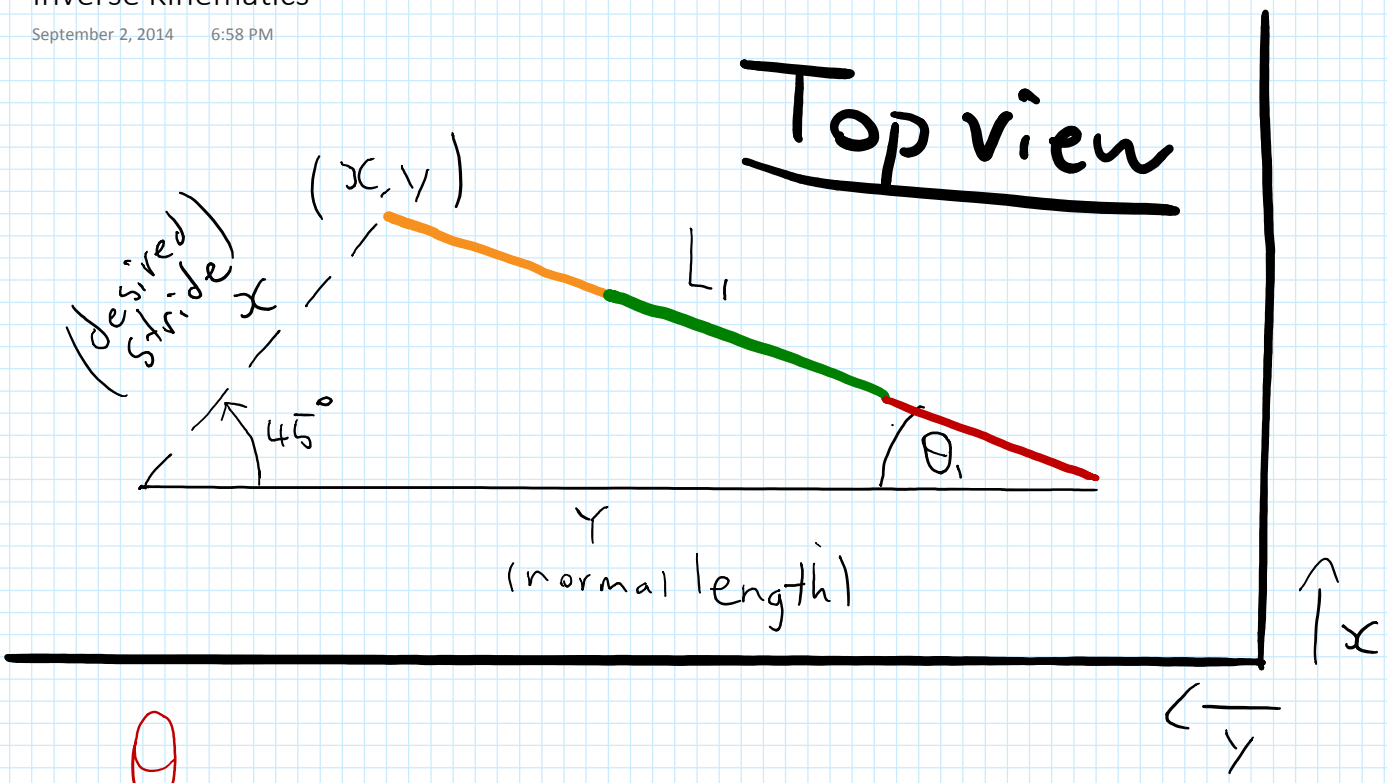
Inverse Kinematics

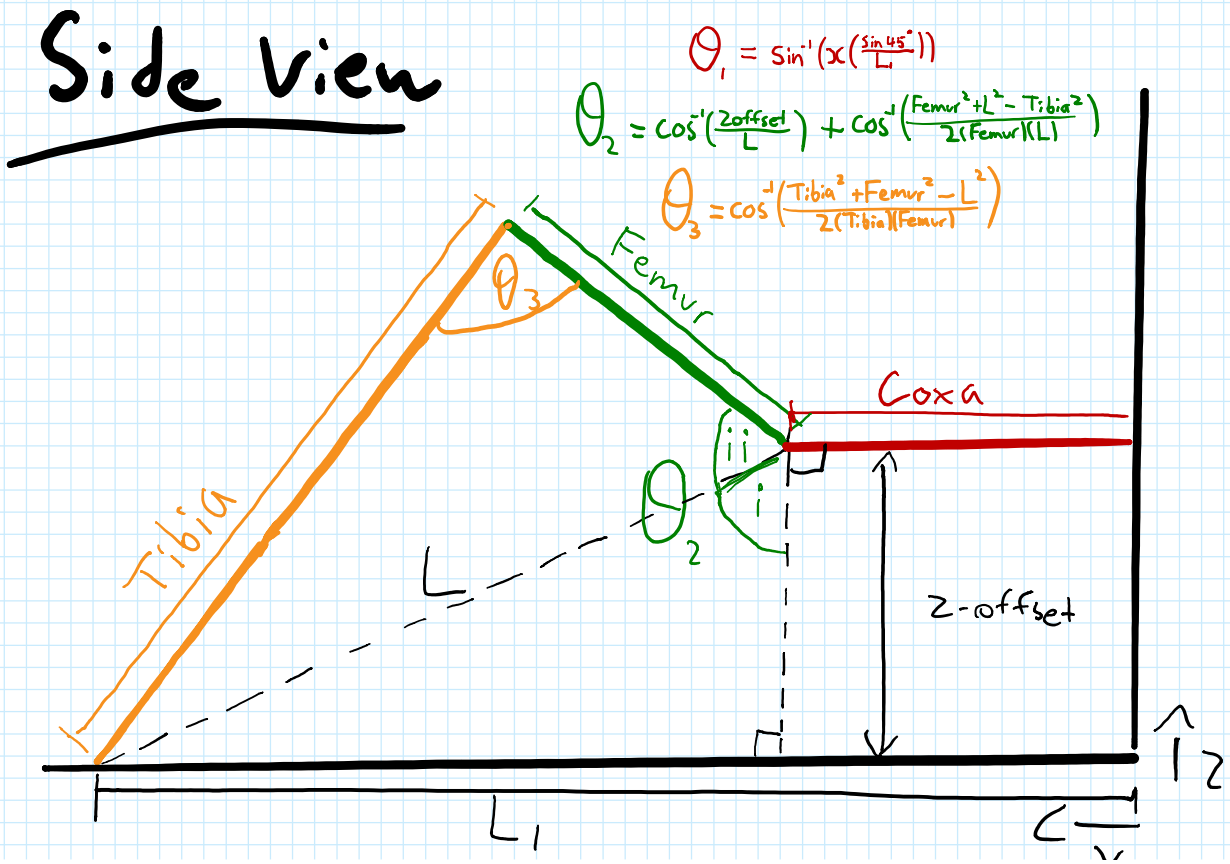
September 2, 2014 6:58 PM



θ_1

$$\frac{\sin\theta_1}{x} = \frac{\sin 45^\circ}{L_1}$$

$$\theta_1 = \sin^{-1}\left(x\left(\frac{\sin 45^\circ}{L_1}\right)\right)$$



L_1

$C = \frac{1}{y}$

$$L = \sqrt{(2offset)^2 + (L_1 - Coxa^2}$$

θ_2

i)

$$\cos\angle i = \frac{2offset}{L}$$

$$\angle i = \cos^{-1}\left(\frac{2offset}{L}\right)$$

ii)

$$Tibia^2 = Femur^2 + L^2 - 2(Femur)(L)\cos\angle ii$$

$$\angle ii = \cos^{-1}\left(\frac{Femur^2 + L^2 - Tibia^2}{2(Femur)(L)}\right)$$

$$\theta_2 = \angle i + \angle ii$$

$$\theta_2 = \cos^{-1}\left(\frac{2offset}{L}\right) + \cos^{-1}\left(\frac{Femur^2 + L^2 - Tibia^2}{2(Femur)(L)}\right)$$

θ_3

$$L^2 = Tibia^2 + Femur^2 - 2(Tibia)(Femur)\cos\theta_3$$

$$\theta_3 = \cos^{-1}\left(\frac{Tibia^2 + Femur^2 - L^2}{2(Tibia)(Femur)}\right)$$