FFTs in Graphics and Vision

Michael Kazhdan

(601.760)

What are we studying?

- Signal Processing
- Representation Theory
- Alignment
- Symmetry Detection

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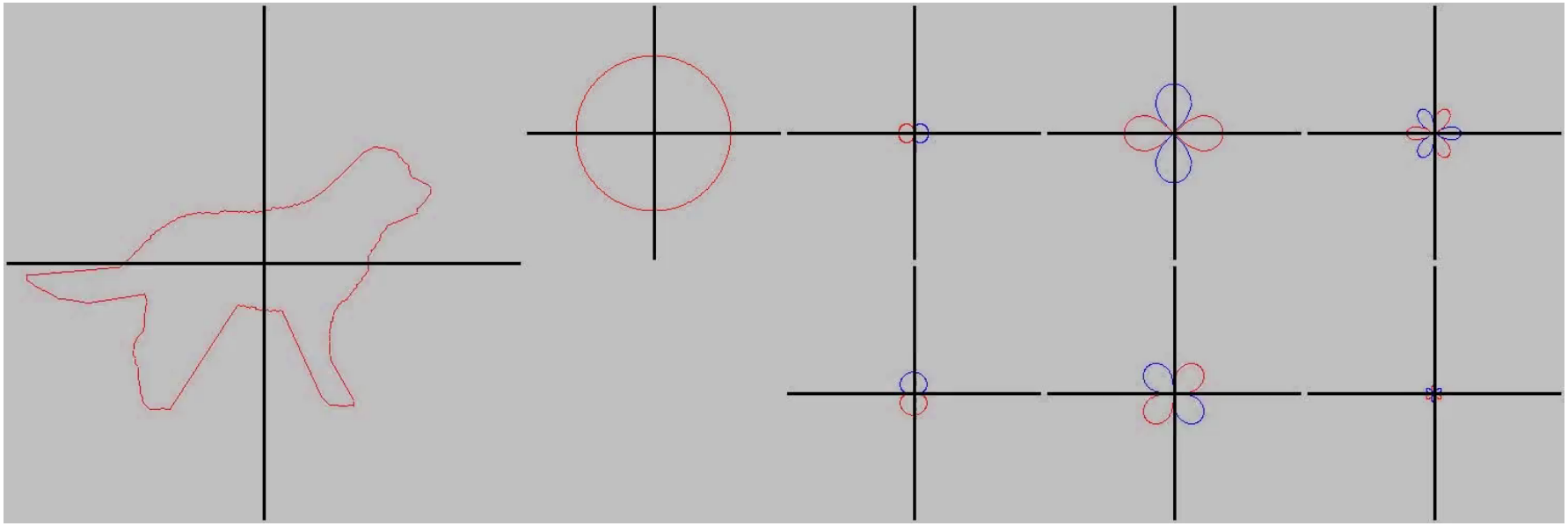
- Signal Processing



Fourier Decomposition

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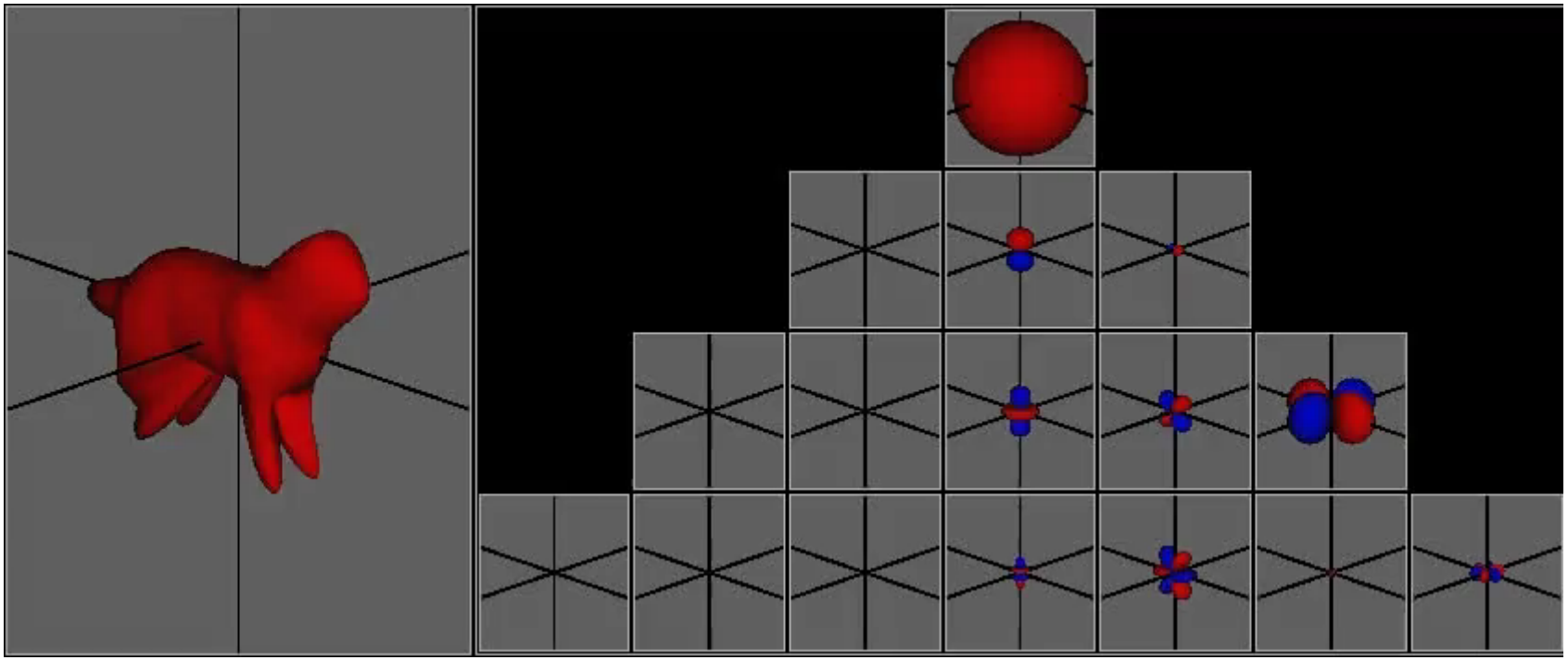

Spherical Harmonic Decomposition

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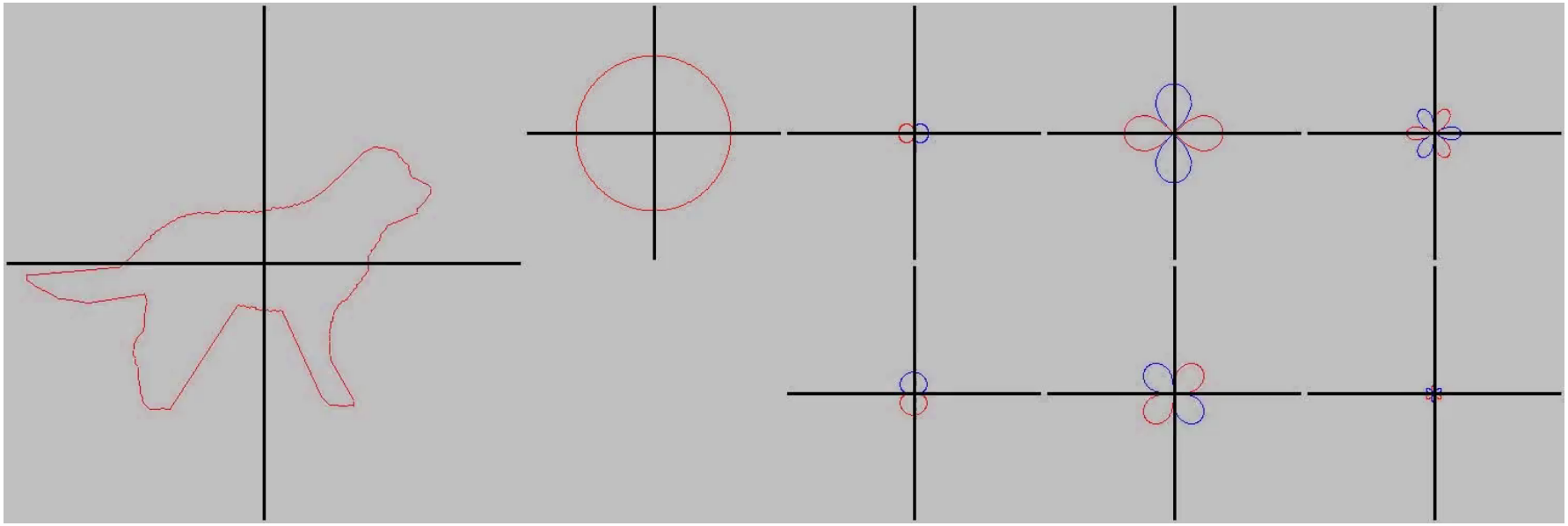

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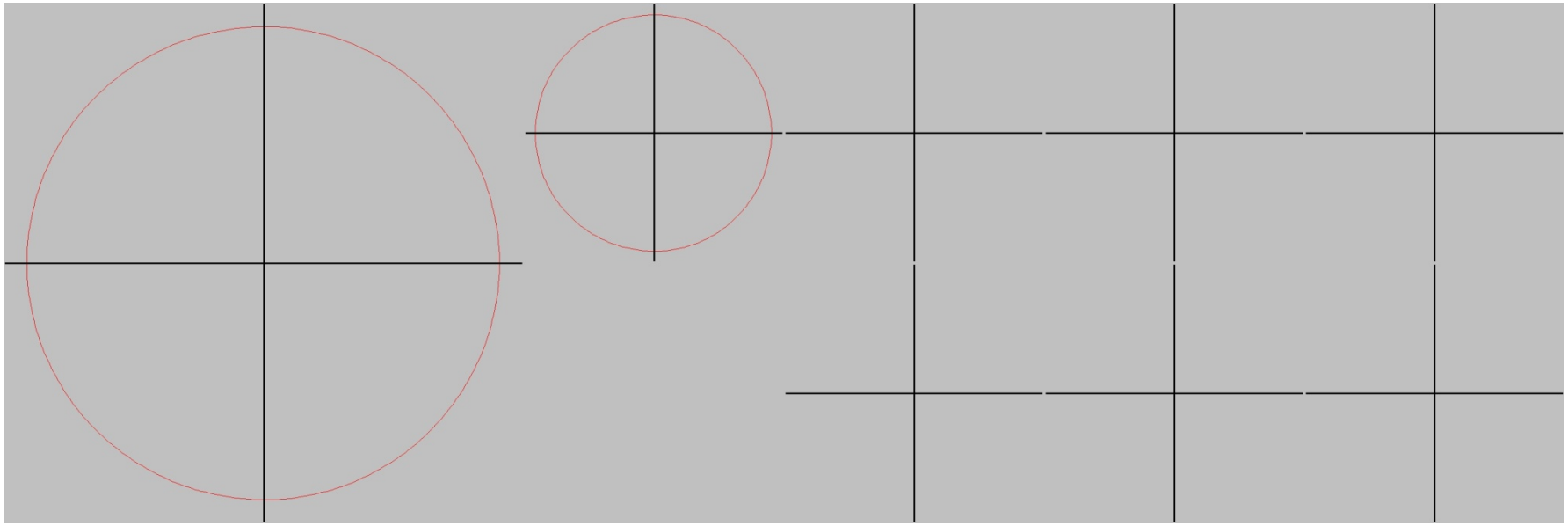

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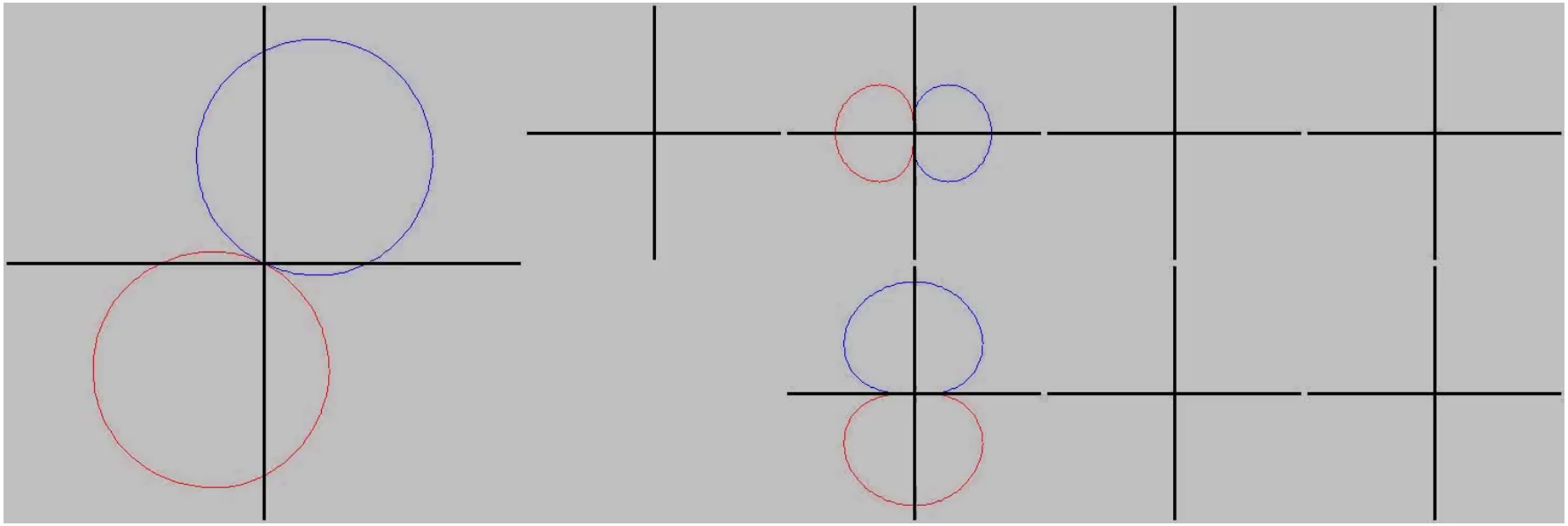

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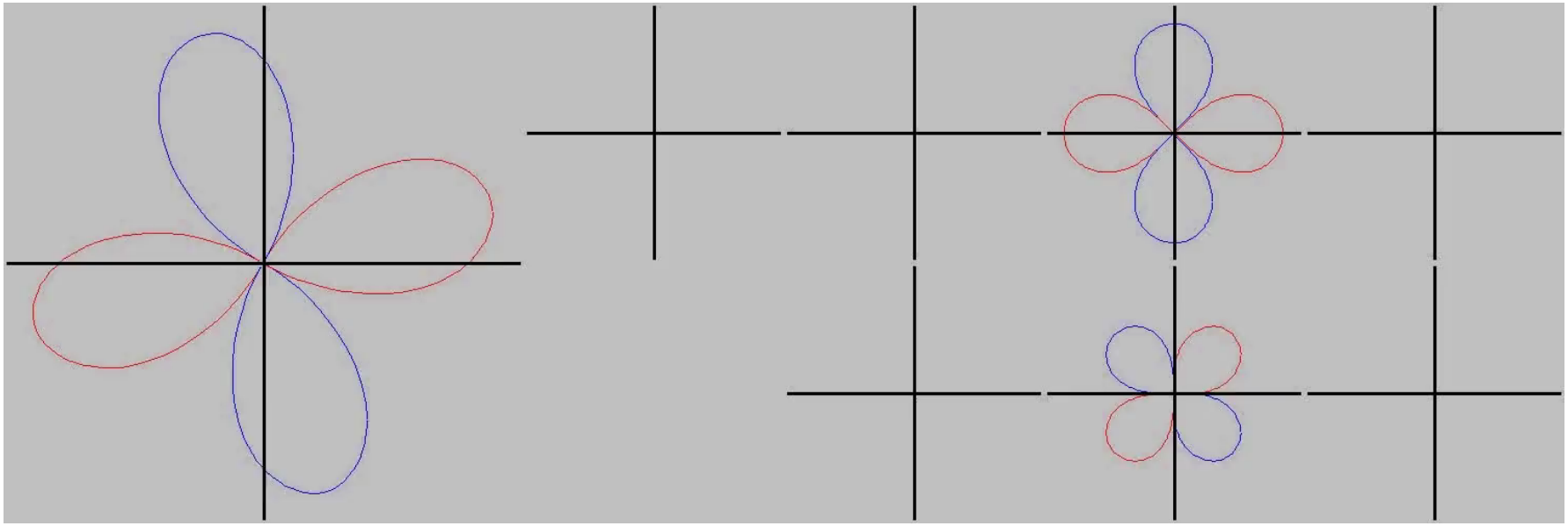

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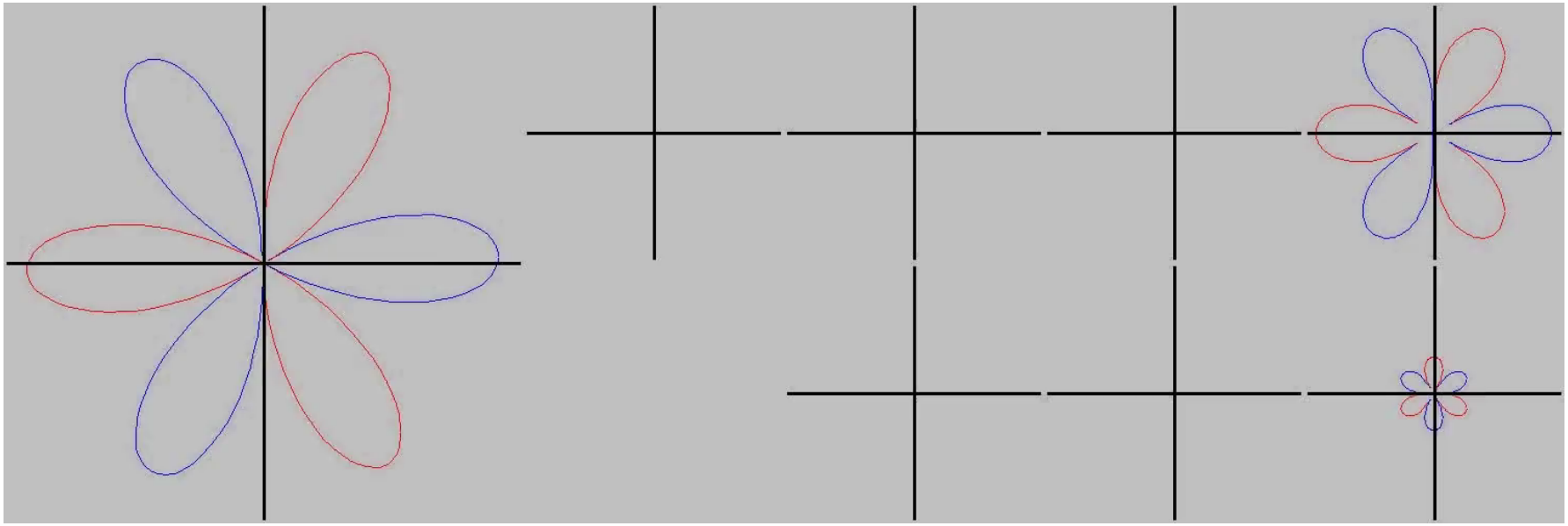

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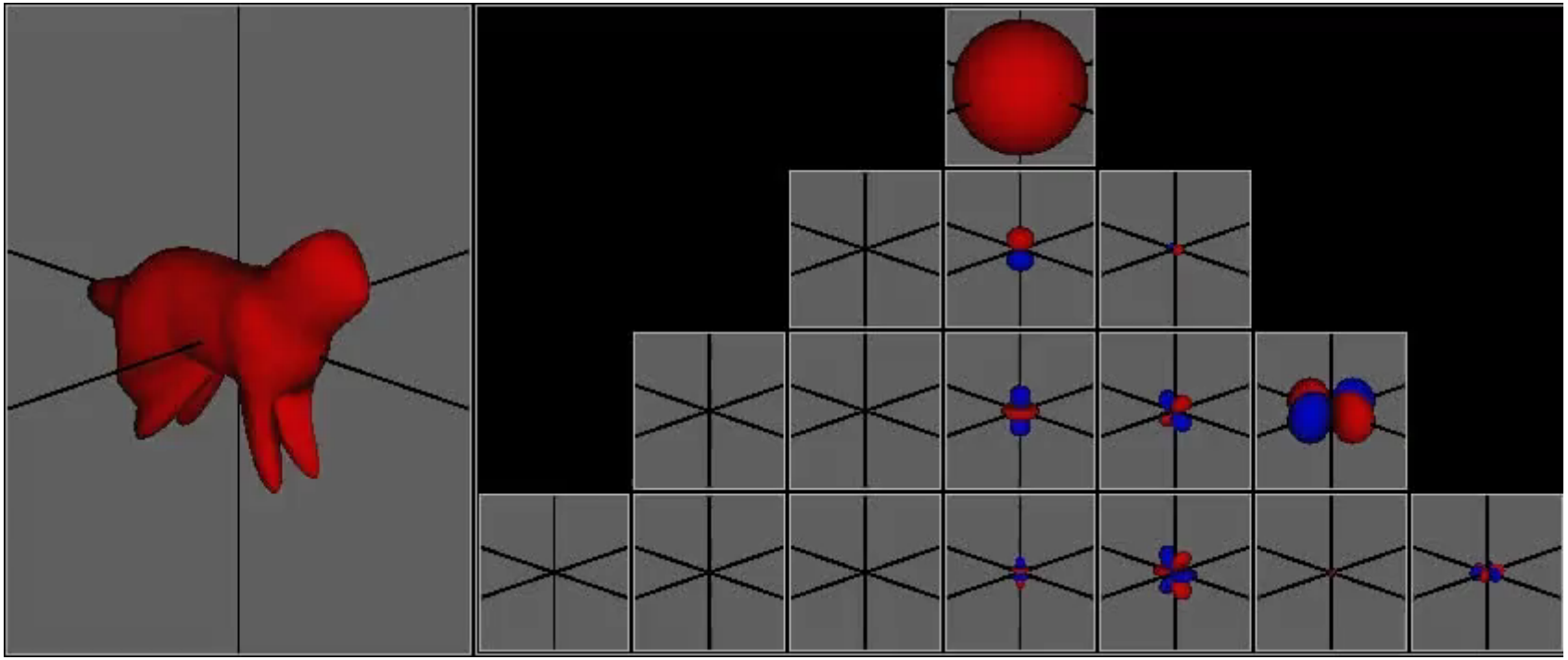

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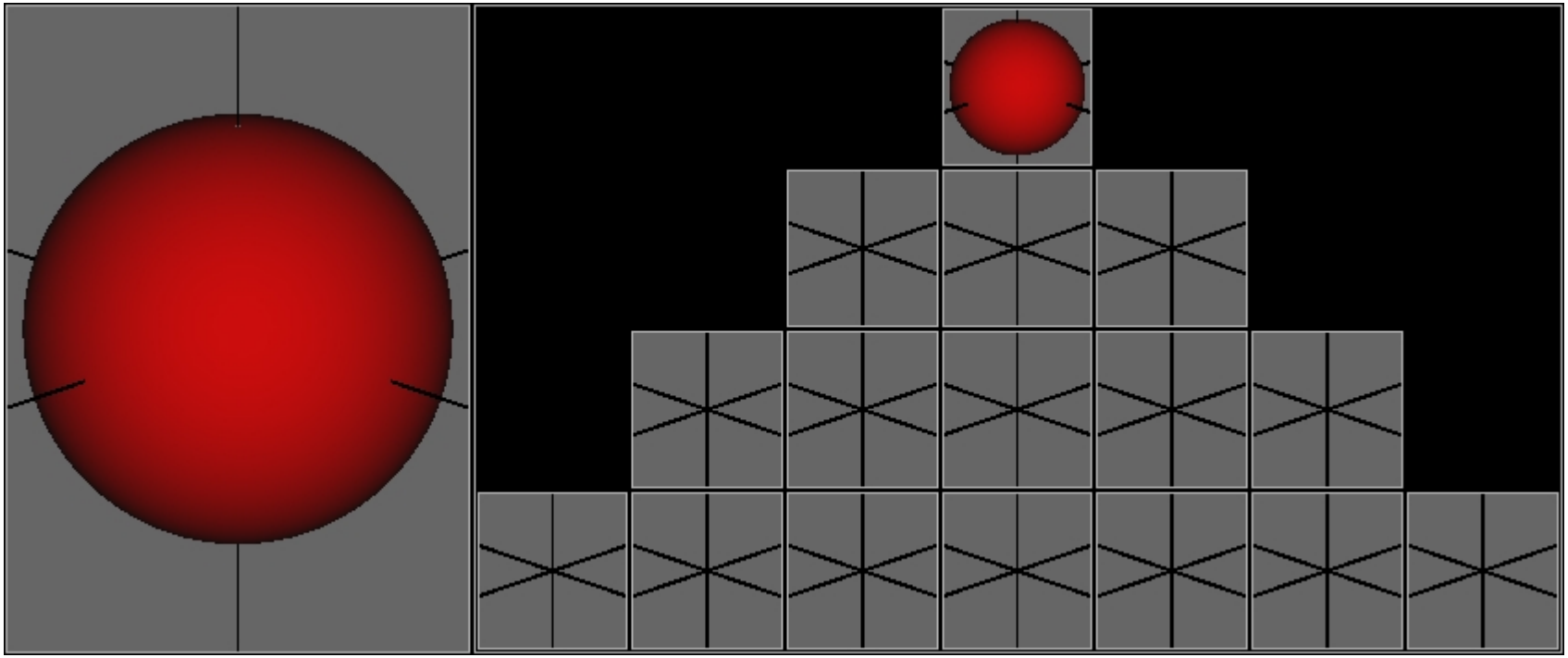

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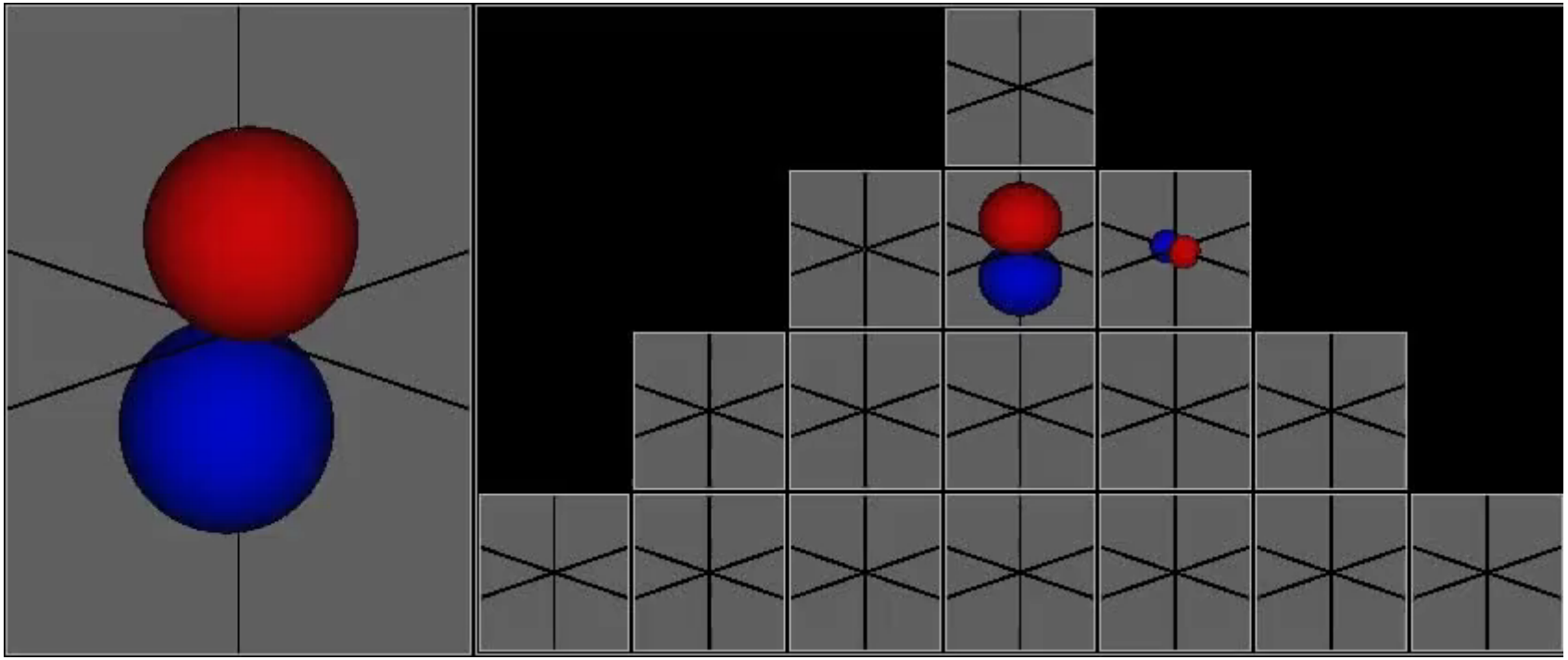

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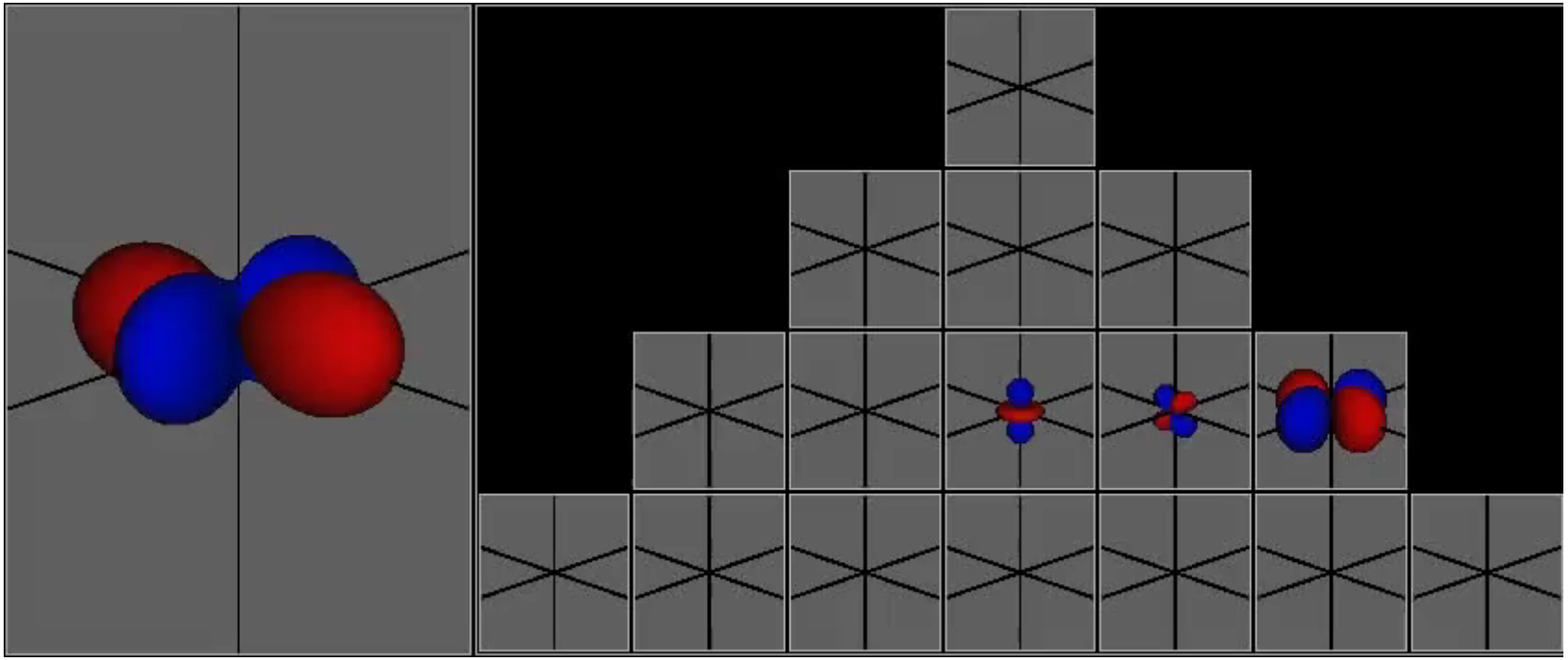

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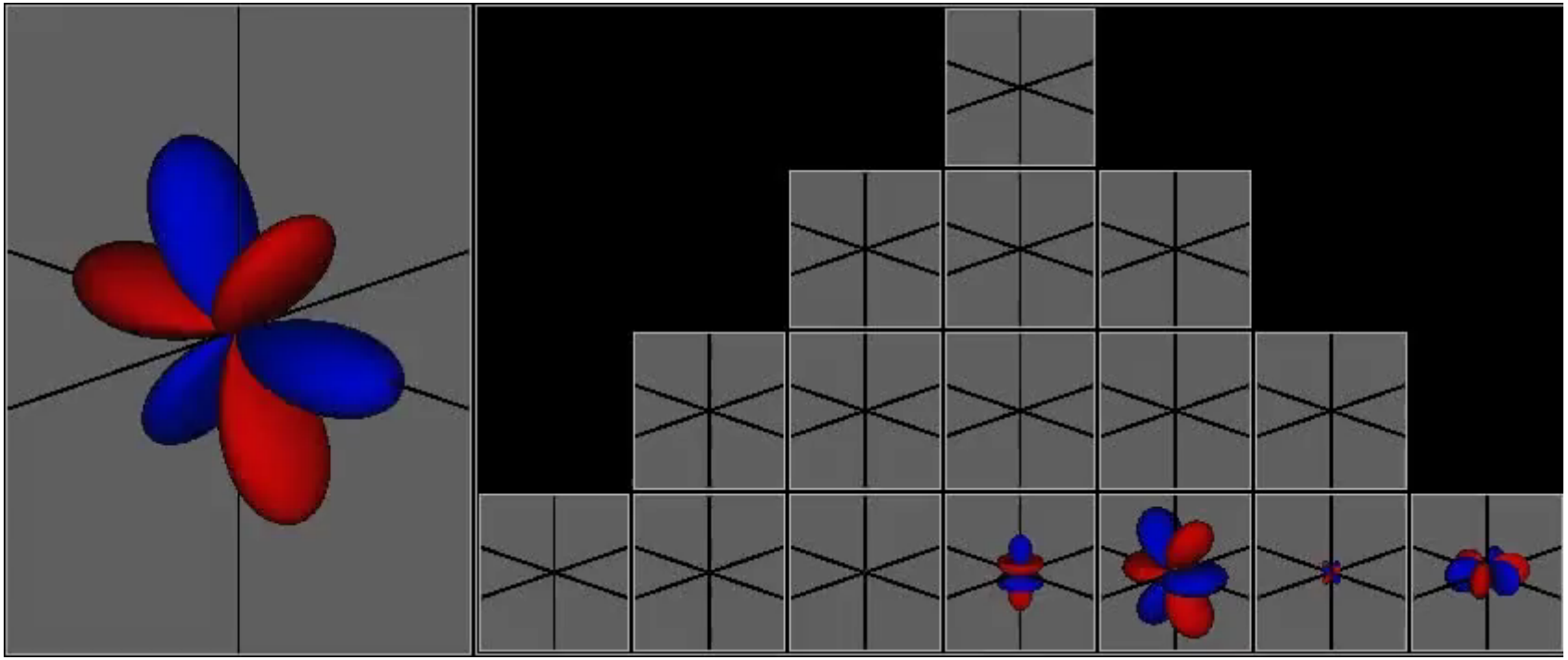

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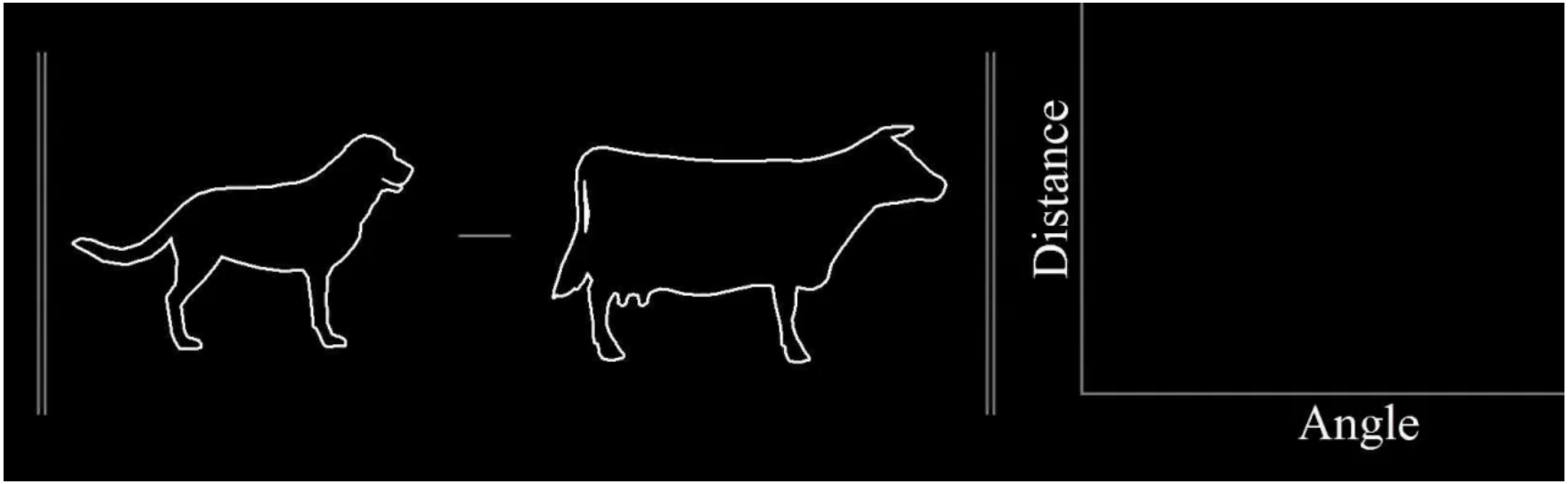

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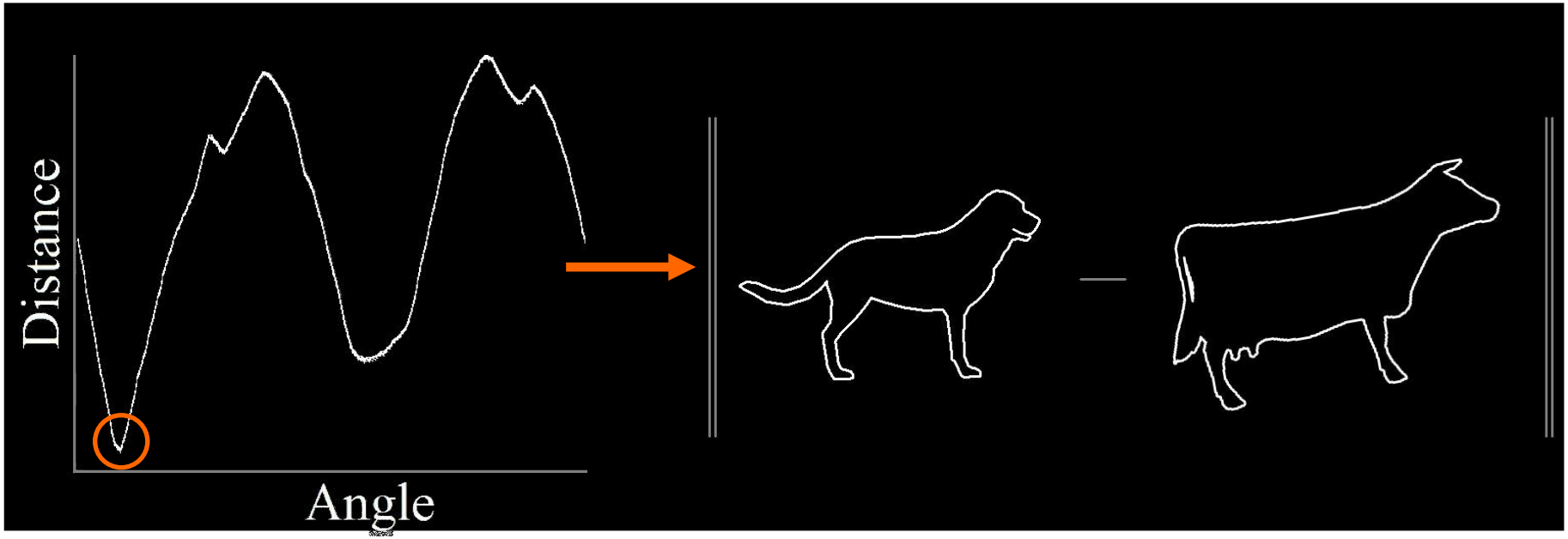

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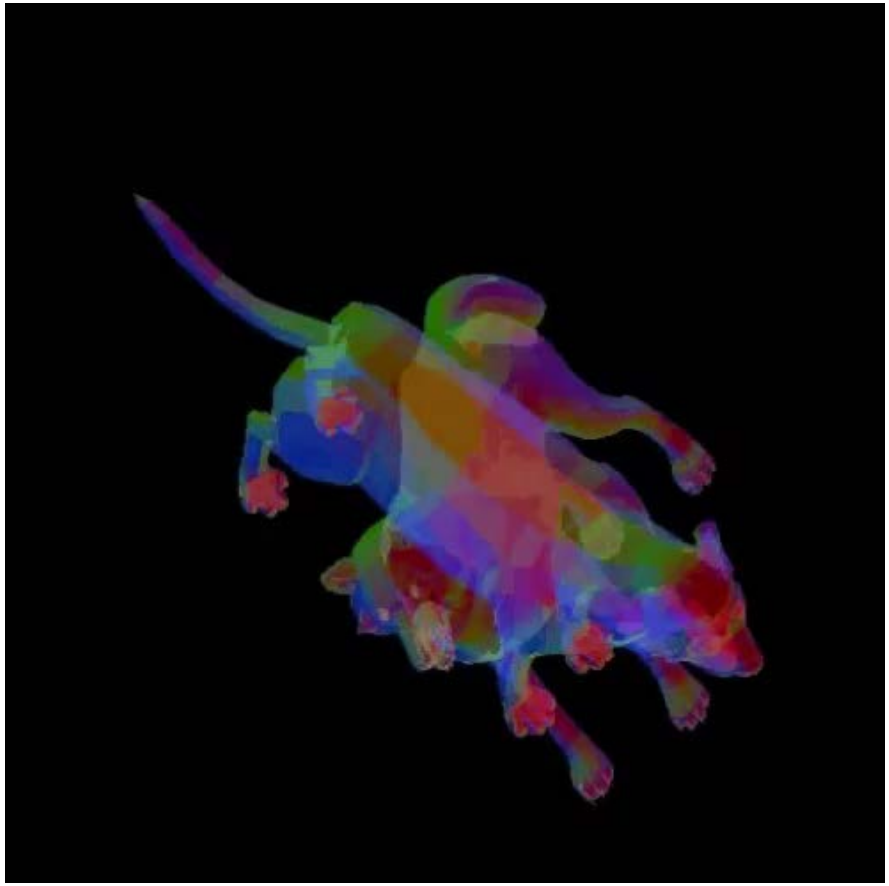

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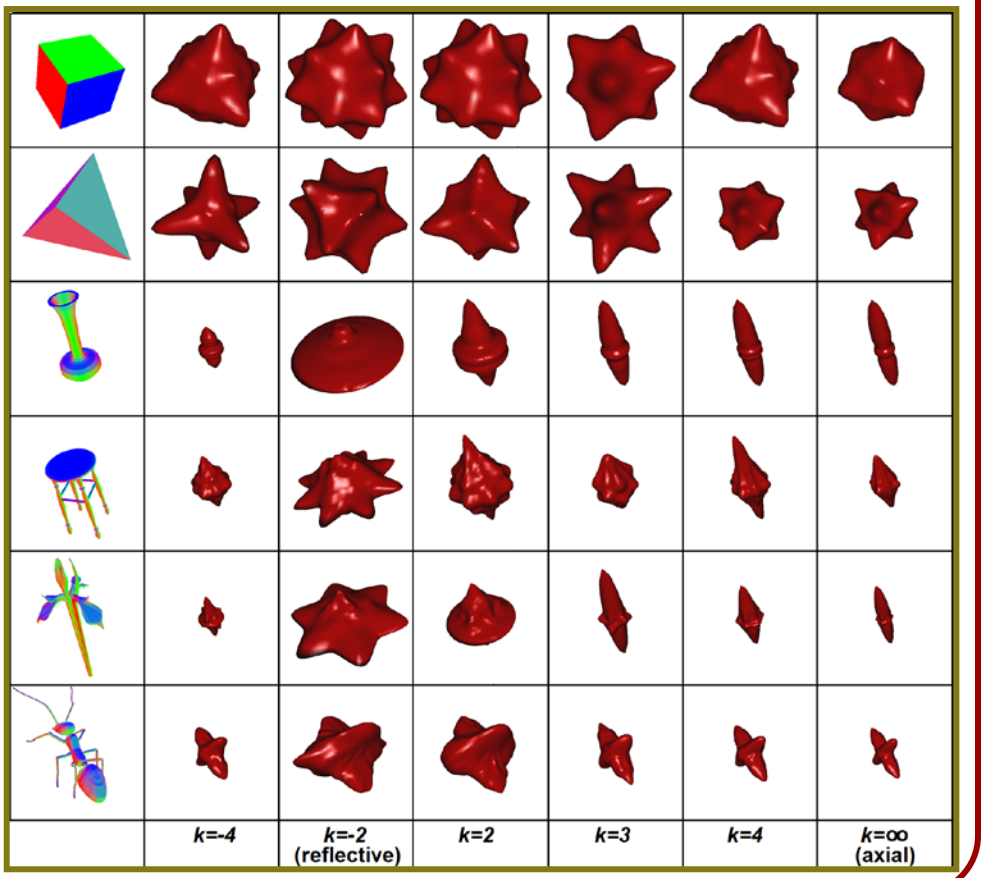

What We Will Cover

- Some basic algebra
  - Representation Theory
  - Commutative Groups
    - » Schur's Lemma
- Signals on a circle / torus
  - Fourier Transform
  - Convolution/Correlation
    - » Smoothing, Differentiation, etc.
- Signals on a sphere
  - Spherical Harmonic Transform
  - Wigner-D Transform
  - Convolution/Correlation
    - » Smoothing, Differentiation, etc.

What I Expect of You

Homework

- A code-base is provided. (Assignment 1 posted and due 2/19/23.)
- Assignments will focus on implementation.

~~Presentations~~

~~Exams~~

Readings

- There is no text book.
- Class notes will be posted.
- Supplementary readings will be suggested.

http://www.cs.jhu.edu/~misha/Spring23/

Miscellany

Contacts:

- Professor:
  - » Misha Kazhdan
  - » misha@cs.jhu.edu
- TA:
  - » Hongyi Liu
  - » liuhongyi@jhu.edu
- Piazza:
  - » https://piazza.com/jhu/spring2023/601760
  - » I will not respond to queries on Piazza unless I’m notified about them. (Don’t hesitate to notify me if you want me to respond.)