Transformations
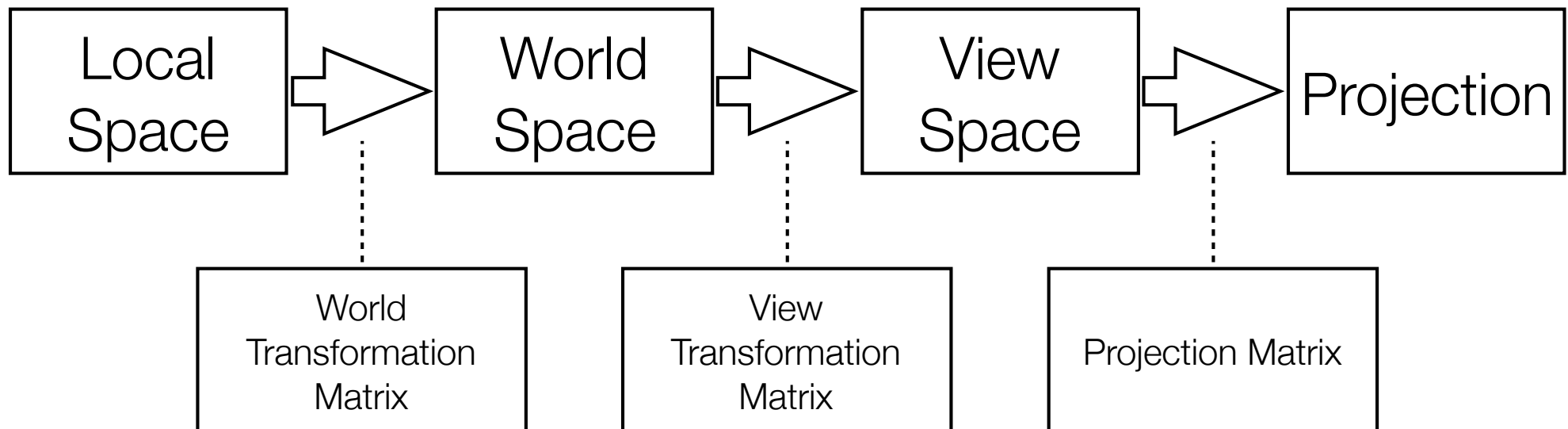
Make our world perfect

Rendering Pipeline

every object has to pass some stages

every stage consists of a transform

for calculation we use matrices

```
┌──────────┐      ┌──────────┐      ┌──────────┐      ┌──────────┐
│  Local   │  ⇒   │  World   │  ⇒   │   View   │  ⇒   │Projection│
│  Space   │      │  Space   │      │  Space   │      │          │
└──────────┘      └──────────┘      └──────────┘      └──────────┘
```

| World Transformation Matrix | View Transformation Matrix | Projection Matrix |

World Transformation

transform an object from local into world space

we are creating a world/scene

consists of

　　Translation

　　Rotation

　　Scaling

normal order is scaling * rotation (x * y * z) * translation

View Transformation

transform all object into camera space

original of this coordinate system is camera position

rotation of this coordinate system is orientation of camera

distinguish between left and right handed coordinate system

Projection

project all object onto a 2d plane for rasterise a picture

two projection

  perspective

  orthographic

Perspective Projection

normal projection with

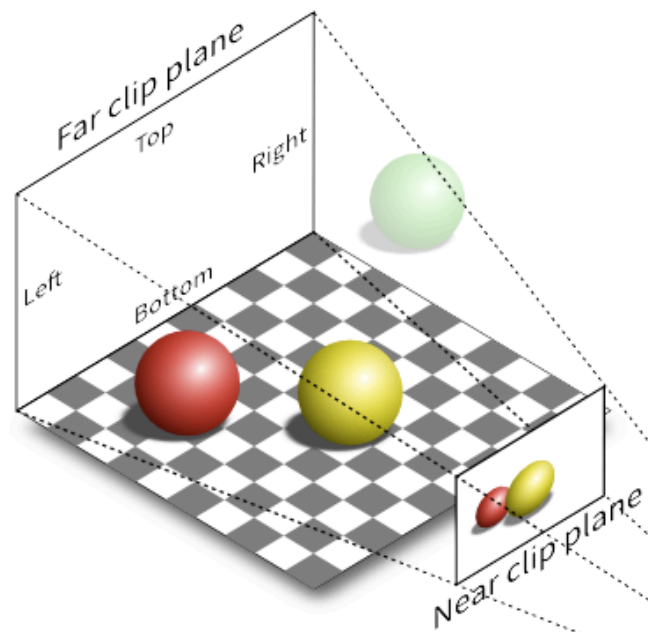field of view

aspect ratio

near and far clipping plane

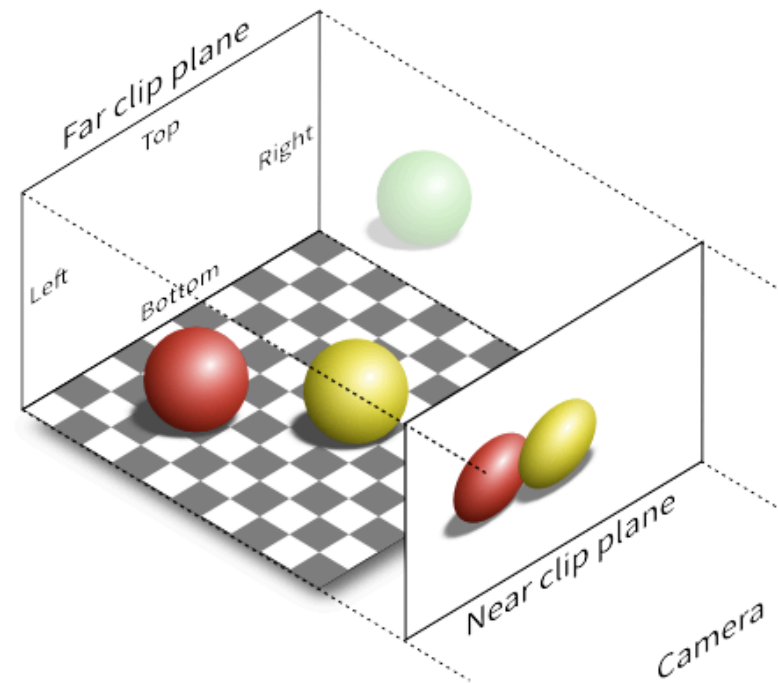# Orthographic Projection

perpendicular projection with

window size

near and far clipping plane

Perspective projection (P)

Orthographic projection (O)

Coding Time

Let's transform the world

Algorithm (noun.)

Word used by programmers when...
they do not want to explain what they did.