

Kangwon National University

Advanced Solid Modeling

Ch 0 History Basic

DEPARTMENT OF
MECHATRONICS ENGINEERING

Prof. B. H. Kim

Adv. Solid Modelling

Kangwon National University

Preview: Computer Graphic

- The term computer graphics;
 - Almost everything on computers that is not text or sound.
 - Representation and manipulation of image data by a computer
 - Various technologies used to create and manipulate images
 - Sub-field of computer science which studies methods for digitally synthesizing and manipulating visual content.
- Categorized by two dimensional (2D), three dimensional (3D), and animated graphics.
- Short history



ENIAC



CRT



SAGE



Sketch pad

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Blowing 'Coke' tubes - a scene in Wm. A. C. Cressie's workshop. From a photo by...

Johann Wilhelm Hittorf

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CAD/CAM

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Preview: Computer Graphic

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Pong video game

HMD

D. C. Evans

I. Sutherland

Alan Kay

Warnock

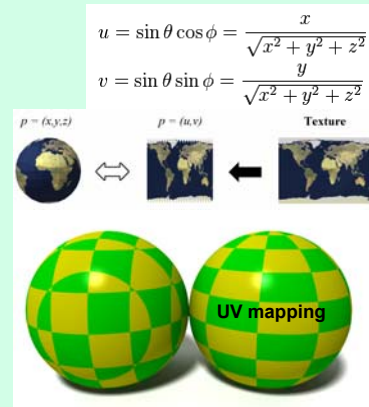
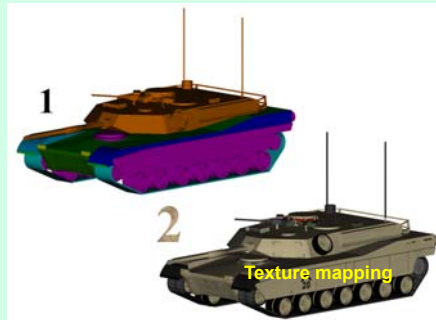
Catmull

Univ. of Utah

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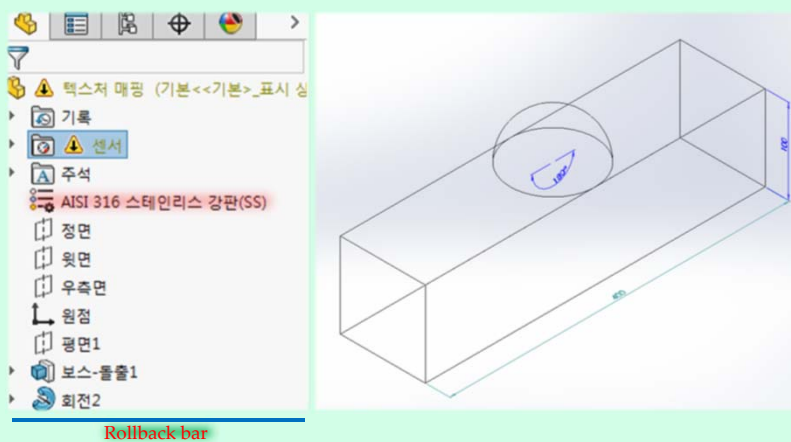
Preview: Computer Graphic

- What has done by Edwin Catmull?
 - Texture mapping (1974)



Move to the SWs

- Simple Example
 - Let's learn more about the [Manager Pane \(toggled by F9\)!!!](#)

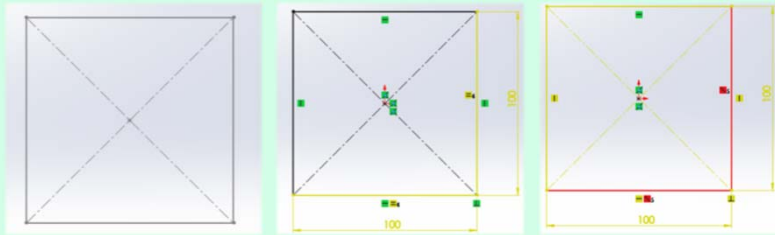


Move to the SWs

- Simple Example

- Let's learn more about the [Manager Pane \(basic Conventions\)!!!](#)

(+)	over defined	(+) 스케치1
(-)	under defined	(-) 스케치1
(?)	the sketch could not be solved	(?) 스케치1

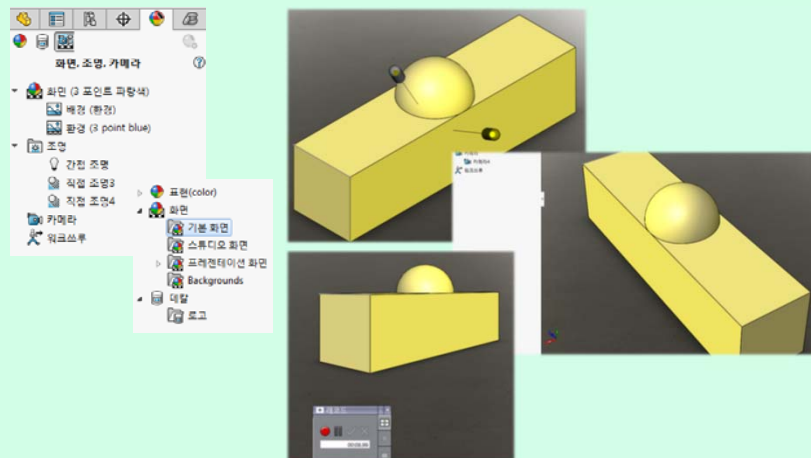


errors and warnings

Move to the SWs

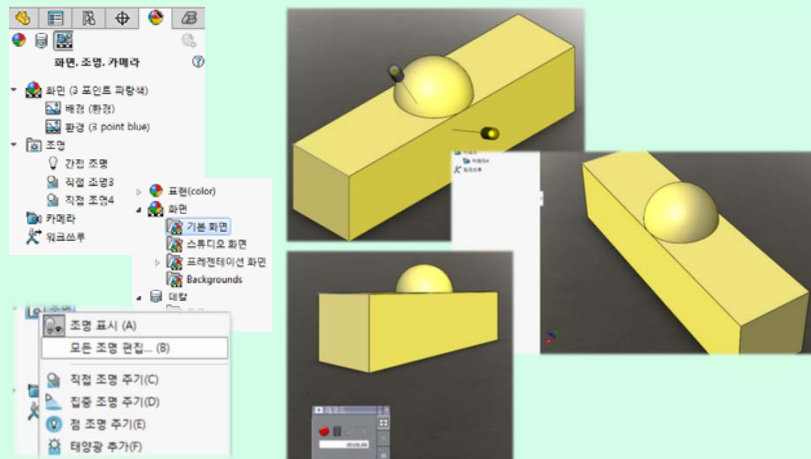
- Simple Example

- Let's learn more about the [Manager Pane \(Display Manager\)!!!](#)



Move to the SWs

- Simple Example
 - Let's learn more about the Manager Pane (Bump Texture Mapping)!!!

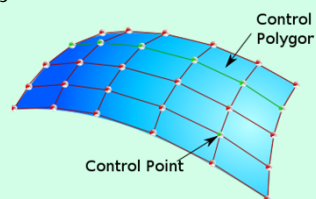


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CAD/CAM

Preview: Computer Graphic

- What has done by Edwin Catmull?
 - Bi cubic patch



- Spatial Anti-aliasing

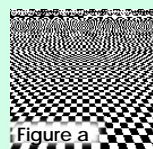


Figure a

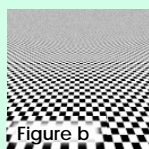


Figure b

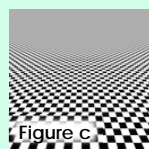
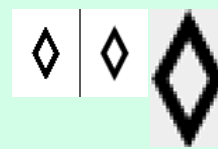


Figure c



- Figure a shows visual distortion(anti-aliasing is not used) → Near the top of the image, where the checkerboard is very small, the image is both difficult to recognize and not aesthetically appealing.
- Figure b shows an anti-aliased version → Checkerboard near the top blends into gray
- Figure c shows another anti-aliasing algorithm → based on the sinc filter, which is considered better than the algorithm used in b.

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Preview: Computer Graphic

- 3D graphics became more popular in the 1990s in gaming, multimedia and animation



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Preview: Computer Graphic

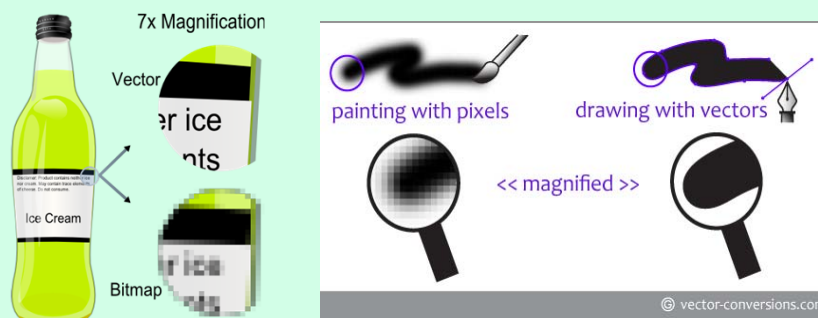
- Categorized by image type
 - Two-dimensional
 - the computer-based generation of digital images—mostly from models, such as digital image.
 - **Pixel art**: A large form of digital art being pixel art is created through the use of **raster graphics software**, where images are edited on the pixel level. Graphics in most old (or relatively limited) computer and video games, graphing calculator games, and many mobile phone games are mostly pixel art.
 - **Vector graphics**: the use of geometrical primitives such as points, lines, curves, and shapes or polygon(s), which are all based on mathematical expressions, to represent images.



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Preview: Computer Graphic

- Categorized by image type
 - Two-dimensional
 - Pixel art (bitmap) vs. Vector graphics



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Preview: Computer Graphic

- Categorized by image type
 - Three-dimensional
 - For the purpose of performance this is stored in the computer. this includes images that may be for later display or for real-time viewing.
 - 3D computer graphics are the same as 3D models.
 - Computer animation
 - Computer animation is the art of creating moving images via the use of computers.
 - Sometimes the target of the animation is the computer itself, but sometimes the target is another medium, such as film. It is also referred to as CGI (Computer-generated imagery or computer-generated imaging), especially when used in films.



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Preview: Computer Graphic

- **Basic glossary & principles**

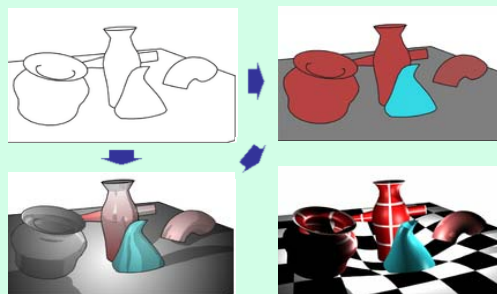
- Pixel: a single point in a raster image (bitmap)
 - In typical uncompressed bitmaps, image pixels are generally stored with a color depth of 1, 4, 8, 16, 24, 32, 48, or 64 bits per pixel. Pixels of 8 bits and fewer can represent either grayscale or indexed color.
- Graphics: Visual presentations on a surface, such as a computer screen. Examples are photographs, drawing, graphics designs, maps, engineering drawings, or other images.
 - Graphics often combine text and illustration.
- Rendering
 - Generating a 3D model by means of computer programs.
 - It would contain geometry, viewpoint, texture, lighting, and shading information as a description of the virtual scene.
 - 3D projection/Ray tracing/Shading/Texture mapping/Anti-aliasing
- Volume rendering
 - A technique used to display a 2D projection of a 3D discretely sampled data set. A typical 3D data set is a group of 2D slice images acquired by a CT or MRI scanner.
- 3D modeling

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Preview: Computer Graphic

- **Rendering**

- The process(or image) of generating an image from a model by means of computer programs.
- A scene would contain geometry, viewpoint, texture, lighting, and shading information as a description of the virtual scene.



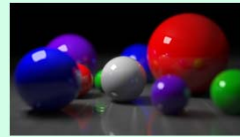
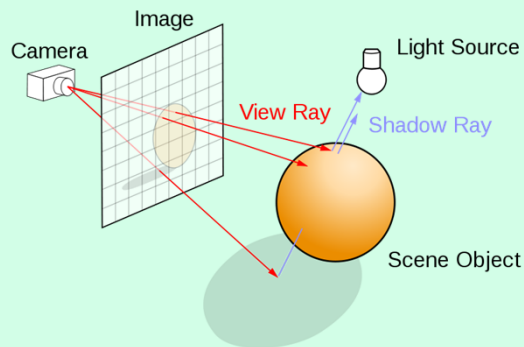
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Preview: Computer Graphic

• Rendering

– Ray tracing

- Tracing a path from an imaginary eye through each pixel in a virtual screen, and calculating the color of the object visible through it.
- Scenes in ray tracing are described mathematically by a programmer or by a visual artist (typically using intermediary tools).



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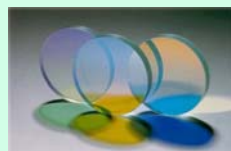
Preview: Computer Graphic

• Rendering

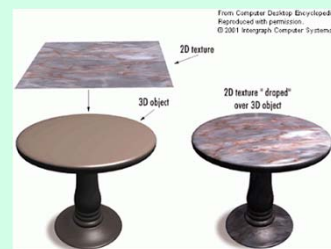
- Shading/Transparency
- Mapping: Texture, Bump



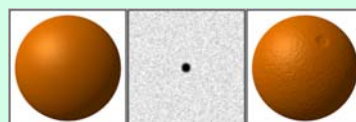
Shading



Transparency



Texture mapping



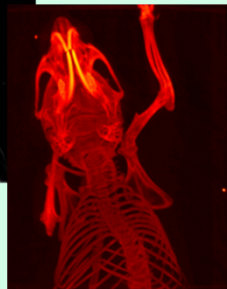
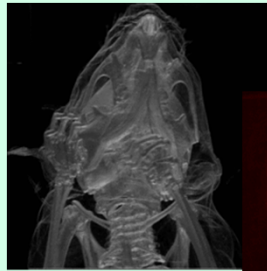
Bump mapping

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Preview: Computer Graphic

- **Volume Rendering**

- A typical 3D data set is a group of 2D slice images acquired by a CT, MRI, or MicroCT scanner.



CT scanned forearm