

Project Proposal: Realistic and Interactive Simulations of Fire

This project will focus on creating a realistic computer graphics simulation of fire as presented by *Christian Baekkelund, Jessica Laszlo, and Christa Starr* based on their paper, “*A Computer Graphics Simulation of Fire: Using Particle Systems and Hypertextures*”. This simulation will also be interactive using a GUI to mimic the behaviors and attributes in a flame through a particle and rendering system.

Animation and simulation of fire already poses difficult challenges in that the physics of fire is not fully understood as well as the fact that it has a sporadic behavior. To make this project a little easier to implement, it will use a particle simulator to model a realistic approximation of a flame, and a rendering system to draw the flame’s particles more accurately. The particles will be created through a system in which a number of particles with limited time spans will be emitted from an area, will move based on each particle’s velocity, and will dissipate when their lifespan is completed. The motion of these particles will be a summation of varying forces that move upward, sideways, and through random turbulence. Temperatures will also be present within the particles as its size and motion depend greatly on how hot or cool the fire currently is. Furthermore, the flames will be rendered using a simple ray caster for volumetric rendering of particles. A ray will be casted from each pixel point in the screen, and the contributions of the particle’s density as well as the color and opacity of the ray will be used to pinpoint the color of the pixel point of the flame that it was casted from. The color of each of the flame’s particles will then be determined after all calculations are completed.

Schedule:

Week Of	Objective	Important Dates
10/7 – 10/13	Create GUI with adjustable variables	
10/14 – 10/20	Implement simple particle system for individual particles	
10/21 – 10/27	Start implementing motion system for particles	
10/28 – 11/3	Implement more variables for a more accurate motion system for particles	
11/4 – 11/10	Complete motion system; Finish everything for midterm demo	
11/11 – 11/17	Start rendering system; Learn simple ray casting	11/11: Midterm Demo
11/18 – 11/24	Complete rendering system of flame particles	
11/25 – 11/1	Debug; Check if system is close to accurate as possible	
11/2 – 11/8	Finish everything for final project + presentation	
11/9 – 11/15	SUBMISSION / PRESENTATION	11/9: Final Project + Class Presentation

Reference:

[1] Christian Baekkelund, Jessica Laszlo, and Christa Starr. “**A Computer Graphics Simulation of Fire: Using Particle Systems and Hypertextures**”.

<https://pdfs.semanticscholar.org/6e2e/297a873dfe8da0645d0084025ae606d5144d.pdf>