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## neuroSLAM

*Solving the simultaneous  
location and mapping problem  
with spiking neural networks*

# Where's Wally?



## Simultaneous Localization and Mapping

- Get data from external and internal sensors
- Fit measurements into model
- Estimate position and update map



## Simultaneous Localization and Mapping

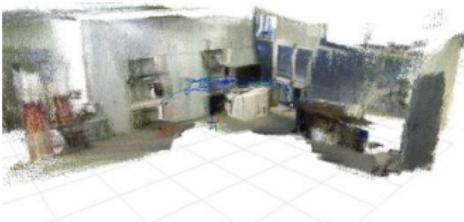
Navigation,



augmented  
reality,



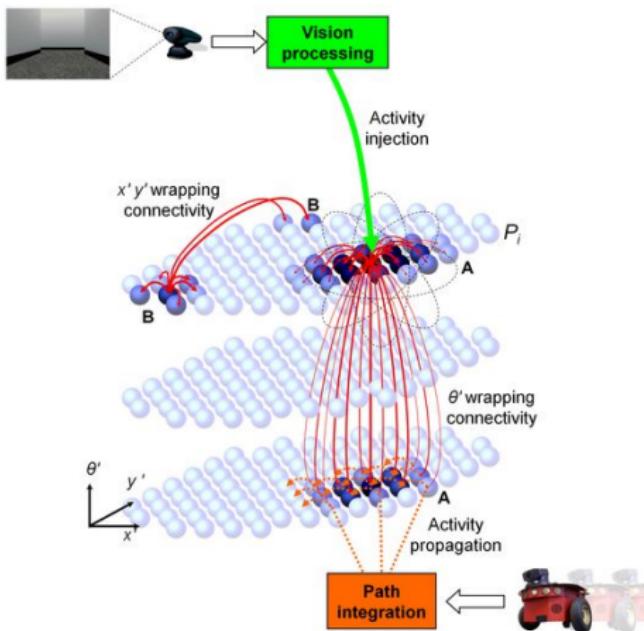
environment  
reconstruction

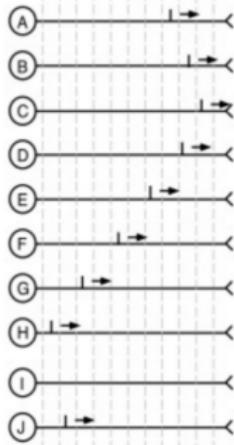
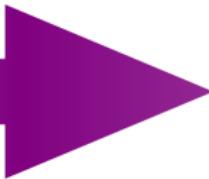


- Power hungry
- Exotic sensors
- Either indoor or outdoor



- Neural networks
- SLAM[1]
- More efficient
- Neuromorphic hardware



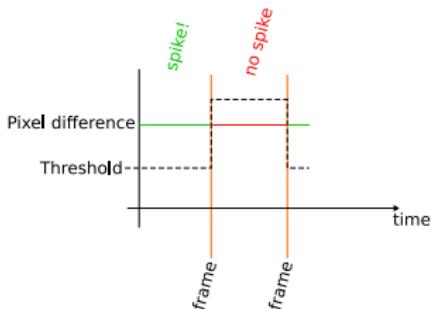


Convert images/video to spike trains

- Based on eye anatomy[2]
- Retains visual information
- 12 fps + correction algorithm



- Emulate Dynamic Vision Sensor
- Sense changes in contrast
- Per-pixel adaptive threshold



- ✓ Video-to-spike encoder
- ✓ Paper waiting to be reviewed in Frontiers

[TO DO] Image classification with deep networks

[TO DO] On-line learning of spiking neural networks

[TO DO] Spiking version of ratSLAM



# Thank You!

Contact me:

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- [1] M. Milford, G. Wyeth, and D Prasser, "RatSLAM: a hippocampal model for simultaneous localization and mapping," *Robotics and Automation*, . . ., no. May 2004, pp. 403–408, 2004, ISSN: 1050-4729. DOI: [10.1109/ROBOT.2004.1307183](https://doi.org/10.1109/ROBOT.2004.1307183).
- [2] B. Bhattacharya and S. Furber, "Biologically inspired means for rank-order encoding images: a quantitative analysis," *Neural Networks, IEEE Transactions on*, vol. 21, no. 7, pp. 1087–1099, 2010, ISSN: 1045-9227. DOI: [10.1109/TNN.2010.2048339](https://doi.org/10.1109/TNN.2010.2048339).