Siddharth Nair

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Summary

Highly motivated theoretical computer scientist specializing in the foundations of mathematics, with applied and research interests in rendering, mathematical physics, and computational modeling.

Skills

Mathematics & Logic: Vector calculus, Euclidean geometry, lambda calculus, geometric algebra

Type Theory: Dependently typed functional programming with proof assistants

Physics: Newtonian mechanics, computational physics, special relativity and relativistic mechanics.

Optimization & Scientific Computing: Network flow, post-optimality analysis, multi-objective/combinatorial optimization; symbolic and numerical computation with SymPy and NumPy

Programming Languages: Proficient in C++20/23; familiar with Python, C#, Lisp, Haskell, and C

Graphics & Rendering: OpenGL, physically based rendering, RenderDoc

Tools & Frameworks: VS, Git, CMake, Perforce, Unreal Engine, Matplotlib, lp_solve, Ableton

Miscellaneous: Grade 5 Guitar (Trinity College London), audio synthesis

Projects

Algebraic Properties of Integral Rings: Type-theoretical proofs in Agda as part of the MS thesis, supervised by Professor Thorsten Altenkirch.
`https://github.com/essentialblend/integers-comm-ring`

- Developed proofs for algebraic properties within a type-theoretical framework, contributing to the foundational effort of the intuitionistic formalization of classical mathematical results.
- Analyzed multiple definitions of integers (including zero-dualities and unsigned forms) to understand their representations within constructive frameworks.

Shirley-Tracer: An introductory Monte Carlo path tracer in C++ based on Peter Shirley's series.
`https://github.com/essentialblend/weekend-raytracing`

- Implemented core systems, including a positionable camera with defocus blur, importance sampling, axis-aligned bounding box (AABB) structures, indirect volumes, textures/materials.
- Enhanced performance with basic multi-threading and sampling strategies.

Indus: Ongoing C++23 Monte Carlo path tracer.
`https://github.com/essentialblend/project-indus`

- Adopting techniques from PBRT to develop an efficient multithreaded Monte Carlo path tracer.
- Current features include spectral rendering, mixed importance sampling, Bidirectional Scattering Distribution Functions (BSDFs), filtering and sampling algorithms.

Education

MS Computer Science, University of Nottingham 2022-2024

- **Merit**. Modules: Linear & Discrete Optimization; Programs, Proofs and Types; Research Methods

BCA Games and Mobile Software Development, CMR University, India 2018-2021

- Modules: Development with Unity; Physical Game Design; Multiplayer Programming

Experience

Audio Engineer, GTPL Hathway, India 2018-2018

- Responsible for audio production and broadcasting duties for a statewide news organization.

Audio-Video Producer, Chrysalis Communications, India 2015-2018

- Managed pre-production and audio-video editing on commercials/infomercials for a communications agency.