ECE C143A Homework 6

Lawrence Liu

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Problem 1

(a)

False, the Na+ channel opens first

(b)

False, only Na+ serve to depolarize the cell.

(c)

True

(d)

False, EEG's cannot record action potentials.

(e)

False because λ does not vary with time and a possion process is memoryless.

(f)

False, if the Fano factor is greater than one, the firing variance is greater than the firing mean

(g)

True

(h)

False, the

(i)

False

(j)

(m)

False it is a low pass.

(n)

False, good for visual bad for motor

(o)

False, Absolute not relative

Problem 2

(a)

$f(\theta)$ reaces a max at $\theta = \theta_0$ therefore this is the prefered direction.

(b)

No because the values of the tuning curve would all be negative

(c)

$$\begin{aligned}\cos(\theta - \theta_0) &= e^{j(\theta-\theta_0)} \\ &= (\cos(\theta) + j\sin(\theta))(\cos(\theta_0) - j\sin(\theta_0)) \\ &= \cos(theta)\cos(theta_0) + \sin(\theta)\sin(\theta_0)\end{aligned}$$

(d)

$$k_0 = c_0$$
$$k_1 = c_1 \sin(\theta_0)$$
$$k_2 = c_1 \cos(\theta_0)$$

(e)

We have

$$y_0 = 25 = k_0 + k_2$$
$$y_{120} = 70 = k_0 + \frac{k_1}{2} - \frac{k_2\sqrt{3}}{2}$$
$$y_{240} = 10 = k_0 - \frac{k_1}{2} - \frac{k_2\sqrt{3}}{2}$$

Therefore we have

$$y_{120} + y_{240} = 2k_0 - k_2\sqrt{3}$$
$$2y_0 - y_{120} - y_{240} = (2+\sqrt{3})k_2$$
$$k_2 = \boxed{\frac{2y_0 - y_{120} - y_{240}}{2+\sqrt{3}}}$$
$$k_0 = \boxed{y_0 - \frac{2y_0 - y_{120} - y_{240}}{2+\sqrt{3}}}$$
$$k_1 = \boxed{y_{240} - y_0 + \frac{2y_0 - y_{120} - y_{240}}{2+\sqrt{3}} + \frac{4y_0 - 2y_{120} - 2y_{240}}{2\sqrt{3}+3}}$$

(f)