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PlaNeural: Spiking Neural Networks that Plan

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Aims & Objectives

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- Systematic
- Development
- Planning
- Insert into complex agents
- Cell Assembly
- Spiking Neurons
- Maes Networks

- Test
  - Environment 1
  - Environment 2
  - Spiking Raster plots
- Results

  Conclusions
- Future Work

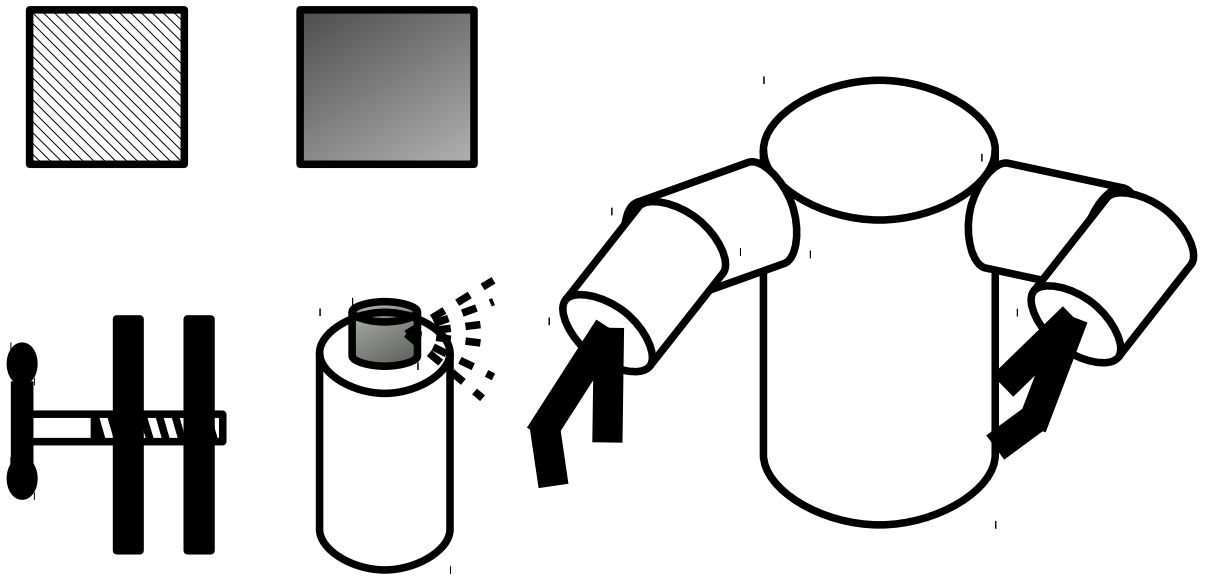
Introduction

- Cell Assembly
  - Population Cells
- PyNN
- Nest
- Neuralensemble.org
- Spinnaker

- Planning
  - Static, no learning yet
  - Maes Networks
  - Complex
  - Graphical | Pattern
  - Developing Cell Assemblies in a Maes Network for planning.

Environment 1 – Maes network Robot[13]

- Robot
  - 2 hands
  - Sand paper
  - Board
  - Spray paint
  - Vice



(b)

Environment 2 – Roaming Agent

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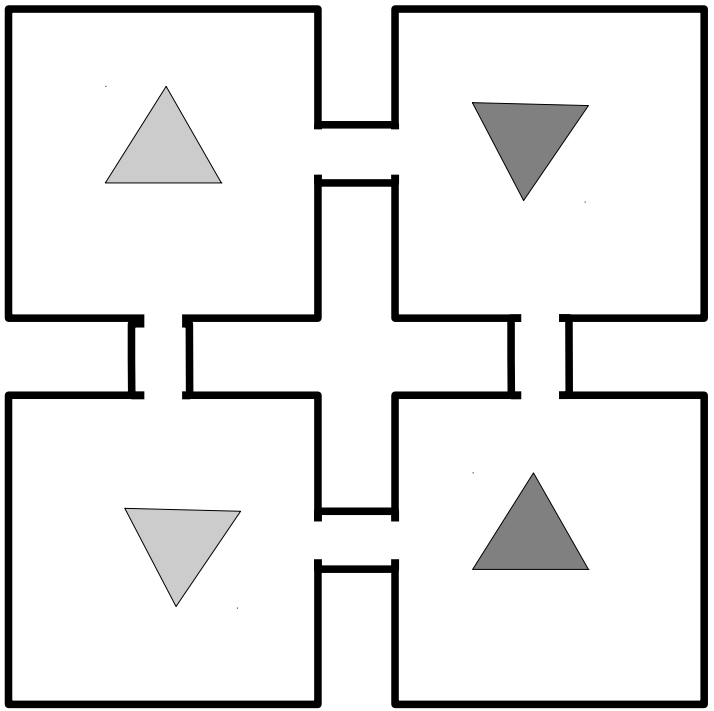
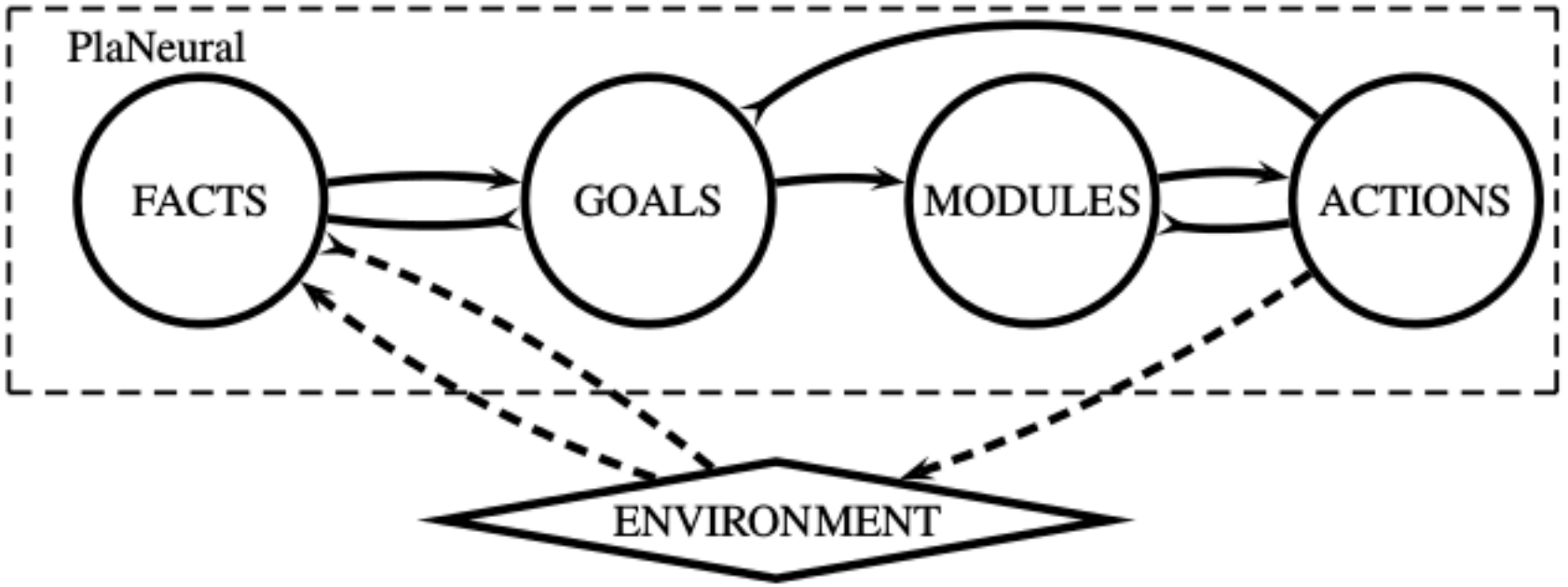
- 4 rooms
- Different objects
- Plan is to
  - Identify object
  - Go to door
  - Go to room
  - Explore
  - FW, BW, TR, TL



Maes



Development for Environment 1

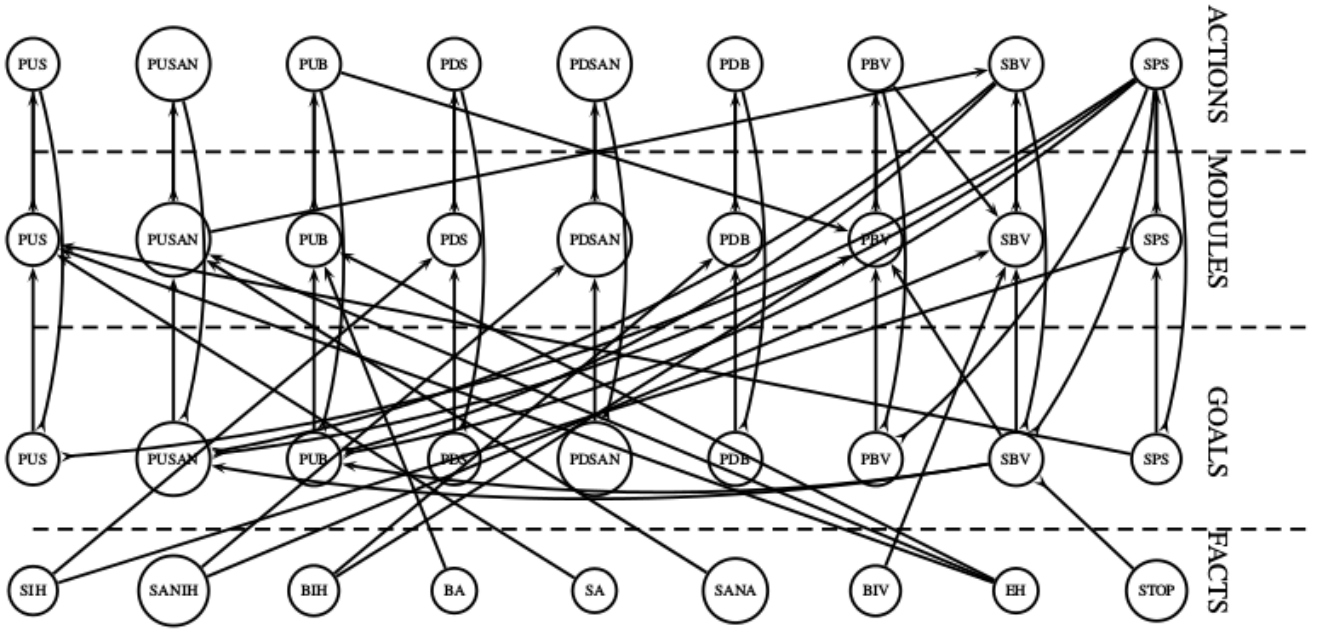


Figure 2: PlaNeural Structure for Robot. Key is referred to Table 1

Key	Description	Key	Description	Key	Description
BA	Board Available	PDSAN	Put Down Sander	BIV	Board in Vice
SA	Spray Available	PDS	Put Down Spray	SANIH	Sander in Hand
SANA	Sander Available	PBV	Put Board in Vice	BIH	Board in Hand
PUS	Pick up Spray	SBV	Sand Board in Vice	SIH	Spray in Hand
PUSAN	Pick up Sander	EH	Empty Hand	SPS	Spray Paint Self
PUB	Pick up Board	STOP	Stop	PDB	Put down Board

Table 1: Commands for Maes Robot

Development for Environment 2

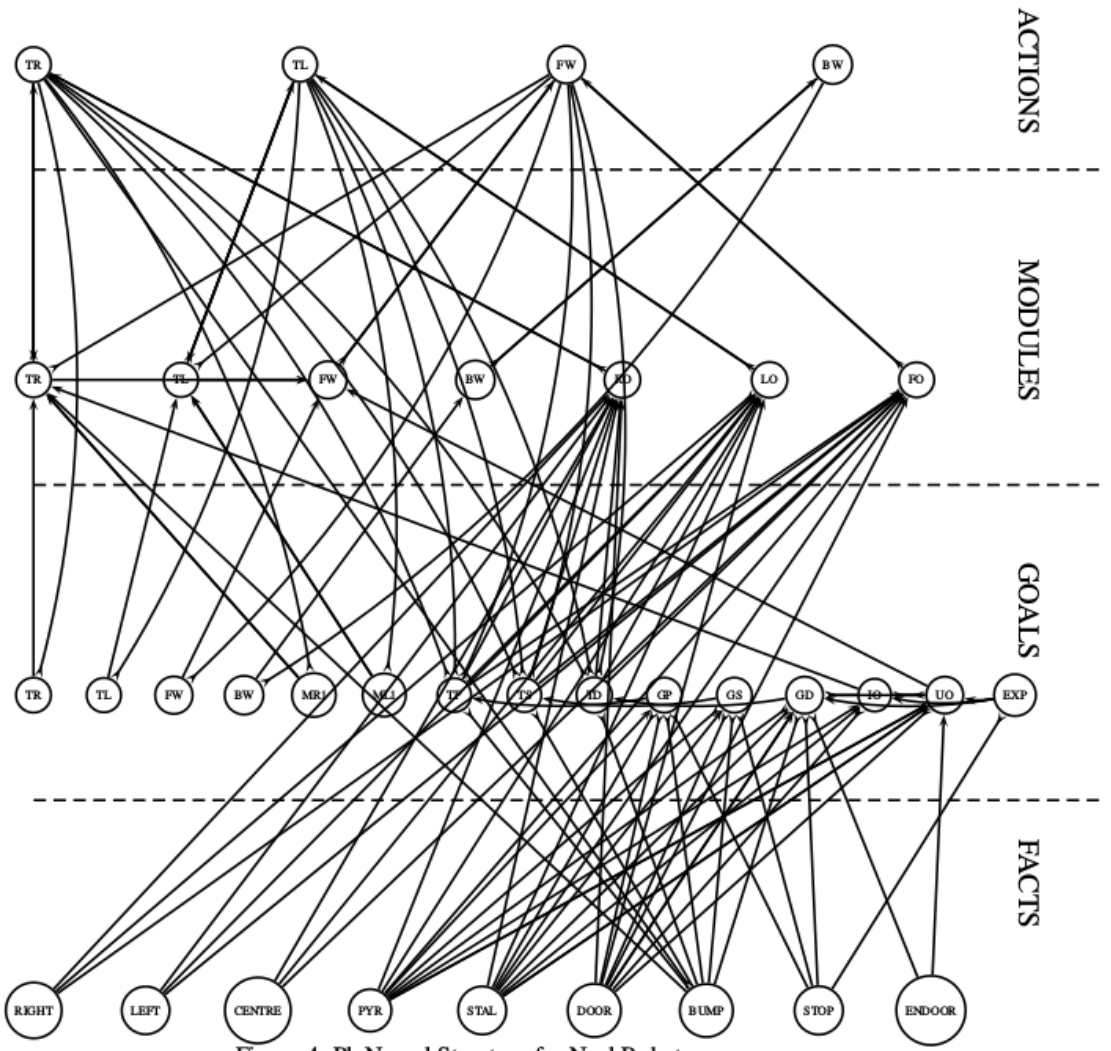
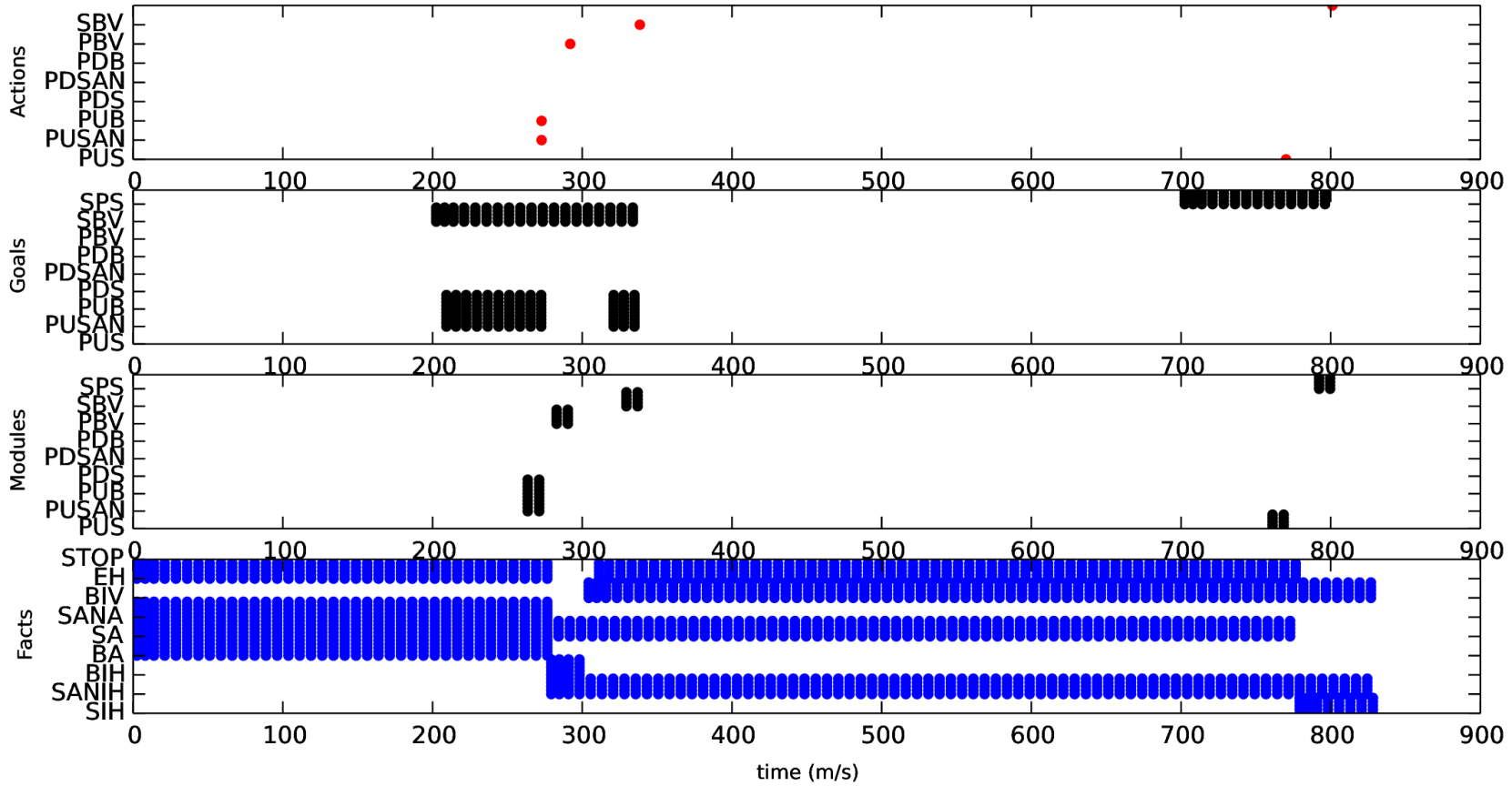


Figure 4: PlaNeural Structure for Neal Robot

Results for Environment 1



Results for Environment 2

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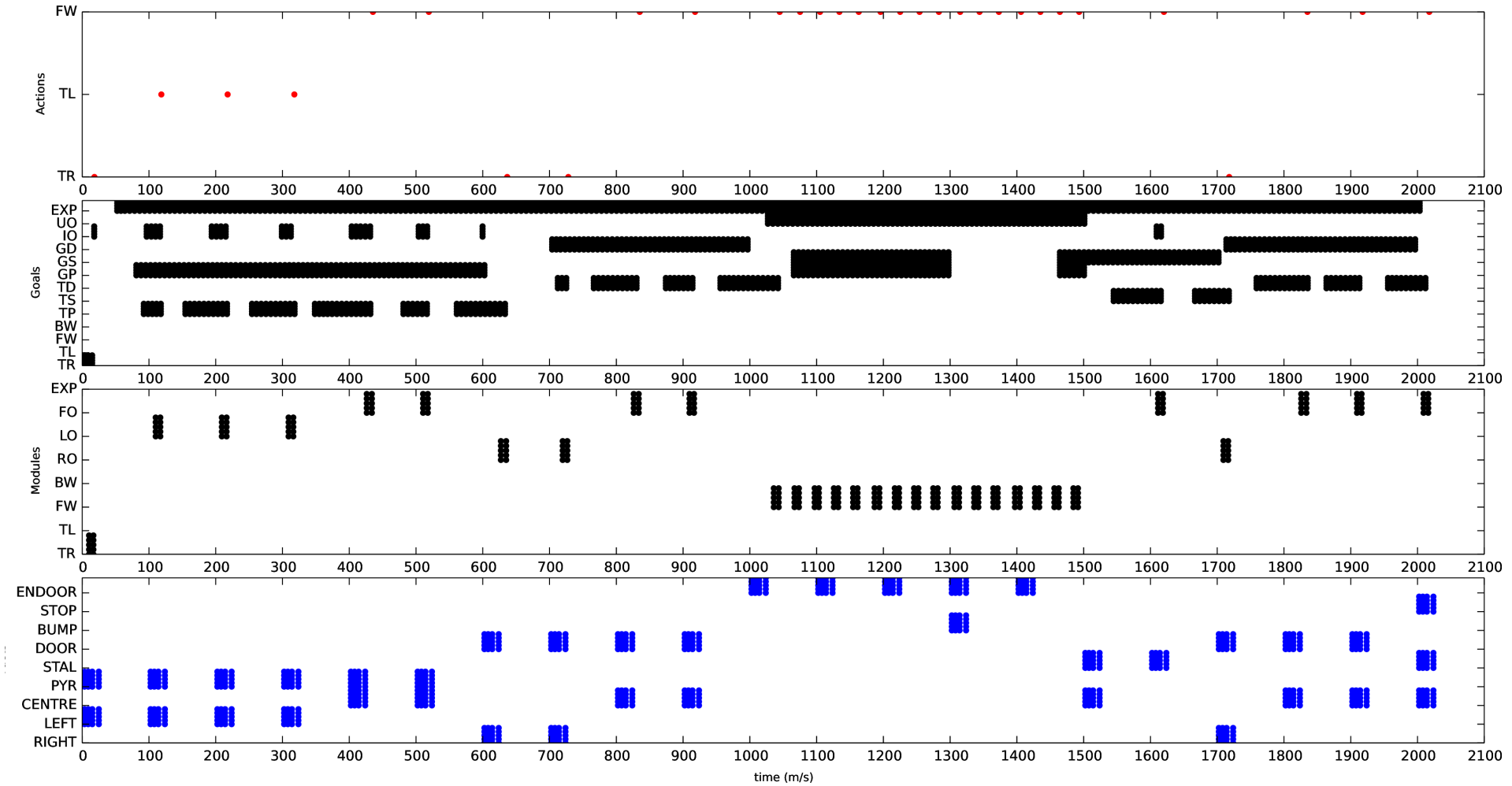

Conclusions

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- 1. Planning with SNN. The topology describes a network that demonstrates the ability to plan in two environments under two different implementations, Nest and Spinnaker, using the concept of Maes-inspired Networks combined with Cell Assemblies.
- 2. Topology: Systematically building a framework for future agents, has been used in NEAL. This systematic approach will improve areas of planning in the development of agents.

Summary

- Contributions
  - Planning
  - Development
  - Systematic
  - “Spikification”
  - Not visual | logic
  - Planning part of NEAL
    - Neural Embodied Agent that Learns
- Results
  - Works in at least 2 environments
  - Maes
  - Robot
- Future
  - Improve complexity
  - NEAL
  - Learning

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