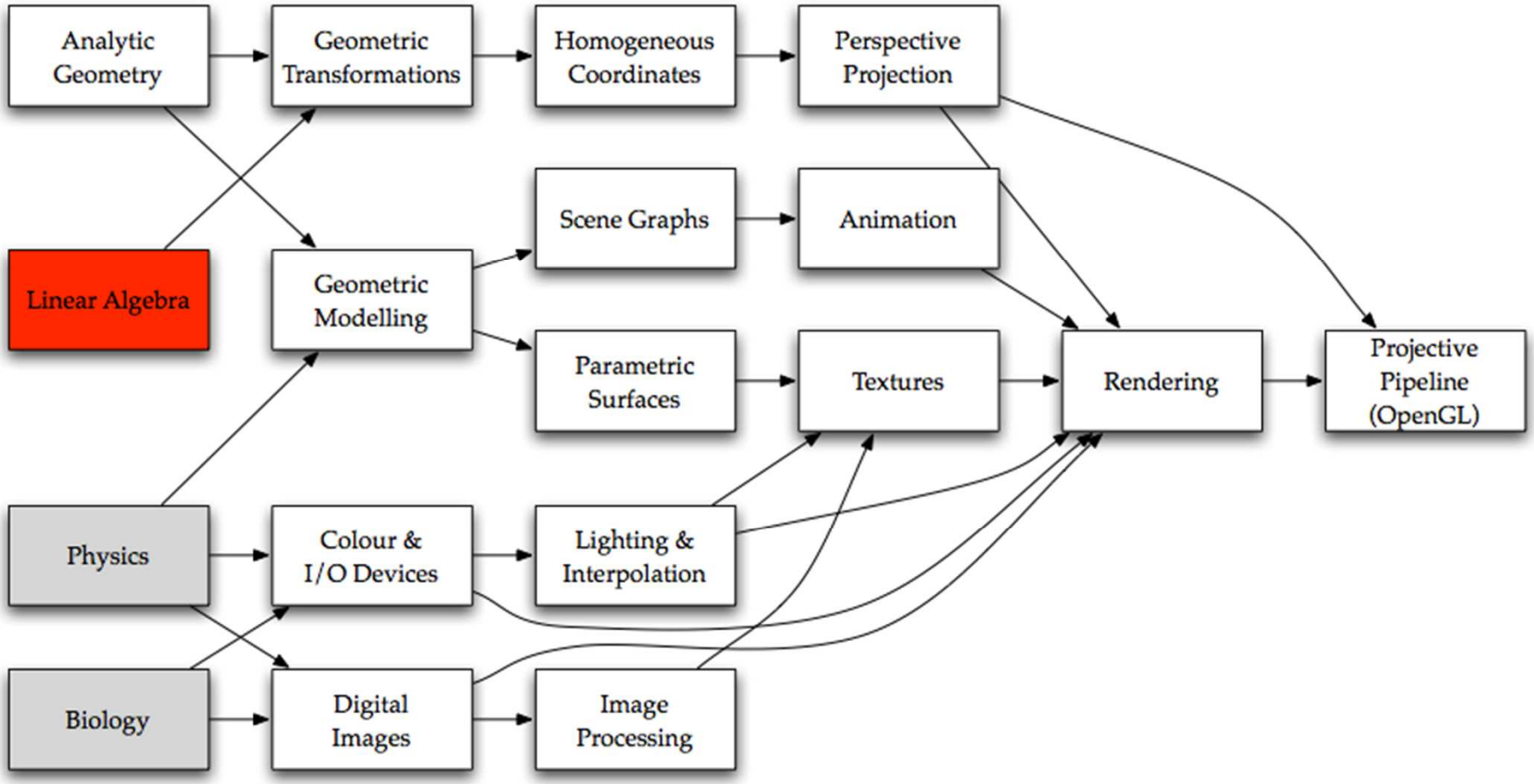
Coding Linear Algebra for Java

Where We Are


Analytic Geometry
Geometric Transformations
Homogeneous Coordinates
Perspective Projection
Linear Algebra
Geometric Modelling
Scene Graphs
Animation
Parametric Surfaces
Textures
Rendering
Projective Pipeline (OpenGL)
Physics
Colour & I/O Devices
Lighting & Interpolation
Biology
Digital Images
Image Processing

Point Class

- Start with the simplest type (a point)
- Give it three coordinates
  - use z=0 when in 2-D
- Also allow access by name or index

Point Class (JAVA)

```
Public class Point()
  { // class Point

 public float x, y, z;                          // the coordinates

  Point();                                  // default constructor
  Point(float X, float Y, float Z);         // initializing constructor
} // class Point
```

Point Constructors

```
public class Point3f {

public float x;
public float y;
public float z;

// default constructor
public Point3f() {
x = 0.0f;
y = 0.0f;
z = 0.0f;
}

//initializing constructor
public Point3f(float x, float y, float z)
{
this.x = x;
this.y = y;
this.z = z;

}
```

Vector Class (Java)

```
public class Vector3f {

public float x=0;
public float y=0;
public float z=0;

public Vector3f() {}

public Vector3f(float x, float y, float z)  {}
public float length()
public Vector3f Normal()
public dot(Vector3f v)
public Vector3f cross(Vector3f v)
```

Addition

- Undefined:
  - Point + Point
- Point result:
  - Point + Vector, Vector + Point
- Vector result:
  - Vector + Vector

Subtraction

- Undefined:
  - Vector - Point
- Point result:
  - Point - Vector
- Vector result:
  - Point - Point, Vector - Vector

Scalar Multiplication

- Undefined:
  - Scalar * Point, Point * Scalar
- Point result:
  - None
- Vector result:
  - Scalar * Vector, Vector * Scalar

Matrix Class (JAVA)

We will cover this in later class but its worth reminding you now about Matrix multiplication

Matrix Multiplication

- Assuming the dimensions match,
- Point * Matrix, Vector * Matrix undefined
- Matrix * Point returns Point
- Matrix * Vector returns Vector
- Matrix * Matrix returns Matrix