

UNIVERSITY OF SOUTH FLORIDA

Defense of a Doctoral Dissertation

Adaptive Multi-scale Place Cell Representations and Replay for Spatial Navigation
and Learning in Autonomous Robots

by

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For the Ph.D. degree in Computer Science and Engineering

Place cells are one of the most widely studied neurons in the brain hippocampus thought to play a vital role in spatial cognition. Studies show that place cell activity is highly correlated with the animal's location in an environment, forming "place fields" that are highly specific to the animal's current location. This dissertation presents a novel multi-scale model of place cell representations and replay, which is able to capture the essential features of place cell activity across different spatial scales. The model is implemented in a robot navigation task, demonstrating its ability to learn and replay spatial information in a way that is consistent with the behavior of real place cells. The model is also able to learn and replay spatial information in a way that is consistent with the behavior of real place cells. The model is also able to learn and replay spatial information in a way that is consistent with the behavior of real place cells.

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THE PUBLIC IS INVITED

Publications

- 1) **Scleidorovich, P.**, Weitzenfeld, A., Fellous, JM., and Dominey, P. Integration of velocity-dependent spatio-temporal structure of place cell activation during navigation in a reservoir model of prefrontal cortex. Biol Cybern (accepted).
- 2) **Scleidorovich, P.**, Llofriu, M., Fellous, JM. et al. A computational model for spatial cognition combining dorsal and ventral hippocampal place field maps: multiscale navigation. Biol Cybern 114, 187–