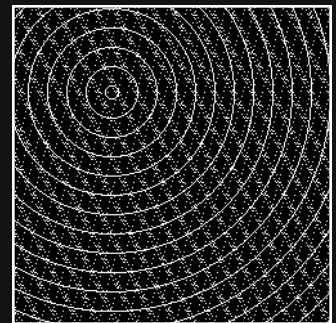
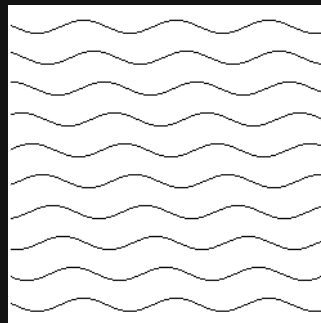
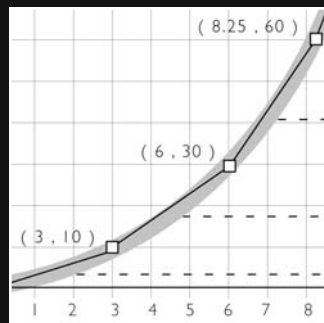


## 4 COMPUTER GRAPHICS, THE FUN, EASY WAY



This chapter gives a simplified and highly abridged overview of computer graphics. Graphics and visualization is one of the major research areas in computer science and has a reputation for being highly complex and mathematically demanding. However, there is a wide range of research being conducted under the heading “graphics and visualization”—with varying degrees of complexity. Dr. Edward Angel, in his widely read textbook *Interactive Computer Graphics*, lists four major application areas within computer graphics:

- Display of information
- Design
- Simulation and animation
- User interfaces

**Display of information** involves data visualization, which can range in complexity from basic charting or plotting of simple data sets (e.g., business graphics), to visualizing molecular interactions or biological processes, to real-time mapping of complex dynamic systems (e.g., modeling of the weather).

**Design** (really, computer-aided design) is applied in manufacturing, engineering, and architecture. It integrates the visual (form) requirements with the analytical or structural (function) requirements. For example, an architect can design a part of a structure visually, through the manipulation of planes and cubes and other simple geometry, while the system calculates underlying structural issues.

**Simulation and animation** is similar to display of information, but involves time—often real time—and verisimilitude, or the appearance of reality. For example, a pilot can practice emergency landings more safely in a flight simulator than in a real plane. Haptics, another related research area in computer science, involves tactility, or touch, that complements visual and aural (sound) data used in simulation to create an immersive, real-feeling virtual experience.

**User interfaces**, sometimes referred to as GUIs (graphical user interfaces), make up the area of computer graphics research that people are most familiar with. We are surrounded by interfaces—not just on our PCs, but on our watches, phones, cameras, appliances, automobiles, and so forth. Yet, for all its ubiquity and apparent simplicity, user interface research is complex, because it deals with human interaction. An entire area of computer science research is devoted to this important and challenging area, called HCI (human-computer interaction).

Processing is being used, to varying degrees, in all four of these areas, and as additional code libraries are developed by readers like you, Processing’s application in graphics and visualization research and development will continue to expand. Unlike proprietary languages like ActionScript and Lingo, built primarily around a specific market-driven application area (e.g., web development, CD-ROM/Kiosk development), Processing’s Java core and open source status give it a vast breadth of application possibilities.