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Work Experience

Nov 2019 - Aug 2021

Google Chat

- Solved an entire class of race conditions from collaborative updating of messages by specifying and enforcing a source of truth for all edits.
- Re-architected the central Message object, for each layer of the stack.
- Designed a future-proof Annotation object, for component-like attaching of arbitrary structured data to messages.

Jun 2016 - Nov 2019

Google Earth

- Architected core/document, enabling collaborative editing for documents.
- Architected the Earth State System, allowing the app to react to external changes while maintaining constraints, while being readable and flexible. Led three other engineers in the implementation. Permanently eliminated an entire class of bugs.
- Championed tech-debt efforts, resulting in the resolution of hundreds of bugs.
- Brought integration testing to the Earth webapp, trained and led the team in writing webdrivers.
- Implemented Chrome LocalFileSystem support, to save users' documents in the browser.
- Designed client-side crypto-shredding of cached documents, to protect users' privacy while enabling offline editing.

Feb 2014 - Jun 2016

Google MyMaps

- Designed and implemented MyMaps' Address Geocoder.
- Designed changing columns' types, to solve a fundamental user-visible sorting problem, with a 36-page doc exploring options, involving load testing, distributed migration, and benchmarking.
- Designed and implemented MyMaps' mobile user-generated content discovery platform.

Vale Programming Language

Jan 2013 - Present

- Lead for the Vale Programming Language, a statically typed, ahead-of-time compiled, 100% safe, native-speed language with the goal to bring safety, speed, and flexibility to all programmers.
- Implemented the Vale compiler, 100,000 lines of:
  - A recursive-descent parser using Scala parser combinators.
  - A typing phase, written in Scala.
  - A backend LLVM codegen phase, written in C++.
- Invented Hybrid-Generational Memory, a new memory management paradigm alternative to reference counting, garbage collection, or the borrow checker.
  - Optimized performance using cache-friendliness skills.
  - Balanced multiple language design priorities to make it ergonomic for the user.
  - Designed static analysis phases to eliminate a majority of run-time overhead.
  - Led a masters student in a thesis project implementing static analysis.
  - Invented a special 1-bit reference counting technique called Scope Tethering.
- Designed and implemented:
  - Universal Function Call Syntax and Infix Calling (Operators Are Just Functions™)
  - Compiler error reporting, with immediate feedback and fix suggestions.
  - Single ownership, weak references, and immutable shared ownership objects.
  - Lambdas, capturing values from the environment.
  - Abstract and override functions for run-time polymorphism
  - Templates and overloads for compile-time polymorphism.
  - Cross-compilation to both LLVM and Javascript, with designs for JVM and CLR.

Education

California Polytechnic State University San Luis Obiscpo, CA

Class of '13

Masters | Computer Science
Bachelors | Software Engineering

Graduate Major GPA: 3.97

Leadership

- Founder and director of Google Humans vs Zombies, a yearly game where hundreds of googlers try to infect humans, stun zombies, and accomplish various missions on campus.
  - Organized >100 volunteers and trained them in logistics, advertising, game design, safety procedures and flexible planning. Many went on to organize future games.
  - Worked with other internal organizations to fund and distribute supplies to players.
  - Led a team of 16 developers to make the PlayHVZ game coordination webapp.
- Organized several Non-Profit major community Humans vs Zombies nerf wars for the City of Camarillo with proceeds supporting the Red Cross, one with 83 attendees. Managed logistics, permits, advertising, zoning overhaul campaign, designing rules and gameplay, coordinating missions, and finances.
- Led a team of programmers in creating Helios, an online, multiplayer, 3D RTS game from the ground up with OpenGL and C++. Wrote an optimized pathfinding algorithm, 3D rounded-cylinder intersection code, network synchronization, discrete-step-less game simulation, realtime in-game sanity checking, a configurable shader framework, on-demand and predictive resource loading, a field-of-view algorithm, a fully-threaded non-polling networking library, a vector library, a parametrics-based animation engine, and an allocation tracker.

Skills & Interests

- Program architecture, with skills in EC, ECS, functional programming, classic and modern OO, valuing readability, simplicity, flexibility, testability, and performance.
- Created Domino, a 3D symbolic view layer, enables tiling of arbitrary groups of polygons.
- Created Incendian Falls, Ember Deep, and Shattered Forest, time-traveling roguelike games where the player works with their past selves in combat to defeat enemies and challenges. Uses Domino and the Chronobase. Featured on Roguelike Radio.
- Invented Chronobase, a declarative language for a journaling database that compiles to C#.
- Expert with C++, C, Java, Javascript, Scala, C#, Rust, CSS, HTML, PHP.
- Proficient with Typescript, SQL, Kotlin, Scheme, Swift, Objective-C, VB, plus some obscure ones.
- Made a Javascript-to-Sparc compiler in Scala, with optimizations.
- Developed a CUDA raytracer, with reflections, refractions, transparency, and area lights.
- Designed and implemented T4, a browser-based online multiplayer puzzle game with innovative UI and an in-game chat system.
- Invented See the Reason, an web platform to facilitate debates online. Developed a prototype, did experiments objectively comparing it to existing platforms. Wrote a 200-page thesis analyzing the results, areas it could improve, and areas it performed better than existing solutions. Used Tomcat, MySQL, AJAX, and jQuery.
- Created the HashAssisted AVL tree, with a lookup time of O(1), with half the removal time of standalone AVL trees, with constant time sorted iteration.
- Created a proof-of-concept browser-based online multiplayer tactics game called Nobilia.