Interpolation During Scanconversion
- interpolate values between vertices
  - z values
  - r,g,b - colour components
  - u,v - texture coordinates
  - \( N_x, N_y, N_z \) - surface normals

Computing Normals
- polygon:
  \[ N = (P_2 - P_1) \times (P_3 - P_1) \]
- assume vertices ordered CCW when viewed from visible side of polygon
- normal for a vertex
  - used for lighting
  - supplied by model (i.e., sphere), or computed from neighboring polygons

Transforming Normals
- What is a normal?
  - Vector
    - Orthogonal (perpendicular) to plane/surface
- Do standard transformations preserve orthogonality?

Planes and Normals
- Plane - all points where \( P \cdot N = 0 \)
- \( PN^T = 0 \) (transpose for matrix mult!)

\[ P = \begin{bmatrix} x & y & z & 1 \end{bmatrix} \]
\[ N = \begin{bmatrix} A & B & C & D \end{bmatrix} \]
- Implicit form

\[ Plane = A \cdot x + B \cdot y + C \cdot z + D \]

Finding Correct Normal Transform
- transform a plane
  \[ \begin{array}{c}
  P \\ N
  \end{array} \rightarrow \begin{array}{c}
  P' = PM \\ N' = NQ
  \end{array} \]
- Given M, find Q
  \[ P^T N^T = 0 \]
  \[ (PM)(NQ)^T = 0 \]
  \[ PMQ^T N^T = 0 \]
  \[ MQ^T = I \]
- \( Q = (M^{-1})^T \)
- Normal transformed by inverse transpose of modelling transformation