Rayground:
An Online Educational Tool for Ray Tracing

TDT03 - Presentation by Martin Solheim.
What is Rayground

- An educational tool to learn Ray Tracing
  - Made by: N. Vitsas, A. Gkaravelis, A. A. Vasilakis, K. Vardis, G. Papaioannou
  - In: Athens University of Economics and Business
- An online IDE for ray tracing algorithms
Why

● To learn ray tracing without distractions
  ○ The specific characteristics of a framework/API, etc
● Learning ray tracing in OpenGL/c++ has a lot of additional challenges
● Low-level APIs like OptiX can be quite technical
● Argues that learning about ray tracing should be more accessible
  ○ Webapps are super accessible
How

- Online IDE for ray tracing algorithms
- Can run in any WebGL2 compliant browser
- Inspired by ShaderToy
- User is encouraged to use GLSL functions and types
  - Vec, mat
  - cross(), dot()
Stages

- 5 customizable stages:
  - Scene, Generate, Hit, Miss and Post-Process

Figure 2: High level overview of the Rayground pipeline. Shaded polygons correspond to programmable stages. Rays are submitted as waves and intersection results are provided to the next stages through appropriate API calls.
Scene

- What objects you want in the scene, ie type
- Where you want them
- Properties
  - Scale
  - Rotation
  - material
Generate

- Generate primary rays
- Virtual camera
- Spawn rays in parallel for each pixel using `rg_generate()`
Hit | Miss

- Intersection data is available.
- Calculate distance and angle of primitive to light source
- Spawn new rays
- Miss stage can be used for skyboxes
Post Process

- Functions almost like a fragment shader
- Used for filtering, tone mapping, etc
- De-noising
Conclusion

- **Evaluation of 20 students**
  - 80% - very positive effect of learning ray tracing
  - 73% - wanted to experiment further

- **Web-based graphics has drawbacks**
  - Bi-directional methods
  - Animation systems
Demo?

https://rayground.com/view/dExaQa67tqI