

# Non-Photorealistic Rendering

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Final Project

# Background and Purpose

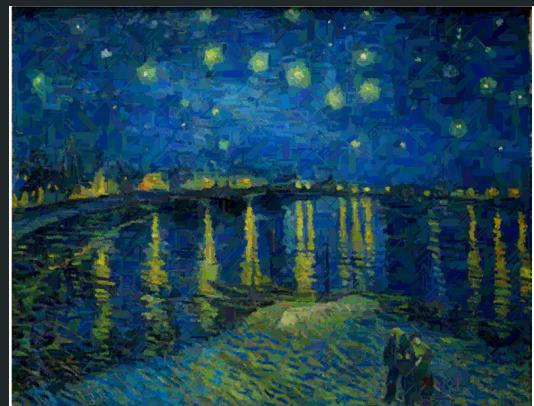
- Intersection of technology and the visual arts
- Generate non-photorealistic images
  - Impressionism
  - Cubism
  - Cel-Shading



## Impressionism, Pointillism, and Expressionism

- Calculate brush stroke parameters
  - Construct brush stroke mask
  - Average pixel values
  - Add random perturbations
  - "Paint"
  - Repeat
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Impressionism (above); Pointillism (top right;  
Expressionism (bottom right)





Impressionism (left); Pointillism (middle); Expressionism (right)



# Cubism



Picasso's "Girl with a Mandolin"



Picasso's "Portrait of Ambroise Vollard"

# Algorithm

- Split image into circles
- For each circle
  - Generate random superquadric parameters: rotation angle, new radius, and semi-major and minor axes

$$\left(\frac{x}{a}\right)^{\frac{2}{\alpha}} + \left(\frac{y}{b}\right)^{\frac{2}{\alpha}} = r^{\frac{2}{\alpha}}$$

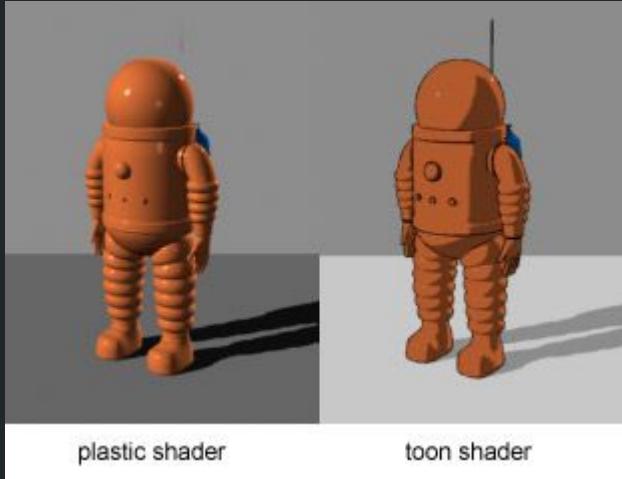
- Discretize colors of pixels in the circle and blur
- Map pixels in circle to enclosing superquadric
- Blur resulting image to give it a more “painted” texture



Cubism examples



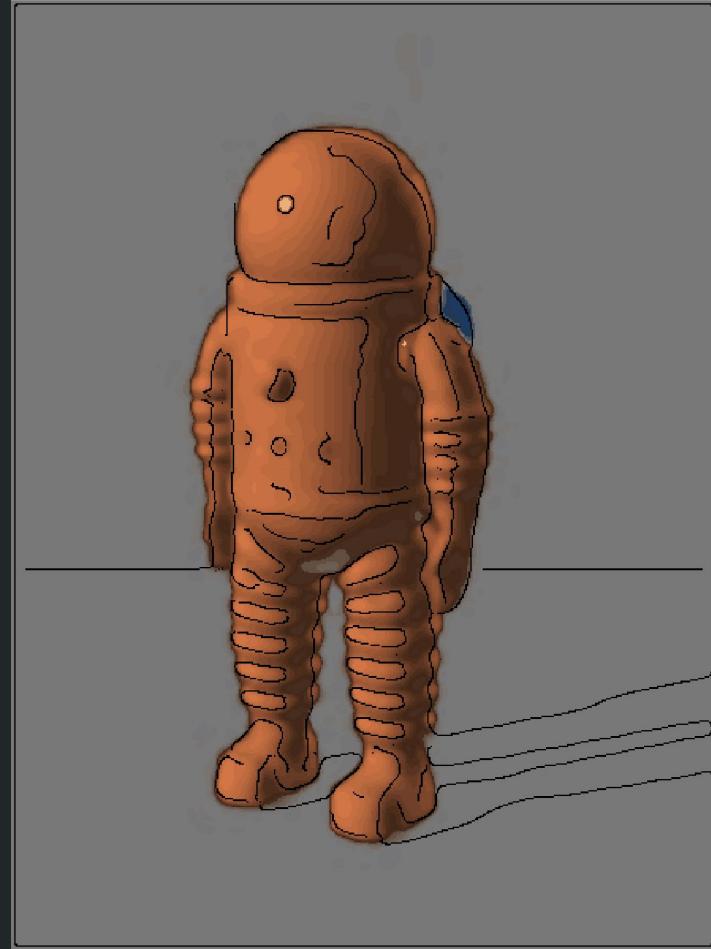
Cubism examples



# Cel-Shading

aka "Toon Shading"

- Detect edges
  - Bilateral filter
  - Color segmentation with K-means clustering
  - Overlay edge map
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# Thanks!

Questions?