#### 1) Portrait

Condition:  $g_{y} < -THRESHOLD$ 

$$a = (\cos \alpha, -\sin \alpha, 0)$$

$$b = (-\sin\alpha, -\cos\alpha, 0)$$

$$c = (0, 0, -1)$$

$$g = s \cdot a + t \cdot b + r \cdot c$$

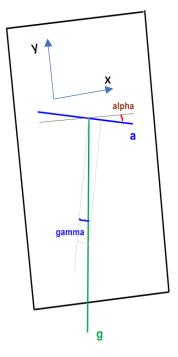
$$g_x = s \cos \alpha - t \sin \alpha$$

$$g_y = -s \sin \alpha - t \cos \alpha$$

$$-t = g_x \sin \alpha + g_y \cos \alpha$$

$$s = g_x \cos \alpha - g_y \sin \alpha$$

$$tan\left(-\gamma\right)=s/t$$



# 2) Landscape Positive (Right)

#### Condition: $g_x > THRESHOLD$

 $a=(\sin\alpha,\cos\alpha,0)$ 

$$b=(\cos\alpha,-\sin\alpha,0)$$

$$c = (0, 0, -1)$$

$$g = s \cdot a + t \cdot b + r \cdot c$$

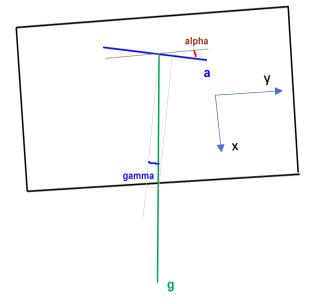
$$g_x = s \sin \alpha + t \cos \alpha$$

$$g_y = s\cos\alpha - t\sin\alpha$$

$$s = g_x \sin \alpha + g_y \cos \alpha$$

$$t = g_x \cos \alpha - g_y \sin \alpha$$

$$tan\left(-\gamma\right)=s/t$$



# 3) Landscape Negative (Left)

Condition:  $g_x < -THRESHOLD$ 

$$a = (-\sin \alpha, -\cos \alpha, 0)$$

$$b=(-\cos\alpha,\sin\alpha,0)$$

$$c = (0, 0, -1)$$

$$g = s \cdot a + t \cdot b + r \cdot c$$

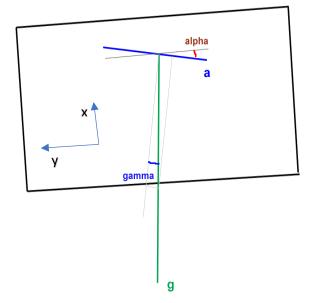
$$g_x = -s \sin \alpha - t \cos \alpha$$

$$g_y = -s \cos \alpha + t \sin \alpha$$

$$-s = g_x \sin \alpha + g_y \cos \alpha$$

$$-t = g_x \cos \alpha - g_y \sin \alpha$$

$$tan\left(-\gamma\right)=s/t$$



# 4) Below (look at phone from above)

Condition:  $g_z < -THRESHOLD$ 

 $a=(\sin\alpha,\cos\alpha,0)$ 

$$b=(\cos\alpha,-\sin\alpha,0)$$

$$c = (0, 0, -1)$$

$$g = s \cdot a + t \cdot b + r \cdot c$$

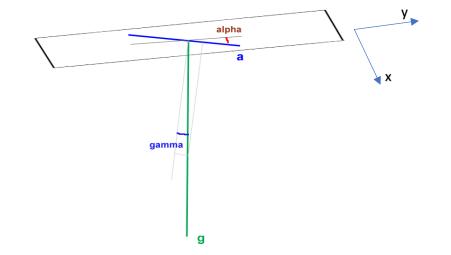
$$g_x = s \sin \alpha + t \cos \alpha$$

$$g_y = s\cos\alpha - t\sin\alpha$$

$$g_z = -r$$

$$s = g_x \sin \alpha + g_y \cos \alpha$$

$$tan\left(-\gamma\right)=s/r$$



# 5) Above (look at phone from below)

#### Condition: $g_z > THRESHOLD$

$$a = (-\sin \alpha, \cos \alpha, 0)$$

$$b=(-\cos\alpha,-\sin\alpha,0)$$

$$c = (0, 0, 1)$$

$$g = s \cdot a + t \cdot b + r \cdot c$$

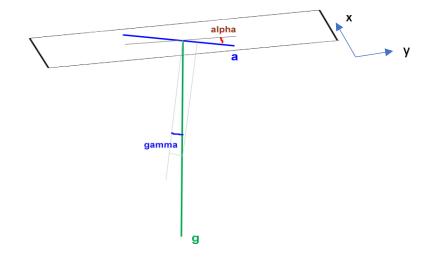
$$g_x = -s \sin \alpha + t \cos \alpha$$

$$g_y = -s\cos\alpha - t\sin\alpha$$

$$g_z = r$$

$$-s = g_x \sin \alpha + g_y \cos \alpha$$

$$tan\left(-\gamma\right)=s/r$$



#### 6) Top Down

Condition:  $g_y > THRESHOLD$ 

 $a = (-\cos \alpha, \sin \alpha, 0)$ 

 $b=(\sin\alpha,\cos\alpha,0)$ 

c = (0, 0, -1)

 $g = s \cdot a + t \cdot b + r \cdot c$ 

 $g_x = -s \cos \alpha + t \sin \alpha$ 

 $g_y = s \sin \alpha + t \cos \alpha$ 

 $t = g_x \sin \alpha + g_y \cos \alpha$ 

 $-s = g_x \cos \alpha - g_y \sin \alpha$ 

 $tan\left( -\gamma\right) =s/t$ 

