

HW due date 2001
2-1

559 DAY 2

HOMEWORK REMINDER

REGISTRATION QUESTIONS

TUTORIAL - MONDAY

XIN

Books

VISION AND DISPLAYS

DL -

Sept 24

Oct 17

Nov 8

Dec 6

Where all this ends up -

Providing Stimulus to VIEWER

- LIGHT INTO EYE

When? 1000 - AL-HAZEN

FIRST THING PROVEN BY EXPERIMENT

SCIENTIFIC METHOD (NY TIMES IDEA OF MILLENNIUM)

AUTHORITY $\Rightarrow$ OBSERVATION

EUCLID, PTOLEMY $\rightarrow$ light eye $\rightarrow$ OBJECT

How did prove?

Stare at sun, burns eyes (not a great proof but....)

Also figured out light travels in straight lines (invented the pinhole camera)

Fun Facts About Vision

(Poynton Ch 5 - not reading)

Contrast ratio of eye = 100:1
perceive 1% differences

How to measure?

- ① Radiance - amount of power in spectrum

BUT.....

eye is differently sensitive

- ② Luminance - correct for sensitivity



Where 100:1? Adaptation p85

sunlight	10k	[[[]]]
twilight	10	
starlight	.001	

100:1 is more contrast than most displays!

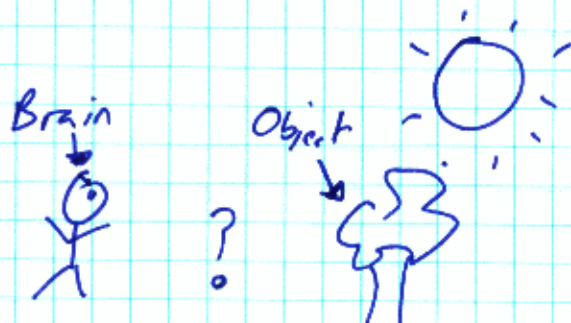
Day 2 9/7/00

Book Update
Readings Change
Policy Questions

Help Session

Visual Computing -

Fundamentals - how do we see?



Paths of Light

Light travels source to eye

Quiz: when did this become known?

GREEKS WERE DIVIDED

EUCLID, PTOLEMY - eye to object

Aristotle - object to eye

Ibn Al-Haytham $\equiv$ Alhazen $\approx$ 985
empirical scientist

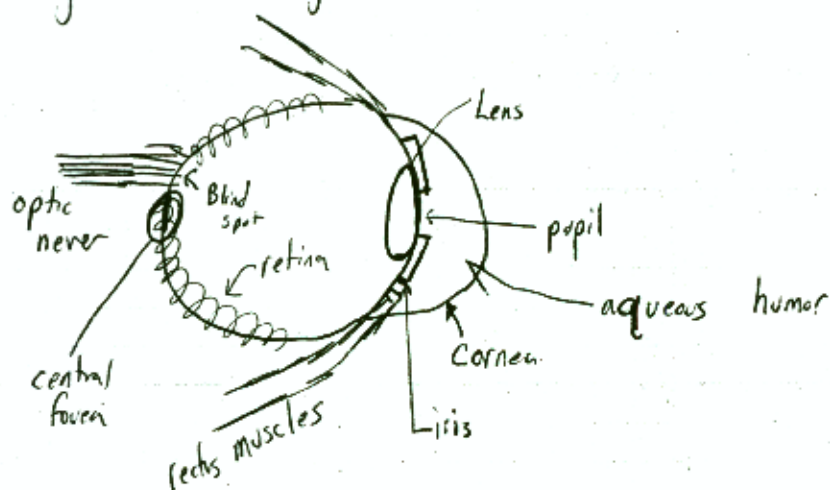
turning point of empirical science over ^{pure reason} ~~philosophy~~

Bouncing Around $\equiv$ emitters vs. reflectors, ...

Light Physics

The eye i visual system

The eye (I)



pupil - hole in the iris

iris - round muscle that controls how much light enters

rectus muscles - change shape of eyeball to focus

Retina - only place on body that you can see blood vessels directly

Photo receptors are in retina

Rods - for night vision, dim light, sensitive to motion

Cones - for color vision, sharpness

- can't see color when dark out

Central Fovea - densest packing of cones
no rods

Many more rods than cones

The eye has 4 refractive parts:

cornea, aqueous humor, lens, vitreous humor

Depth Perception : ← retina is a 2D sensor
2D displays

CUES : Stereo

Parallax

Size

Shading

Texture

Shadows / Lighting

Occlusion

Semantics

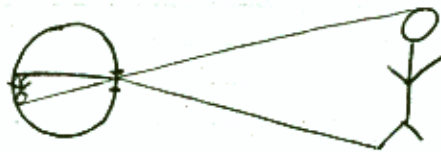
Intensity

Fog Roll-off

The eye (II)

Light rays from more than 20' away are approximately parallel focussed onto fovea

Inverted Images



Rods are pretty useless in bright light

photopigment: Rhodopsin - breaks down in light must be regenerated

if light is bright, breaks down faster than recreated

Adjustment to bright light
bright lights at night

Cones:

photopigments reform quickly

3 different types of cones - each responds best to 1 color, red, green, blue

Persistence of Vision

see until photopigments regenerated

sense light after its gone

cones regenerate faster than rods

LECTURE 2 : OVERVIEW AND BASICS 9/7/99

Reading? HB 1 and 2. Reader?

Procedural Questions? Homework?
Survey?
AM form?

Buzzword Bingo

TOPICS DU JOUR

Uses of Graphics / Fields of Graphics

Graphics Devices

Physiology of the Eye

What has changed since HB?

convergence: image-based graphics
image-processing
computer vision
computer graphics

what is an image anyway?
why can we all of a sudden
compute with them

display systems architecture is dated (at best)

devices

new devices (cameras)

different economics (memory is cheap, CRTs dominate)
cheap inputs

Start with very basics - perception of images

Light goes into eye -

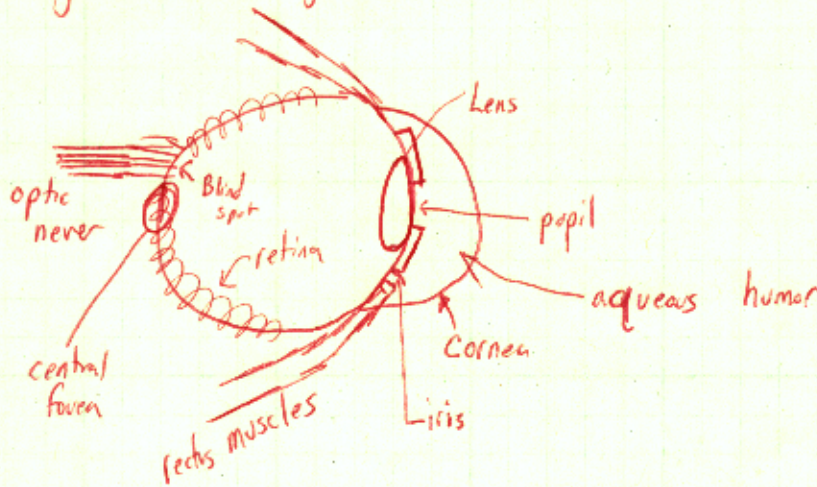
Euclid, Ptolemy proved otherwise

Ibn Al-Haytham - Alhazen around 985

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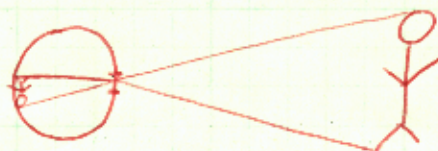
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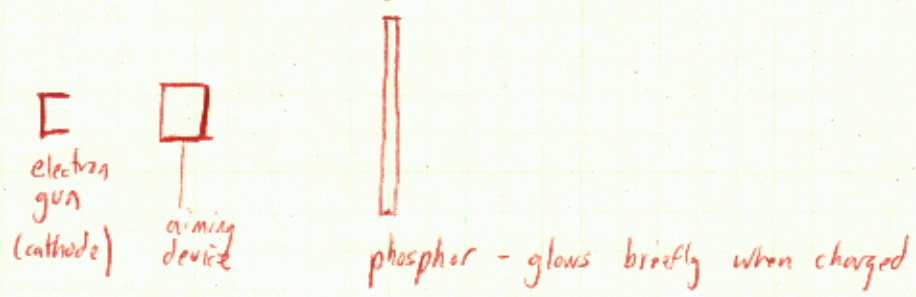
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DISPLAYS BASED ON PERSISTENCE OF VISION

Movie Projector = 48 flashes / minute
24 frames / minute
rotating shutter Flicker Rate

CRT (TV) - not always flashing
but nowadays



Long persistence phosphor - old days
couldn't update fast

Storage Tube - explicitly clear

Raster Scan vs. Vector Scan

Pen plotters vs. Dot Printers

PIXELS - what is a pixel

Caligraphic Display

Use raster devices to simulate vector devices

Draw in Raster vs. Vector
└ 1st part of course

Raster Scan CRT

Interlace

Twitter and other anomalies

Frame Buffer (memory per pixel)
vs. storing text,