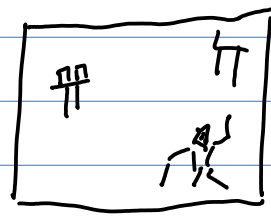
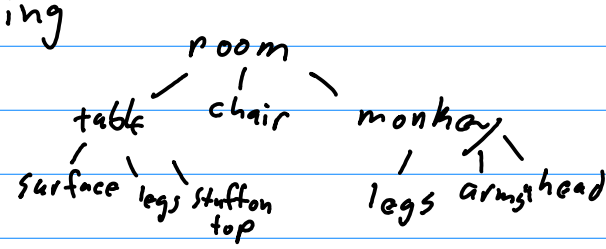
CPSC 220 11/11

Scene graphs - arrange objects in a hierarchy of transformations; each node has transformation matrix used for rendering





$$x' = x\cos\theta - y\sin\theta$$
$$y' = x\sin\theta + y\cos\theta$$

can perform transformations using matrices

$$\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

rotation

$$x' = x + \Delta x$$
$$y' = y + \Delta y$$

$$\begin{bmatrix} 1 & 0 & \Delta x \\ 0 & 1 & \Delta y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

translation

$$\begin{bmatrix} 1 & 0 & \Delta x \\ 0 & 1 & \Delta y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

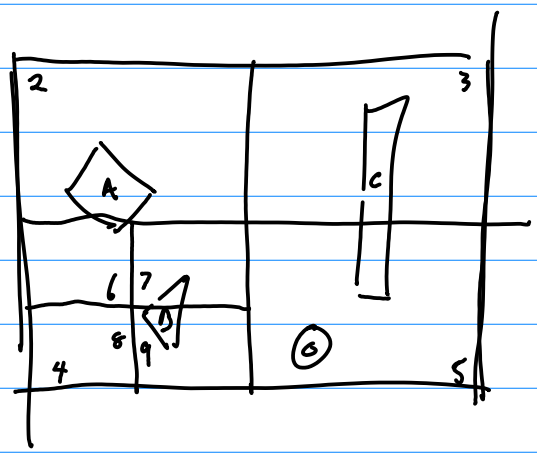
$$\begin{bmatrix} \cos\theta & -\sin\theta & \Delta x \\ \sin\theta & \cos\theta & \Delta y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

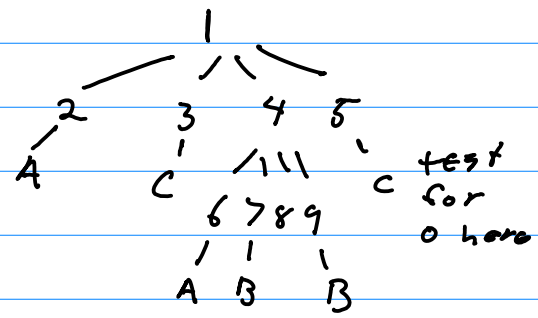
rotation followed by translation

$$= x\cos\theta - y\sin\theta + \Delta x$$
$$y\sin\theta + \cos\theta + \Delta y$$

Quad and Oct Trees

divide area into four sections, stop when area has fewer than two objects



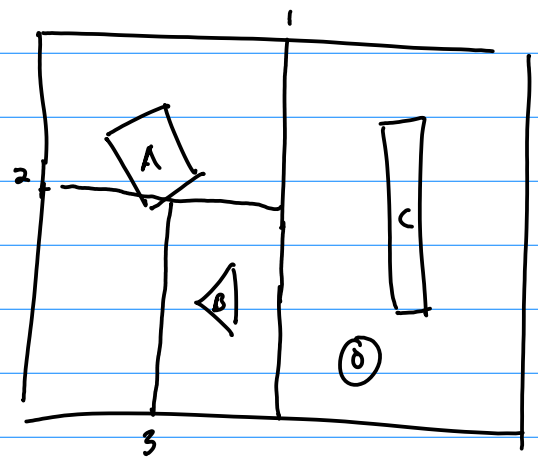


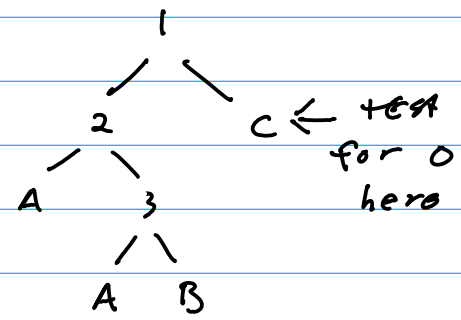
test for collision by traversing tree from root until reaching a leaf, test for collision with other object in leaf (if it exists)

if object spans multiple subdivisions must traverse each

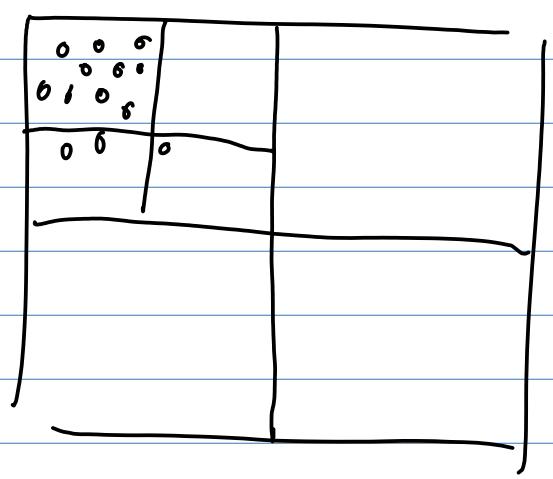
Binary Space Partition

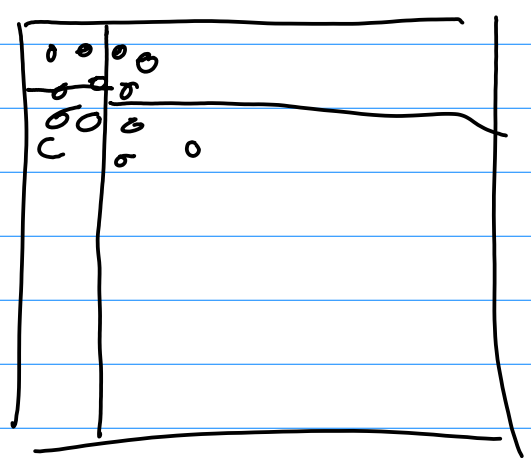
divide area in half, alternating vertically and horizontally, stop when area has less than two objects in it





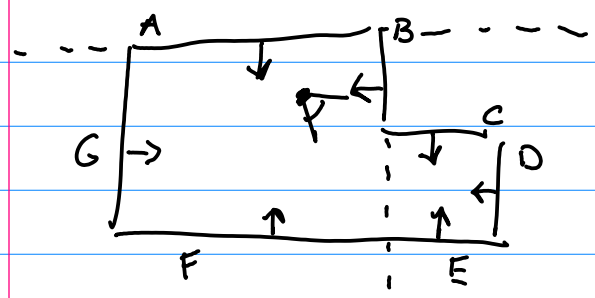
do not have to divide evenly, can create a more flat tree by choosing partition location

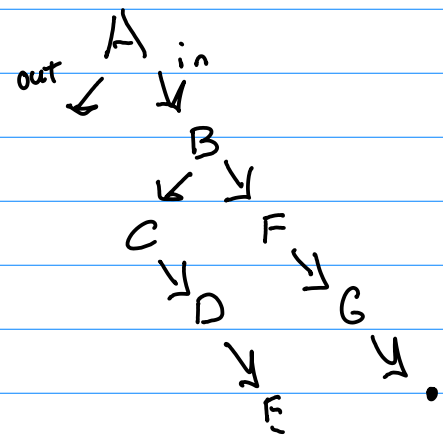




BSP for rendering

each partition is a plane coincident with a polygon





can traverse the BSP based on viewport location to find order to draw polygons

GFBCEDA