Bodies using Compute Shaders.

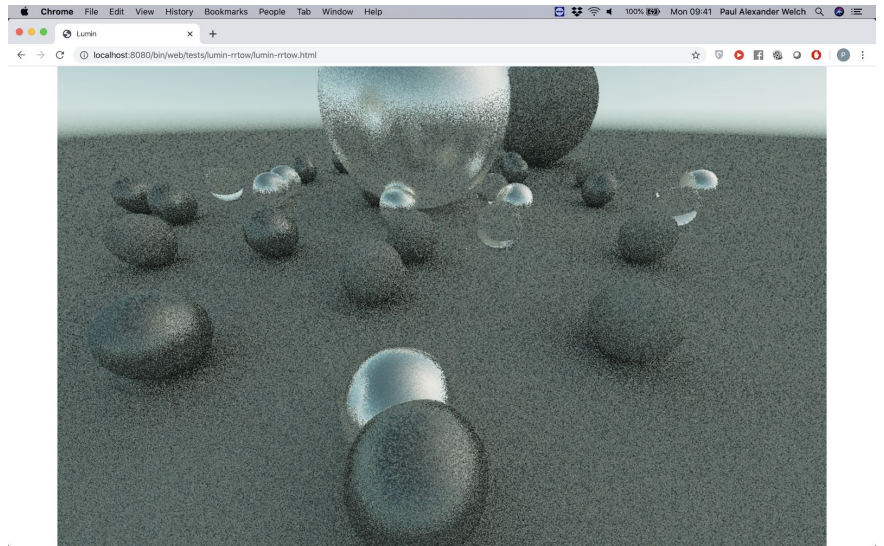
Unique algorithm allows mobile compatible simulation of 100,000~1,000,000 bodies, with stable stacking and constraints on GPU.



## Research Project: High Performance Computation in Browser

Realtime physically based ray tracing.

- Using WebAssembly and WebGL to perform parallel computation.

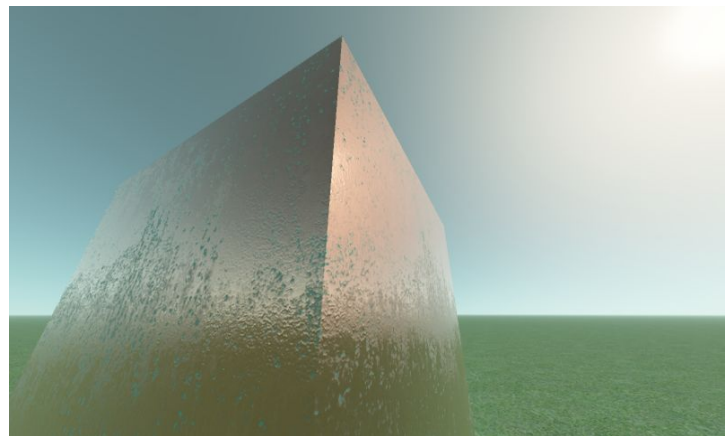


<https://twitter.com/blockulator/status/1131881260568203264>

## Virtual Arts

Cambridge, United Kingdom — 2017 (contract)

- Mobile compatible physically based global illumination rendering.
- Virtual reality development.
- High fidelity 2d and 3d text rendering with signed distance fields.



**Software Engineer, DSSCTech Financial Services** (contract)  
Lisbon, Portugal — 2016-2017

Developed automated trading platforms.

- Development for various financial services.
- .NET Core, React Native, iOS, Android NDK.
- Back-end cloud server development Linux and WinServer.
- Web front end development. HTML, CSS, React.
- Server administration.





## Senior Developer, Jumpgate/Taurus Securities

Seoul, Korea— 2014-2015

Developed automated trading platforms.

- Traded over \$1bn of securities in the first 3 months.
- C/C++ trading platform with KRX DMA access.
- C# WPF risk management and control interface.
- Low level Linux kernel event timing to reduce trade calculations from micro-seconds to nano-seconds.
- Machine-learning auto-regression for short term options/futures price prediction with random-forest.
- Optimise SVM kernels with CUDA for long term portfolio selection.
- Accurate order queue reconstruction for backtest simulation.

<https://www.youtube.com/watch?v=zs0M0UQcFZk>

Star Code	Name	Price	Bid/offer Ratio	Volume Up/Down Tick Ratio	Trade Up/Down Tick Ratio	Move from Yesterday's Close %	Move from Open %
KRX000000000	Woori Bank	10200	1.327788		14.13	0.9803922	0.4901961
KRX010990004	S-Oil	48900	0.1227762		61.60	3.338171	0.2902758
KRX017670001	SK Telecom	254000	0.5959685		18.18	0.984252	-1.198554
KRX096770003	SK Innovation	124000	0.546481		42.80	2.811245	0.8032129
KRX000660002	SK hynix	47950	0.4443533		26.27	0.1042753	-0.1042753
KRX003600004	SK	195500	4.43		99	0.7672634	0
KRX055550000	Samsung Group	41150	0.5949881		22.20	0.8925488	-0.1215067
KRX012450003	Samsung Techwin	32500	0.7390252		20.14	1.538462	0.7692308
KRX016380000	Samsung Elec	61800	1.581101		30.31	0.6472492	-0.3236246
KRX010140002	Samsung Eng'g	18200	0.8235452		19.18	0.8247158	0.8247158
KRX099150004	Samsung Eng'g Mech	56400	2.873997		12.9	1.41884	0.5131449
KRX055000001	Samsung Elec	1291000	0.112446		48.37	0.697134	0.697134
KRX008300000	Samsung S&T	72200	0.3974155		61.573	5.817134	1.521546
KRX094600006	SAMSUNG SEC CO., LTD.	111500	0.4099949		19.8	0.8810571	0.4405396
KRX032810002	SAMSUNG LIFE	104500	0.7380577		16.15	0.4784689	0.4784689
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KRX036570000	NCCor	190000	2.270515		25	0	-0.7894757
KRX035420006	NAVER	595000	0.3997635		23.25	0.8403361	-0.6722689
KRX012310007	Mobis	210000	0.7638356		27.28	1.666667	0.2380592
KRX037620002	KORAM ASSET SEC	59100	1.364461		112.11	0.8460217	0.1680247



## Chief Technical Officer, Gamebase USA

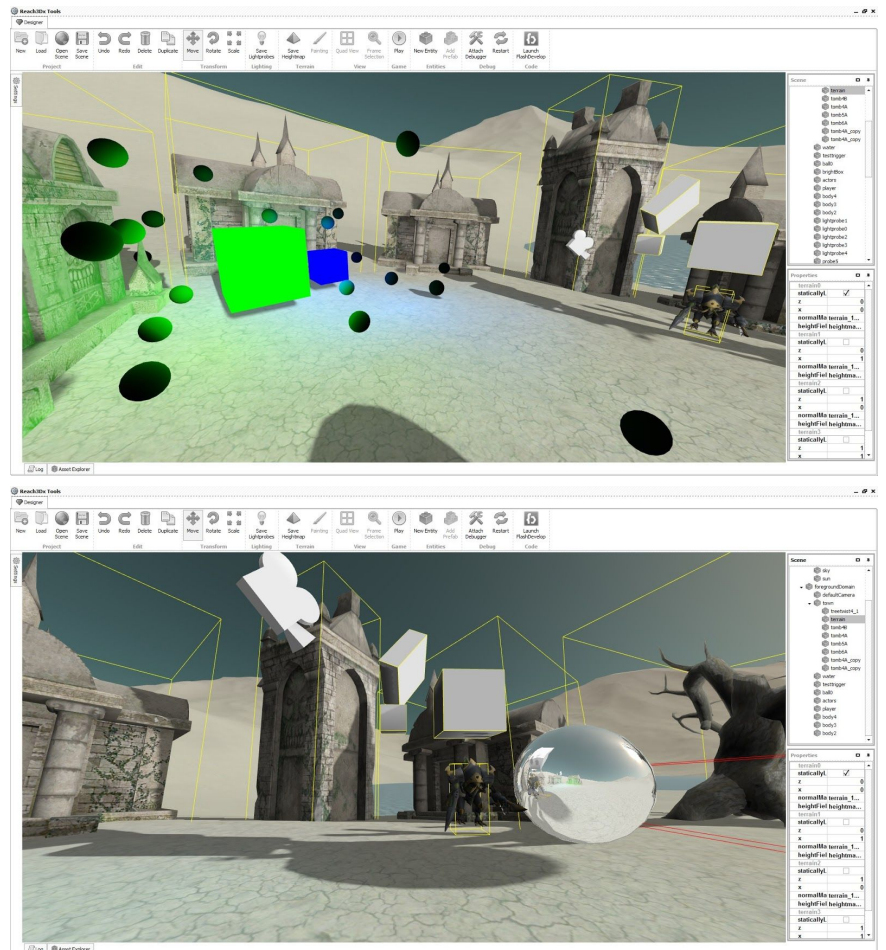
Seoul, Korea — 2012-2014

Gamebase is the owner of the Gamebryo engine, the cross-platform renderer used in the Fallout series of games and numerous Disney titles. Worked on PS3, Wii and PC builds, re-wrote materials system for OpenGL ES 2.0/3.0 and worked with a team to implement mobile rendering.

Created a completely new cross-platform 3D game engine as Technical Director, leading a small team to produce the first competitive 3D HTML5 interactive content creation platform. Native code applications are also generated from the same code for high-performance mobile content.

### Accomplishments

- Supported PC and console builds of Gamebryo.
- Create a new cross-platform game/rendering engine presented at GDC 2014.
- Modified BulletPhysics engine from source, cross-platform builds and engine integration.





## Software Engineer, Company 100

Seoul, Korea — 2011-2012

Back-end server side. Designed and implemented a scalable big-data MMO game server using node.js, Redis, MongoDB and Hadoop on AWS. Assisted with hardware acceleration of mobile HTML5 content using a modified WebKit. Extensive OpenGL and shader development work.

### Accomplishments

- Assisted developing OpenGL Accelerated HTML5 Canvas.
- Unity3D middleware development.
- Developed Unreal Engine 3.0 mobile game with custom shader pipeline, and other substantial UE3 engine modifications from source.
- Mobile shader and Hardware acceleration work.



## **Software Engineer, Various Military Contracts**

UK, Portsmouth — 2004-2010

Military simulation and training games. C++, Flash/AS3, various game and simulation engines.

### **Accomplishments**

- Developed hardware accelerated Navier-Stokes fluid simulator for pump simulation.
- Supported Unreal 2.0 project development.
- Pre-calculated lighting engine with sub-surface scattering.

