

If the leg is 10 kg then the torque on the hip joint is.

$$L=0.48\text{m}$$

$$m=10 \text{ kg}$$

$$g=9.81 \text{ m/s}^2$$

$$M = m * g * \sin(\phi) * L \Rightarrow M = 10 * 9.81 * \sin(60) * 0.48 = 40.7Nm$$

If the weight of the human is on a leg moment-arm =  $x * \cos(30)$

$$M = F * x = 100kg * 0.48 * 9.81 * \cos(30) = 407Nm$$

moment-arm for motor=0.03m

$$M = F * x \Rightarrow F = \frac{M}{x} = \frac{407}{0.03} = 13.6kN$$

$$\text{motor diameter is } 15\text{mm} \Rightarrow R=7.5\text{mm} \quad M = 13.6kN * 0.0075 = 102Nm$$

The motor needs to rotate

proportionally one circle in 1 sek

n=round per second

$$1 * 13.6kN = 102m * n \Rightarrow n = \frac{13.6}{102} = 133.3sn/sek$$

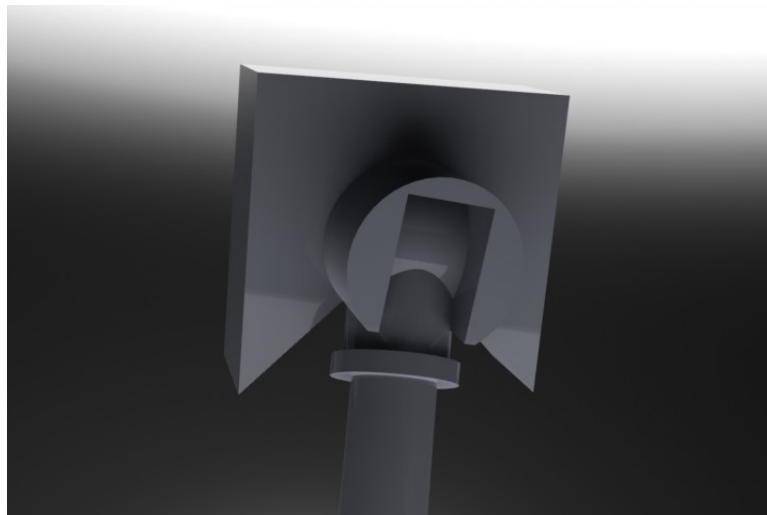


Figure 1: idea for a hip joint



Figure 2: idea for a hip joint

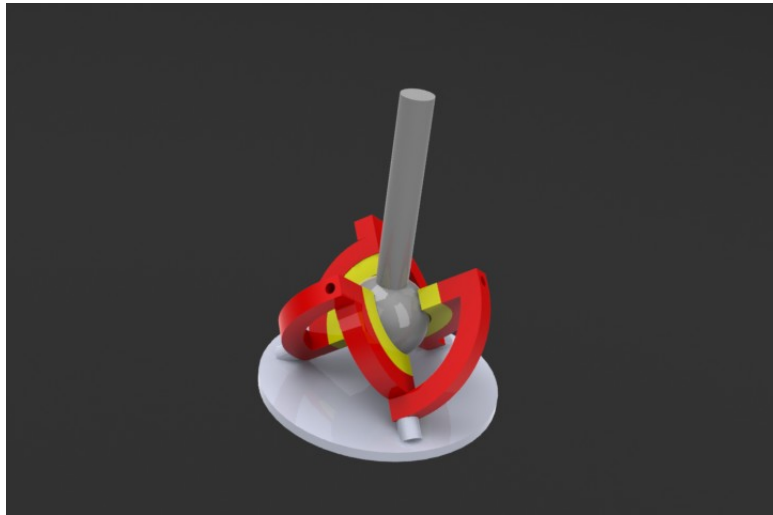


Figure 3: A joint that unites all the motion into 1 point.



Figure 4: Basic shaft cross like joint.