Biological constraints in neural field models of sensor fusion
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Based on dynamic neural fields [1]:

\[
x = B_x \log \left( \frac{\sqrt{r^2 + 2A\rho \cos \phi} + A^2}{A} \right)
\]

\[
y = B_y \arctan \left( \frac{\rho \sin \phi}{\rho \cos \phi + A} \right)
\]

Reproducing the topology of the SC with a logpolar transformation:

Since the retina has a denser distribution of sensors at its center, visual cues will activate more SC neurons when they are close to the fovea than at the periphery.

Hypotheses

Model inspired from the superior colliculus (SC):

- Subcortical region involved in both multimodal merging and saccade generation
- Receiving visual, auditory, and even somatosensory inputs
- Aligned receptive fields: visual, auditory and somatosensory signals at a same location activate the same region of the SC

The AMPLIFIER project

“Active Multisensory Perception and Learning For Interactive Robots”

An interdisciplinary project with three main components:

- Gathering psychophysical data on sensor fusion, and in particular the role of active perception (e.g. eye movements)
- Building biologically-inspired computational models of multimodal merging, in adequation with the new data
- Using this model to enhance robot perception and improve their social interactions

More information: https://projet.liris.cnrs.fr/amplifier/wiki/

Perspective application

Example: A woman is interacting with a robot, which has to turn its head towards her for natural social interactions.

1. The model receives inputs from the camera and microphones and merges it.
2. The perceived location of the signal can be used to finetune the head-related transfer function (HRTF), specific to each subject.
3. The model can generate saccades (or head movements) autonomously [2].

References

