CS4533 Lecture 1 Slides/Notes

Overview; Image Formation; Graphics Hardware, Software & Pipeline Architectures (Notes, Ch 1)

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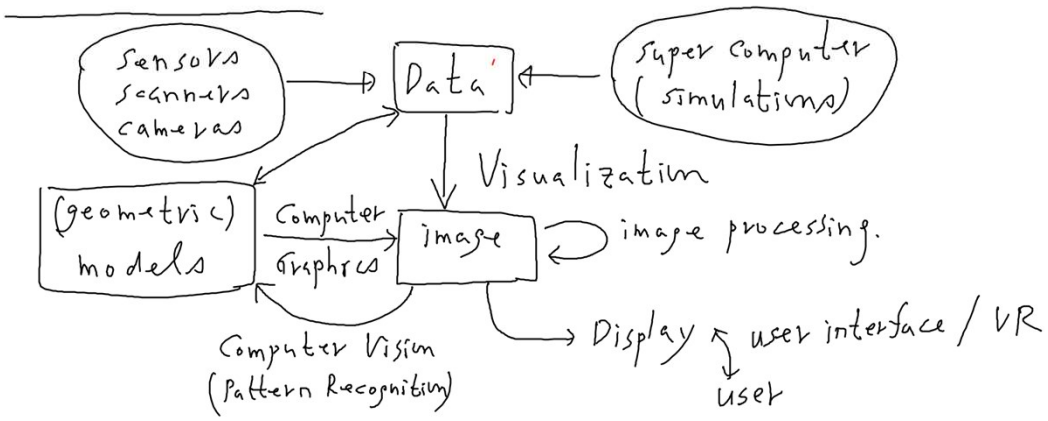
Computer Graphics: All aspects of producing images or pictures using a computer.

Related Fields:

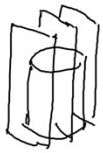


2

Applications of Computer Graphics:

1. Display of Information: Scientific Visualization.

* Medicine: CT, MRI, X-ray, ultrasound.
  (diagnosis) eg. X-ray images; cross-section images



Information Visualization.

* Biology
* physics.
* chemistry
* Earth Science
* Math. - - -

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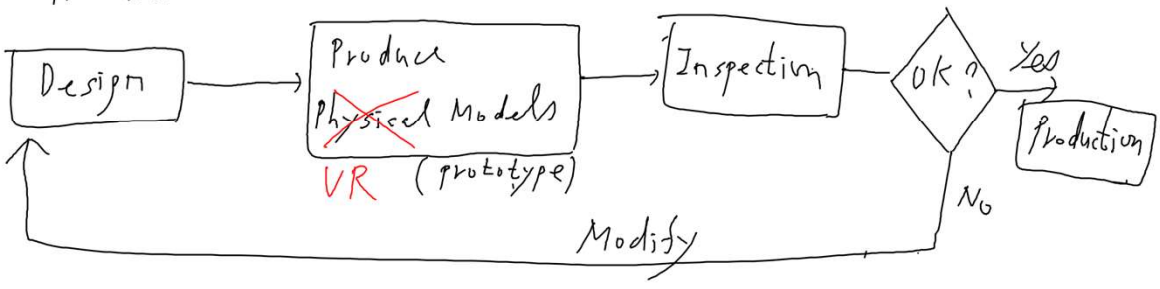
2. Design: Engineering, Architecture, etc
   (car engine, aircraft, - -)
   CAD. VR.

Production Process



Eg. Boeing 777.

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3. Simulation: eg. Graphical flight simulation for pilot traing.
knee surgery simulation for surgeon training.
Animation. movies / television.

4. User Interface: window systems. web browsers. etc.

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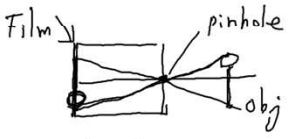
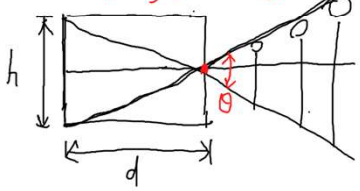
* Image Formation:

(1) The Pinhole Camera

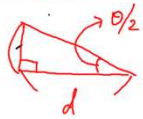
2 drawbacks:
① image is upside down
② pinhole is too small (image not bright enough)



side view.



θ: angle field } ∩ view



$\tan\frac{\theta}{2} = \frac{h/2}{d}$

$\Rightarrow \theta = 2\tan^{-1}\frac{h}{2d}$

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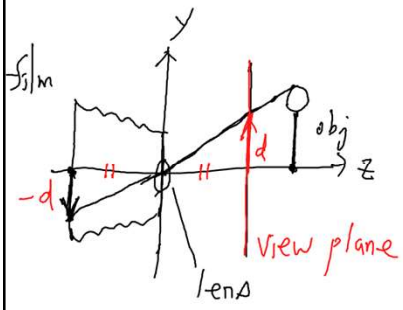
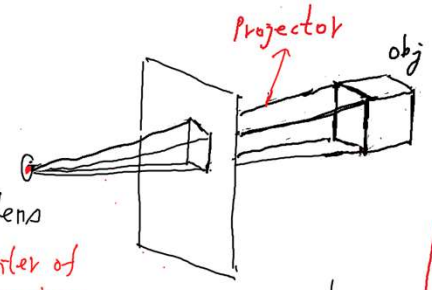
(2) The Synthetic Camera Model (the model used)



Side view.

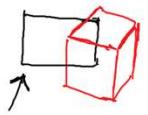


center of projection (cop) (eye, viewer)

Image plane
View plane
projection =
(screen)

* clipping window

decide which part of the obj is to be seen



camera window
clipping =

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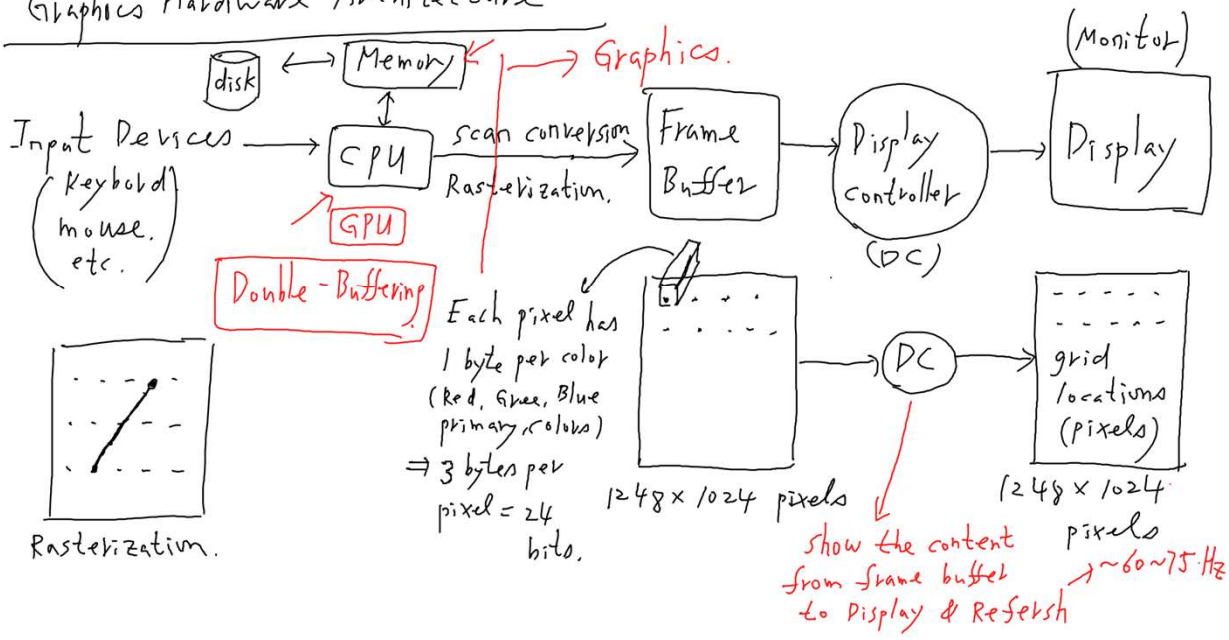
Graphics Hardware Architecture



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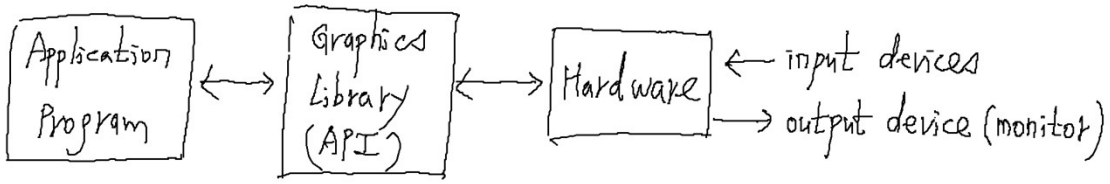
Application Programmer's (software) Graphics Model



API: application programmer's interface (eg. OpenGL)

* Need functions in API to specify:
  - objects: vertices (modeling)
  - the viewer (viewing)
  - light sources, material properties (lighting & shading)

Tasks (4 major steps in imaging process):
- Transformation
- Clipping
- Projection
- Rasterization (Scan-conversion)

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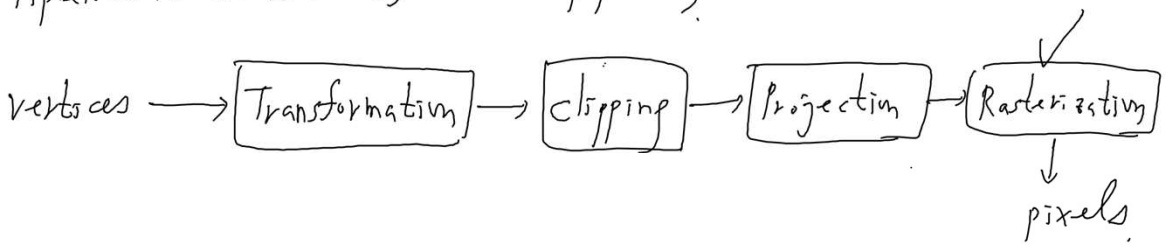
* Pipeline Architecture (geometric pipeline)



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