

Reviewer: Josue Orellana

1) General comments

Although this is a literature section, I find it a bit unusual to make references to neuroscientist in the 3rd person. Instead I expect to see references to neuroscience as the field.

The structure of the paragraphs leading to the application of kalman filter for neural decoding is very clear. I only made some comments on structure within paragraphs.

My exposure to neuroscience might have biased some of my suggestions (feel free to ignore them).

2) Specific comments

Section 2.1. Page 1, 1st paragraph.

Mainly I have a few suggestions on the order of ideas in this paragraph. I am thinking of the Gopen and Swan comments on backward linking.

You might want to be more specific about “neural activity”. You could say: Decoding hand trajectories from neural activity consists of estimating [the intended] position from a sequence of measurements over time.

You can include the definition of spikes here. Neural activity could be the handle for a smooth transition:

“Neurons transmit information using spikes, which are rapid changes in the voltage difference between the inside and outside of the cell”.

Next you can link the previous two sentences by talking more about what you measure and what you compute. As a reader I expect something similar to:

“We measured the number of spikes emitted by a population of neurons during short consecutive intervals and many trials”.

Then tell me how you computed firing rate. And tell me that you use it in your model.

“We compute the firing rate of each neuron as the trial average number of spikes appearing during a short interval”.

Section 2.1. Page 1, 2nd paragraph

The last suggestions we read about writing math encouraged the use of english.

Consider using t that belongs to $(0, T]$.

How about if you include the definitions of z and k in separate sentences. They appear to be different ideas.

Section 2.1. Page 1, 3rd paragraph

topic-stress position: If the topic is the state space model. Then you can stress that it is used in neuroscience to decode neural activity.

“The state space model is [often] used in neuroscience to decode neural activity”.

Consider describing equations 1a and 1b in separate sentences. And perhaps you can combine them with the first sentence after equation 1b.

Section 2.1. Page 1, 4th paragraph

As I read the second sentence, I expect a name for f and g .

Section 2.2. Page 1, 1st paragraph, 1st sentence

“Proved” makes me think of a mathematical proof. Have you considered using “showed”?
Do you mean cosine tuning functions as in equation 2?

Section 2.2. Page 1, 1st paragraph, 2nd sentence

You might want to describe equation 2 as: “[can be] related to movement direction” instead of “is”. Alternatively if you are using it as such, you can state that as an assumption: “We assume, z_t to be related to mov. dir as: ”

Section 2.2. Page 1, 2nd paragraph

You already included the definition for α_t in the previous sentence

The reference to “center out movement” is disconnected from everything else. You can probably take it out, unless you are going to elaborate on it.

Section 2.2. Page 2, 1st paragraph

“Based on the considerations above”, this expression looks like scaffolding. You can probably take it out.

You use the term “spike counts”. Perhaps is best to choose between spike counts or firing rates and remain consistent with that.

Section 2.2. Page 2, under equation 4

typo: “rate [s]and ϵ_t ”

typo: “history of measur[e]ment”

Section 2.2. Page 2, under equation 6

“In terms of distribution, equation 6 is equivalent to”, you can omit [we get that].

Section 2.2. Page 2, under before equation 8

You can do without [of the] in “of the Bayes theorem”.

Think about what you want to stress and what’s your topic. You could restructure this sentence as “Bayes theorem is used to specify a posterior probability for v_t given the observed firing rates”.