Master internship position to fill
Multimodal merging for social robots

Keywords

Multimodal merging, neural fields, active perception, developmental learning, social robotics, dynamical systems.

Subject

To have a consistent perception of its surrounding world, an agent has to continuously merge the data flows coming from its various sensors. Multiple studies were done in animals and humans to understand this process at the neuronal and behavioral levels [5]. Especially, it looks like humans are able to merge data in a statistically optimal fashion [2].

Through this internship, the selected candidate will participate in the AMPLIFIER project that targets to study how an artificial agent can autonomously learn to merge multiple data sources and especially how it can attribute the right relevance to each source, with respect to the precision of the sensors, the current stimulus, the task, ... Our hypothesis is that active perception (i.e. active sampling of data in the environment, e.g. by moving the eyes to sample visual data) plays a key role in this process. We want to test it in psychophysics experiments and explore how it can improve human-robot interactions.

More precisely, the intern will study how to integrate the relevance of modalities in the neural field paradigm [1] that was previously used for multimodal merging [3]. On one hand, this work will be used for modeling psychophysical results (performed by other members of the project). On the other hand, it will be coupled with previous work on active perception and anticipation learning [4]. This raises research questions on multimodal attention that will be studied during this internship.

The AMPLIFIER project (2018-2022) includes members from Lyon 1 University (LIRIS, CRNL), Univ. Grenoble Alpes (LJK, Gipsa-lab, LPNC) and Hoomano, a start-up located in Lyon. The intern will thus have to interact with multiple collaborators (academic and firm researchers, engineers) from multiple domains (computer science, psychophysics, statistics, computational neuroscience, robotics).

Profile

Ideally, the candidate would have the following skills:

- studies in artificial intelligence / machine learning / computational neuroscience (or equivalent)
- good programming skills (Python, git)
- autonomy
- ability to work in a team
- scientific curiosity
- good written/oral English skills

Any of these skills will be a plus:

- programming skills in web technologies
- previous experience with robots (especially Nao and Pepper)

- interest/knowledge in neuroscience and/or psychophysics

- previous experience in research

Localization

LIRIS laboratory, Lyon, France.
The intern may occasionally have to go in the Hoomano office in Lyon or LJK laboratory in Grenoble.

Duration

The internship will begin in February-April (starting date subject to negotiation) for 5 months.
This internship can lead to a 3 years PhD thesis (funding provided by the AMPLIFIER project) that will be co-directed between Grenoble and Lyon with time shared between both sites.

Gratification

3.6€/h, 35h/week (i.e. around 520€/month)

Advisors

- Mathieu Lefort: associate professor at SMA group[1], LIRIS laboratory, Lyon

- Jean-Charles Quinton: associate professor at SVH team[2], LJK laboratory, Grenoble

Application

To apply, please send a CV and application letter to Mathieu Lefort (mathieu.lefort@liris.cnrs.fr) and Jean-Charles Quinton (jean-charles.quinton@imag.fr). The applications will be processed on the fly until the position is filled.
If you have any question regarding this internship position, please send a mail to Mathieu Lefort.

References

[1] Shun-ichi Amari. Dynamics of pattern formation in lateral-inhibition type neural fields. *Biological cybernetics*, 27(2):77–87, 1977.

[2] Marc O Ernst and Martin S Banks. Humans integrate visual and haptic information in a statistically optimal fashion. *Nature*, 415(6870):429–433, 2002.

[3] Mathieu Lefort, Yann Boniface, and Bernard Girau. Somma: Cortically inspired paradigms for multimodal processing. In *IJCNN 2013*, pages 1–8. IEEE, 2013.

[4] Jean-Charles Quinton, Nicola Catenacci Volpi, Laura Barca, and Giovanni Pezzulo. The cat is on the mat. Or is it a dog? Dynamic competition in perceptual decision making. *IEEE Transactions on Systems, Man, and Cybernetics*, 44(5):539–551, 2014.

[5] Barry E Stein and M Alex Meredith. *The merging of the senses*. The MIT Press, 1993.

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[1] http://liris.cnrs.fr/equipes?id=74
[2] http://www-ljk.imag.fr/SVH/