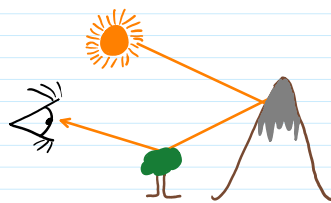


Source: 1. Ray Tracing Essentials, Part-1 to 7  
By Nefi Alarcon, NVIDIA

How is an image formed in general?



In computer graphics,

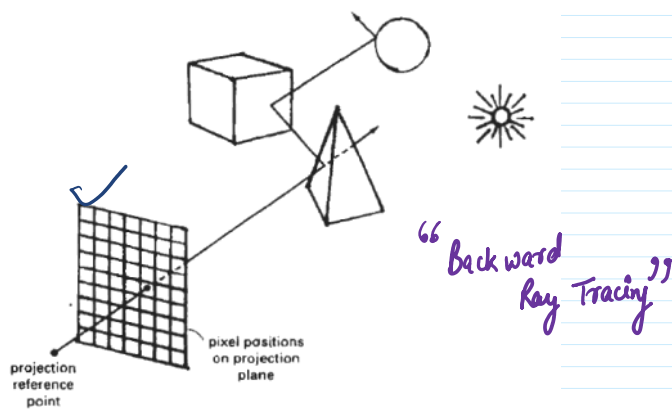
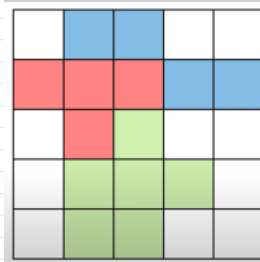
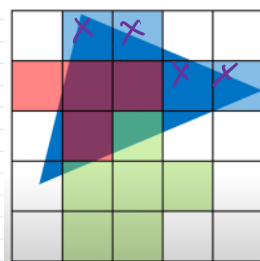
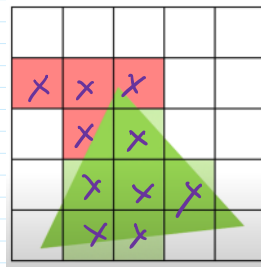
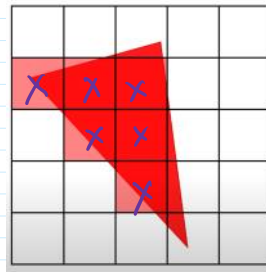


Figure 14-49  
Tracing a ray from the projection reference point through a pixel position with multiple reflections and transmissions.

Rasterization v/s Ray Tracing:-

## Rasterization

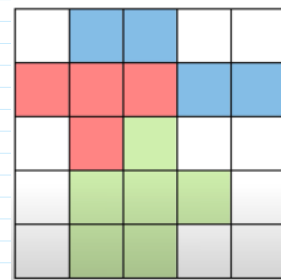
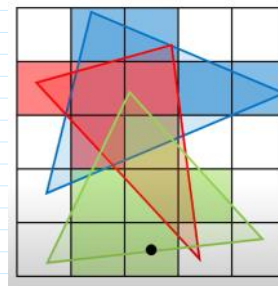
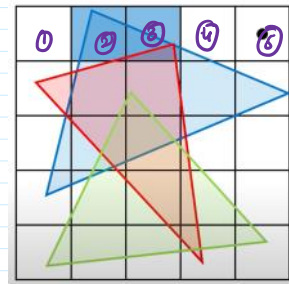
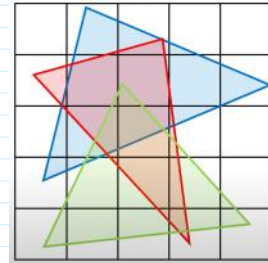
for each object  $\{$   
 for each pixel  
 $\{$   
 $\}$   
 $\}$



What pixels does geometry cover?  
 Test if pixel is inside triangle.

## Ray Tracing

for each pixel  $\{$   
 for each object  
 $\{$   
 $\}$   
 $\}$



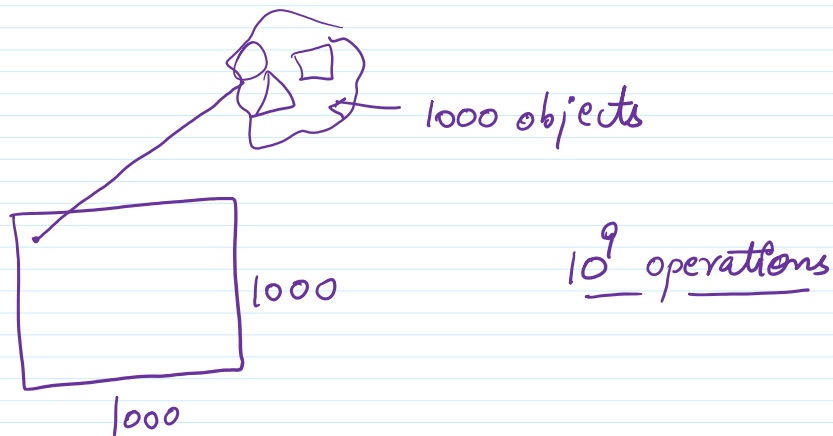
What is visible along this ray?  
 Ray-triangle intersection

Test if pixel is inside triangle.

Stream triangles  
(each stream test  
pixels)

Ray-triangle intersection

Stream rays  
(each stream test  
intersections)



Three fundamental questions related to ray tracing

- ① Draw shadows?
- ② Mirror reflections?
- ③ Refraction?

"Ray tracing is the technology of the future  
and always will be!"  
— David Kirk, NVIDIA.

## A Single NVIDIA RTX™ (a.k.a. NVIDIA Turing™) Card

From the 2018 Star Wars short *Reflections*, produced by Epic Games and built in Unreal Engine in collaboration with IMELAB and NVIDIA



In 1980,

Graphics and  
Image Processing

J.D. Foley  
Editor

## An Improved Illumination Model for Shaded Display

Turner Whitted  
Bell Laboratories  
Holmdel, New Jersey

To accurately render a two-dimensional image of a three-dimensional scene, global illumination information that affects the intensity of each pixel of the image must be known at the time the intensity is calculated. In a simplified form, this information is stored in a tree of "rays" extending from the viewer to the first surface encountered and from there to other surfaces and to the light sources. A visible surface algorithm creates