



Wildfire Simulation & Rendering

Using physically accurate models to simulate and render the spread of wildfire

Who we are

Stephen Lee

Class of 2022

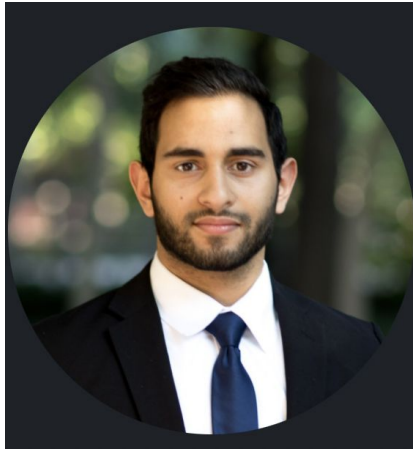
B.S.E in Computer Engineering



Anthony Mansur

Class of 2022

M.S.E. in Computer Graphics
B.S.E. in Computer Engineering



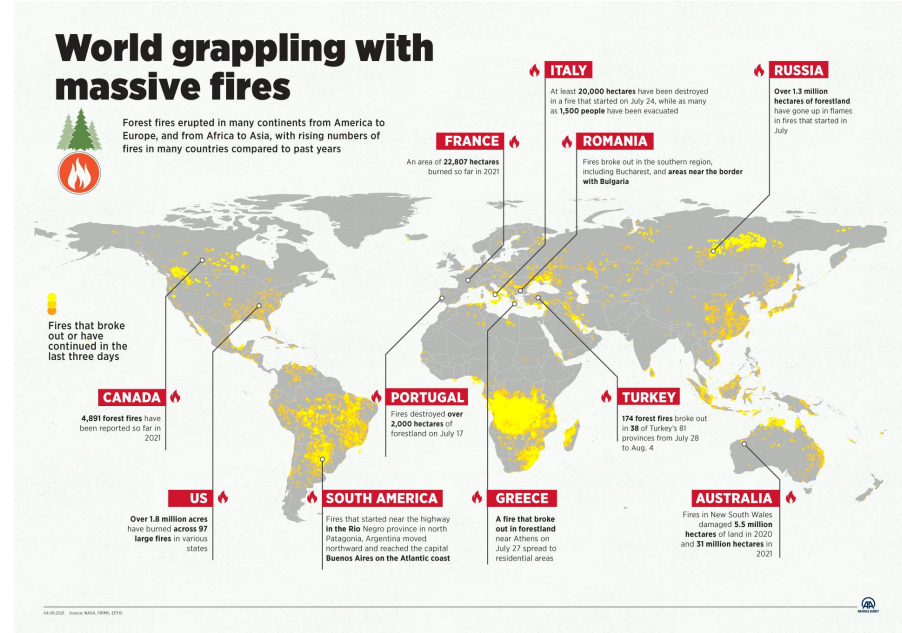
Lindsay Smith

Class of 2022

M.S.E. in Computer Graphics
B.S.E. in Computer Engineering



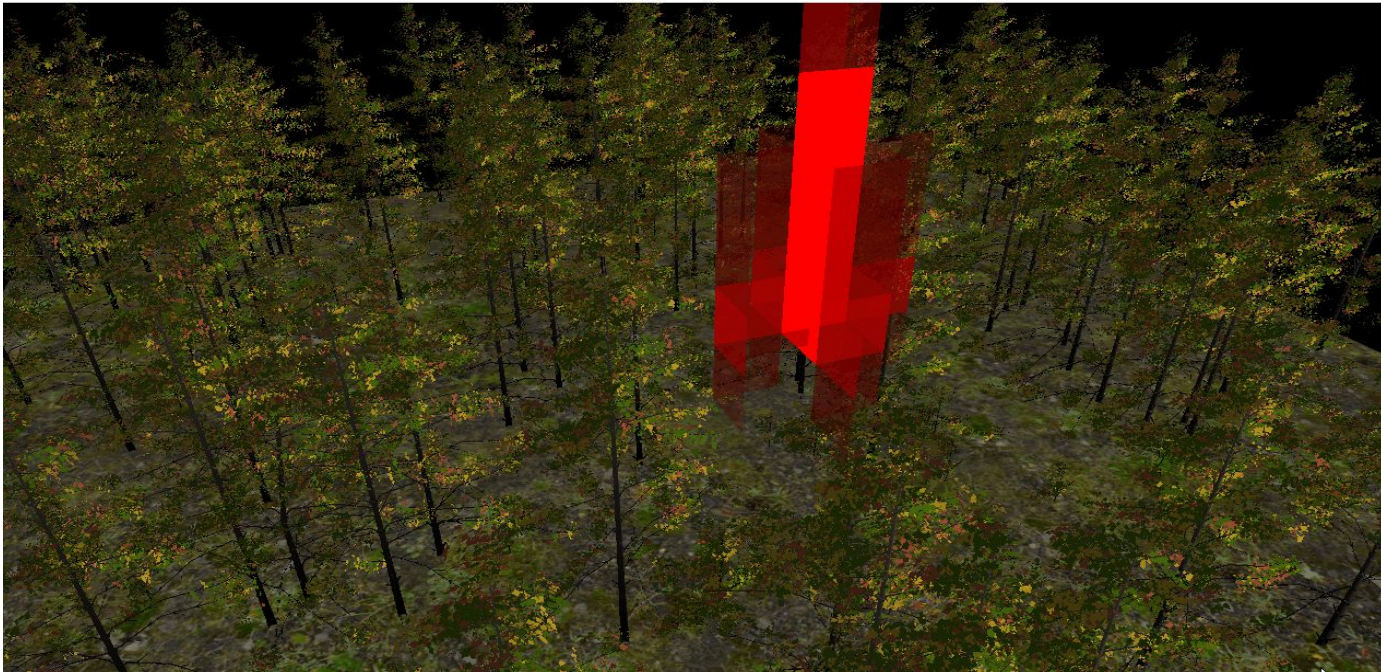
Project Inspiration



As **climate change** exacerbates the frequency and intensity of **wildfires** globally, we need to find ways to **accurately predict** their spread.

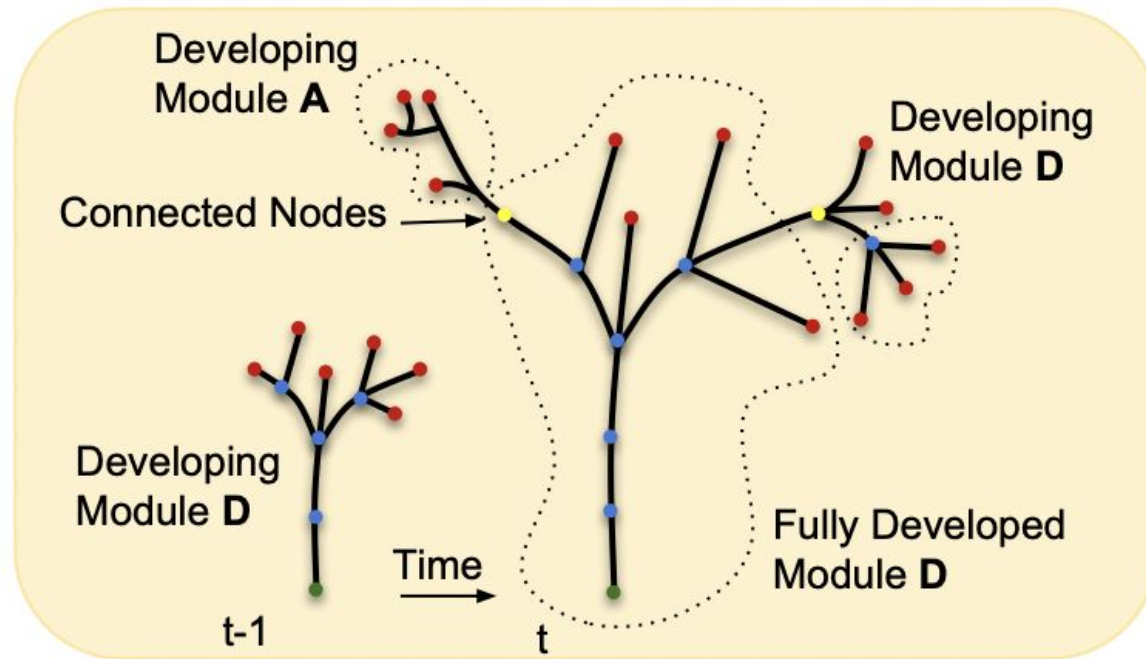
Project Goal

Develop a **physically-based, GPU** approach to leverage **parallelism** at a **modular** level of computation in both trees and simulation space



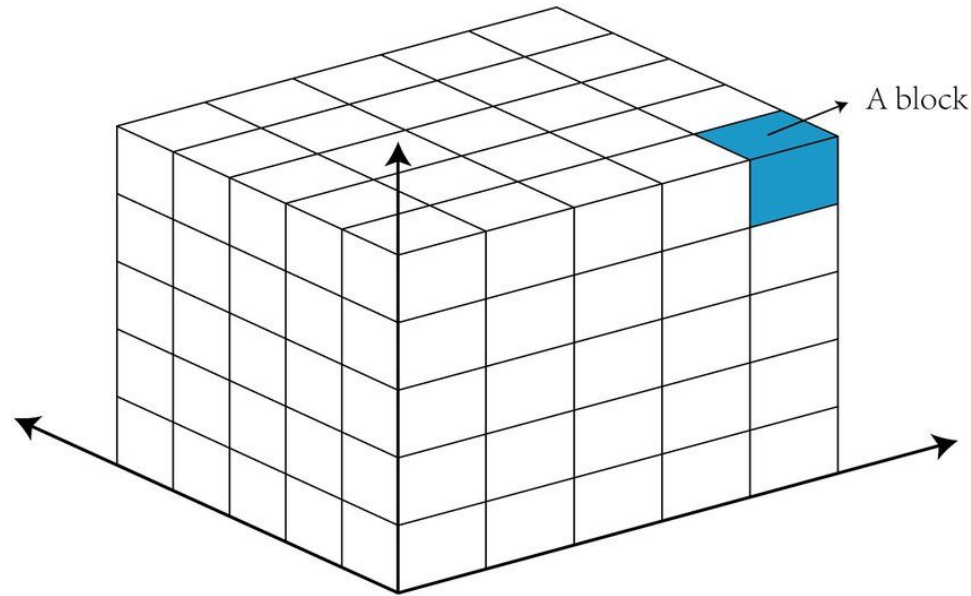
Project Architecture (Trees)

Modules subdivide trees in our forest into the units we parallelize in our tree-level computations



Project Architecture (Simulation Space)

A **grid of voxels** that contains our tree modules and parallelizes our world-level computations



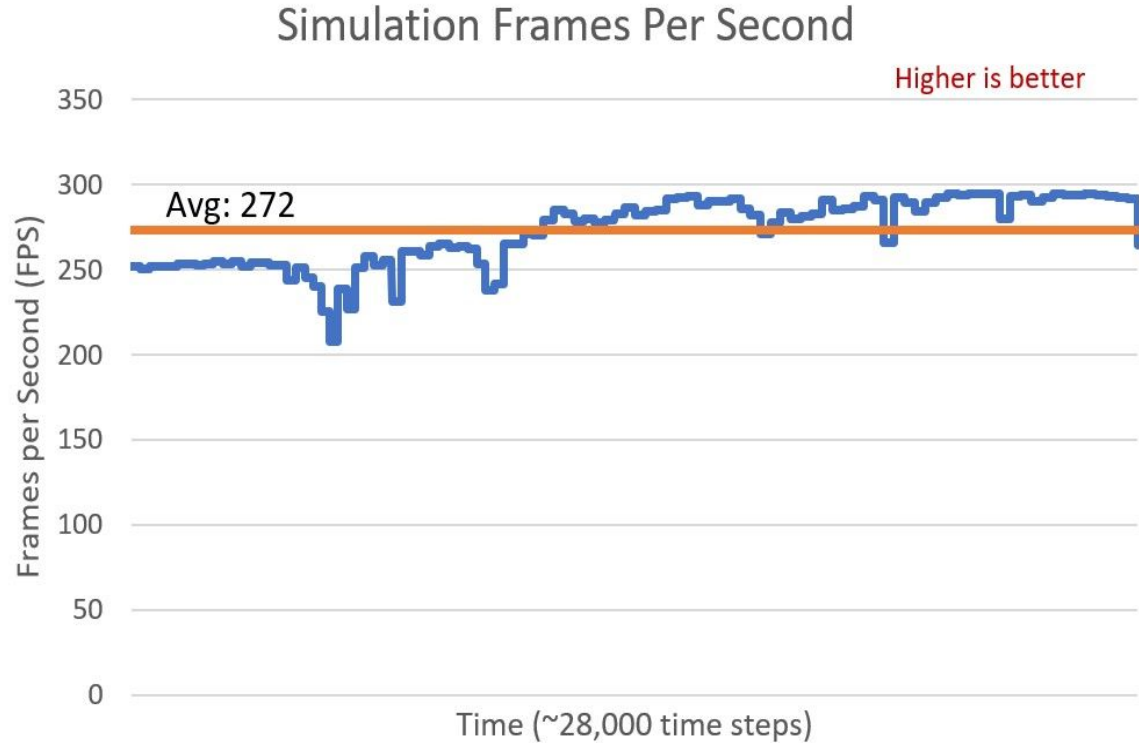


Live Demo

Offline: <https://tinyurl.com/ycku9m5c>

Implementation & Metrics

- Able to achieve real-time performance
- Culling burnt trees increase our performance
- Can maintain this FPS by changing level of detail of each tree



Tested on Windows 10, AMD Ryzen 5 3600, Geforce RTX 2060 Super (personal)

Future Work

- Dynamic environment
 - User adjustable wind and rain
- Interactiveness
 - Addable fire retardant/barriers
- Game Engine
 - Make it more easily accessible to others
- Simulate larger environments
 - Adjust level of detail of each tree to scale for larger scenes

Acknowledgements

We'd like to thank Torsten Hädrich and his team for providing us with the forest scene files used in our simulation.

Our work was based on their research paper

- Paper: <http://computationalsciences.org/publications/haedrich-2021-wildfires/haedrich-2021-wildfires.pdf>
- Website: <http://computationalsciences.org/publications/haedrich-2021-wildfires.html>

Contact Us

Stephen Lee

Class of 2022

sjlee129@seas.upenn.edu

- Github:
<https://github.com/StephenLee129>
- LinkedIn:
<https://www.linkedin.com/in/stephen-lee-bb5a40163/>

Anthony Mansur

Class of 2022

amansur@seas.upenn.edu

- Github:
<https://github.com/anthonymansur>
- LinkedIn:
<https://www.linkedin.com/in/anthony-mansur-ab3719125/>

Lindsay Smith

Class of 2022

lsmith24@seas.upenn.edu

- Github:
<https://github.com/lsmith24>
- LinkedIn:
<https://www.linkedin.com/in/lindsay-j-smith/>