

Computer Graphics

LECTURE 06

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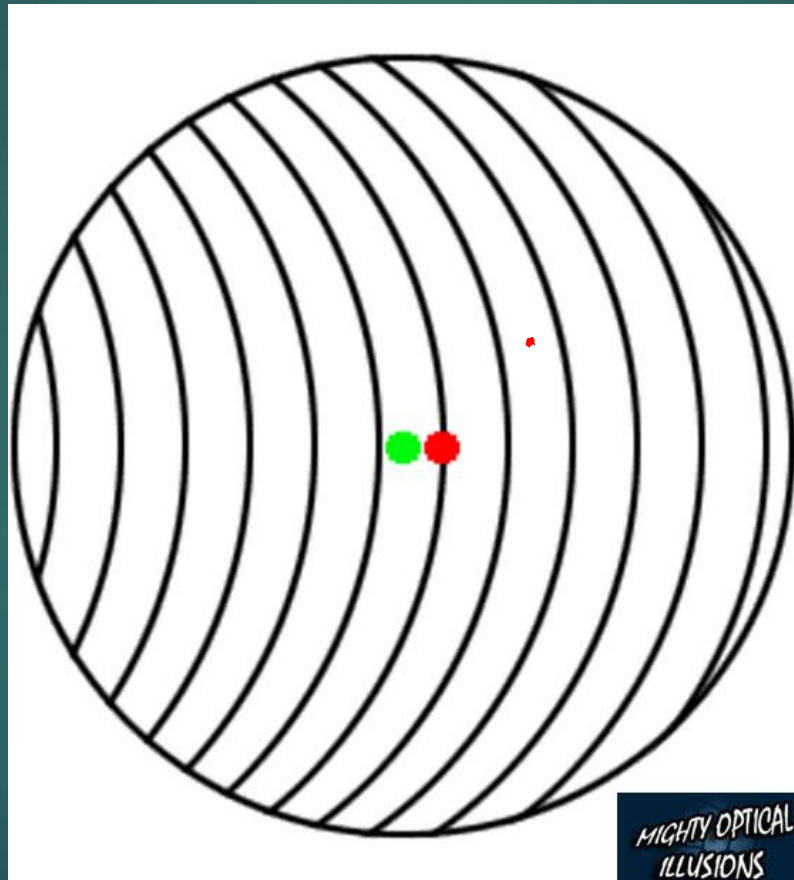
Last Class

- ▶ Overview of Graphic Systems
 - ▶ LED Display
 - ▶ Plasma TV
 - ▶ Hardcopy Devices
 - ▶ Input Devices
- ▶ Human Visual System

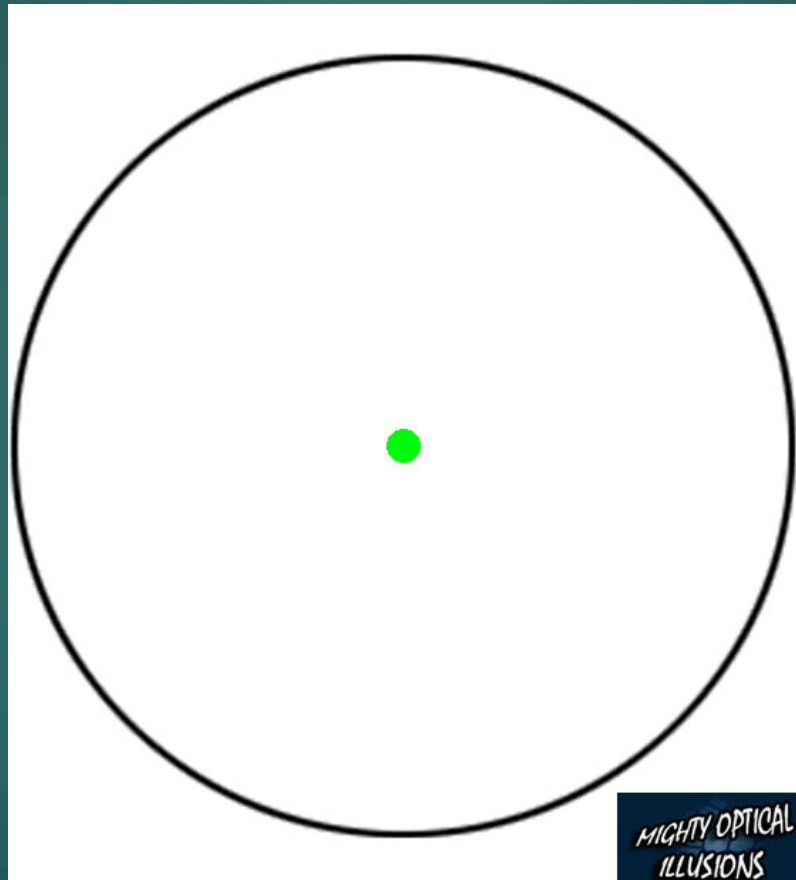
Today's Agenda

- ▶ Human Visual System
 - ▶ Illusions
- ▶ Ray Tracing

Illusions



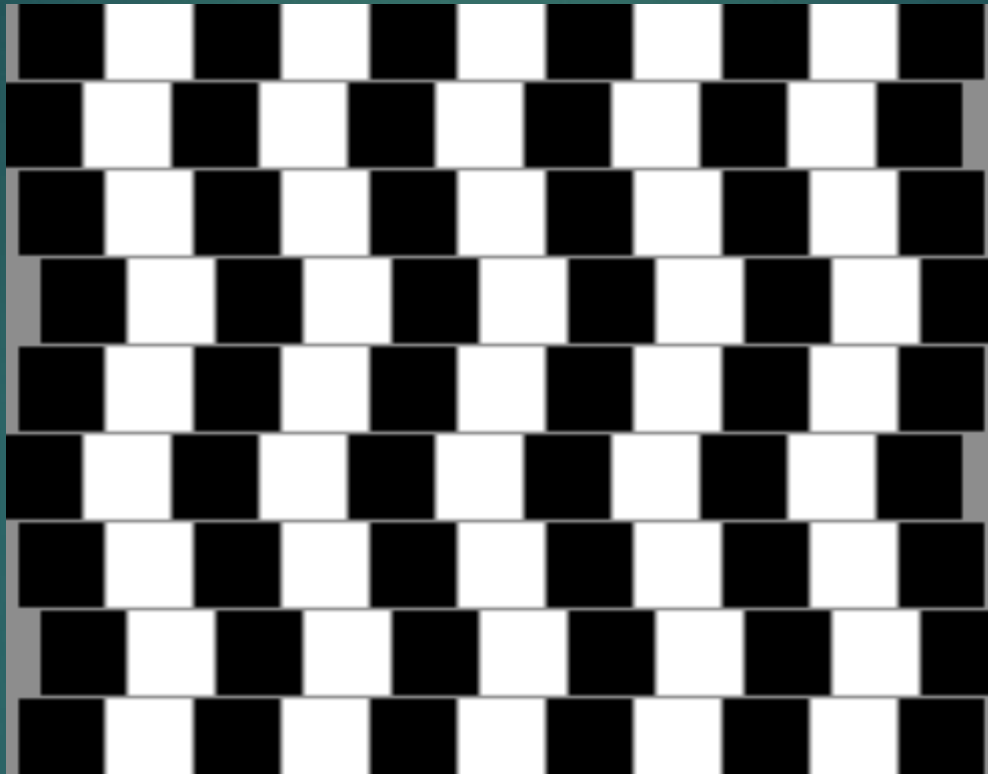
Illusions



Illusions



Illusions



Pixel Formats

- ▶ 1-bit gray scale—text and other images where intermediate grays are not desired (high resolution required)
- ▶ 8-bit RGB fixed-range color (24 bits total per pixel)—web and email applications, consumer photographs
- ▶ 8- or 10-bit fixed-range RGB (24–30 bits/pixel)—digital interfaces to computer displays;
- ▶ 12- to 14-bit fixed-range RGB (36–42 bits/pixel)—raw camera images for professional photography
- ▶ 16-bit fixed-range RGB (48 bits/pixel)—professional photography and printing, intermediate format for image processing of fixed-range images;
- ▶ 16-bit fixed-range gray scale (16 bits/pixel)—radiology and medical imaging;
- ▶ 16-bit “half-precision” floating-point RGB—HDR images; intermediate format for real-time rendering;
- ▶ 32-bit floating-point RGB—general-purpose intermediate format for software rendering and processing of HDR images.

Image Storage

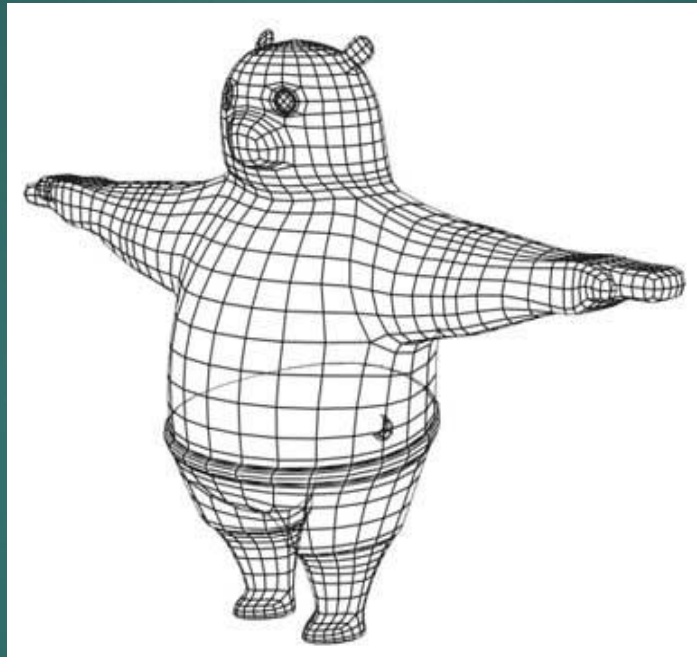


- ▶ RGB images result in almost 3MB for 1 million pixel image
- ▶ To reduce storage space, various compression techniques are employed and used in image compression.
- ▶ Generally compression is categorized as
 - ▶ Lossless Compression
 - ▶ Lossy Compression

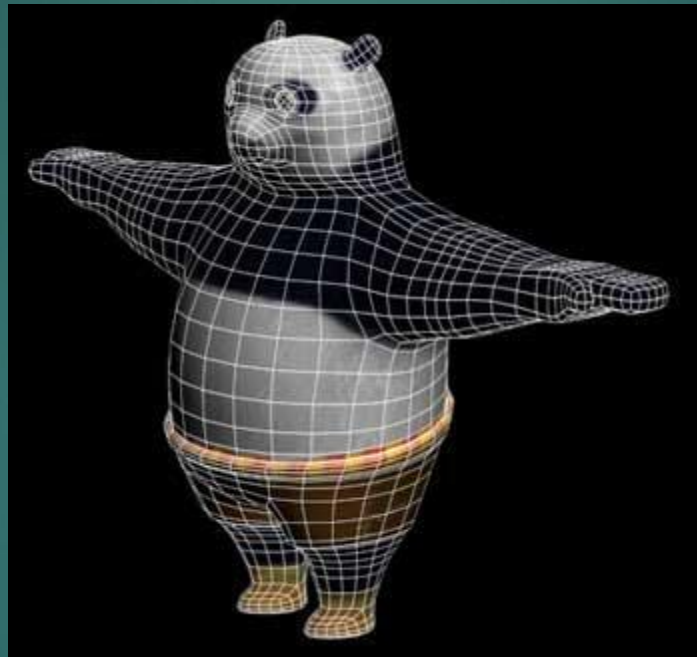
Storage Formats

- ▶ **jpeg.** This lossy format compresses image blocks based on thresholds in the human visual system. This format works well for natural images.
- ▶ **tiff.** This format is most commonly used to hold binary images or losslessly compressed 8- or 16-bit RGB although many other options exist.
- ▶ **ppm. (Portable Pixel Map)** This very simple lossless, uncompressed format is most often used for 8-bit RGB images although many options exist.
- ▶ **png. (Portable Network Graphics)** This is a set of lossless formats with a good set of open source management tools.

Rendering



Rendering

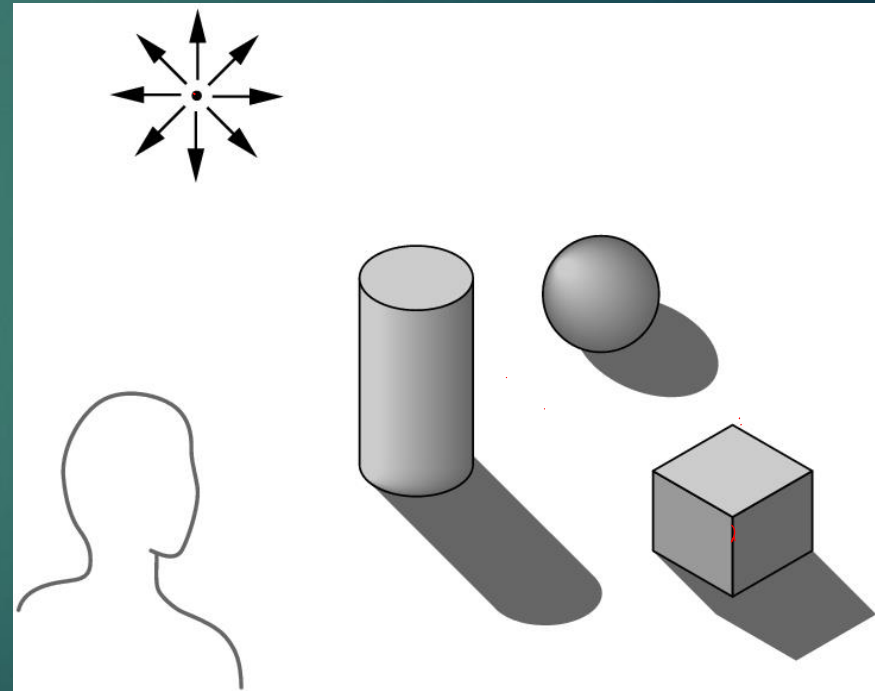


Rendering

- ▶ Most basic task in graphics.
- ▶ Two types
 - ▶ Object Order Rendering: each object is taken into account and for each object all the pixels that it influences are found and updated.
 - ▶ Image Order Rendering: each pixel is considered in turn, and for each pixel all the objects that influence it are found and the pixel value is computed.

Ray Tracing

- ▶ Building an imaging model by following light from a source is known as Ray Tracing
- ▶ A Ray is a semi infinite line that emerges from a source and continues to infinity in one direction
- ▶ Part of ray contributes in making image.
- ▶ Surfaces
 - ▶ Diffusing
 - ▶ Reflecting
 - ▶ Refracting



Summary

- ▶ Human Visual System
 - ▶ Illusions
- ▶ Ray Tracing

References

- ▶ Fundamentals of Computer Graphics Third Edition by Peter Shirley and Steve Marschner
- ▶ Interactive Computer Graphics, A Top-down Approach with OpenGL (Third Edition) by Edward Angel.