Local / Modeling / Object Space

- Each object model has its own local coordinate frame
  - The **coordinates** of the **vertices** and **vertex normals** are specified with respect to the local coordinate frame

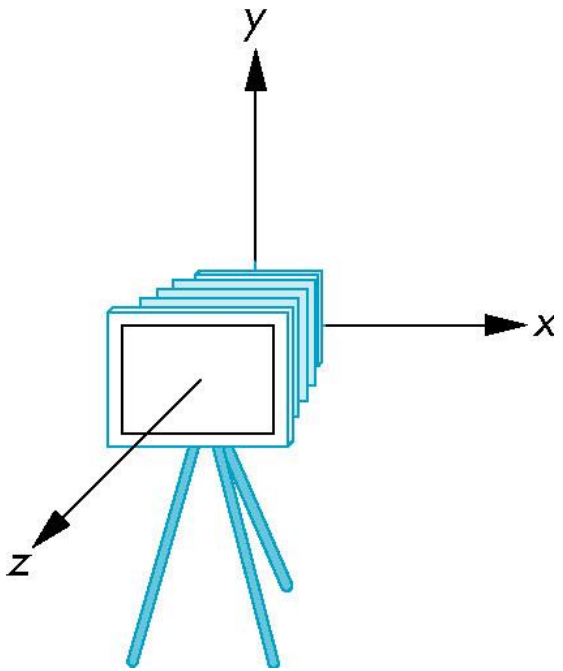
- Convenient for modeling of the object, e.g.
  - A **sphere** is centered at the origin
  - A **cube** with a corner located at the origin and edges parallel to the coordinate axes and

World Space

- A **common coordinate frame** for all objects to form the **scene** to be rendered
  - Each object is transformed from its **local space** to a common world space
  - **Vertex normals** must also be transformed
- **Lights** are defined in this space
  - Positions and directions
- **Camera pose** is defined in this space

Camera Space / View Space / Eye Space

- The camera has a local coordinate frame, called the **camera coordinate frame**
  - Camera is located at the origin
  - Looking in **negative z direction**
  - $+y$-axis is the "**up-vector**"



- **All projections are w.r.t. the camera frame**
- Initially the **world** and **camera** frames are the same
  - Default **model-view matrix** is an identity
- To **specify camera pose**, we need to specify the camera coordinate frame w.r.t. the world coordinate frame