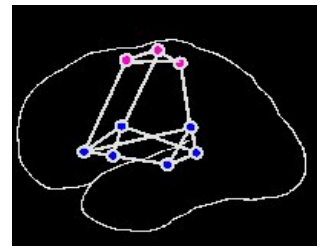
MirrorBot

Biomimetic multimodal learning in a mirror neuron-based robot



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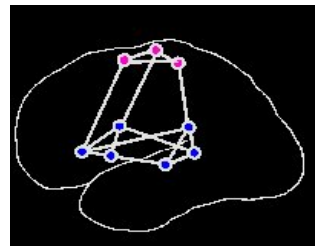
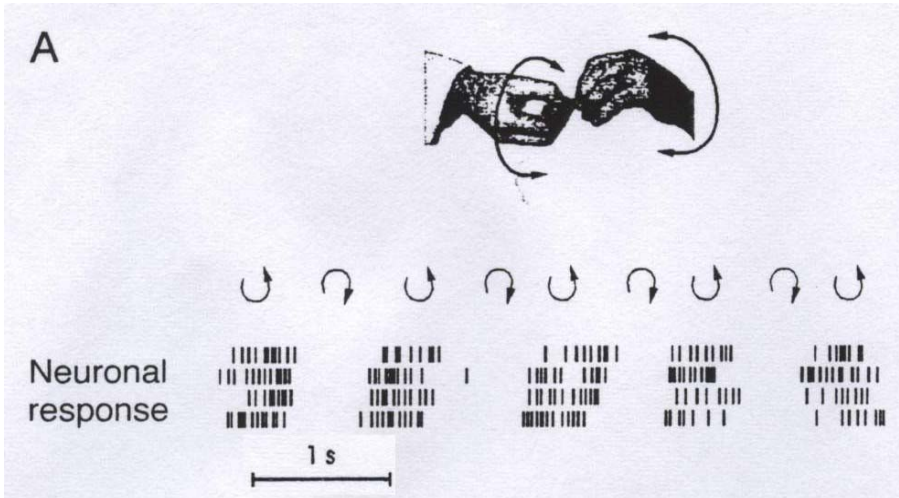
What are the objectives of the MirrorBot project?



- Mirror neurons fire for actions, visually observed actions and acoustically observed actions
- Hypothesis: Can mirror-neuron based cell assemblies be used for multimodal actions in robots?



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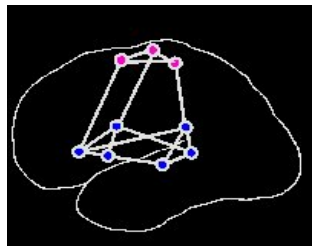
How we address it



- To collect imaging and neural recording data: EEG, MEG, fMRI
- To identify realistic neural architectures to process perceptual visual and language data
- To develop computational cell assemblies implementing the mirror neuron concept
- To integrate the cell assemblies in the MirrorBot
- To train and evaluate the MirrorBot to perform actions based on visual perception and language input

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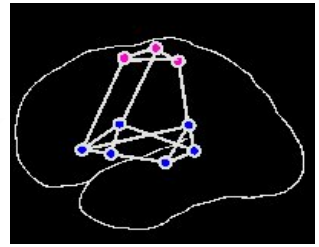
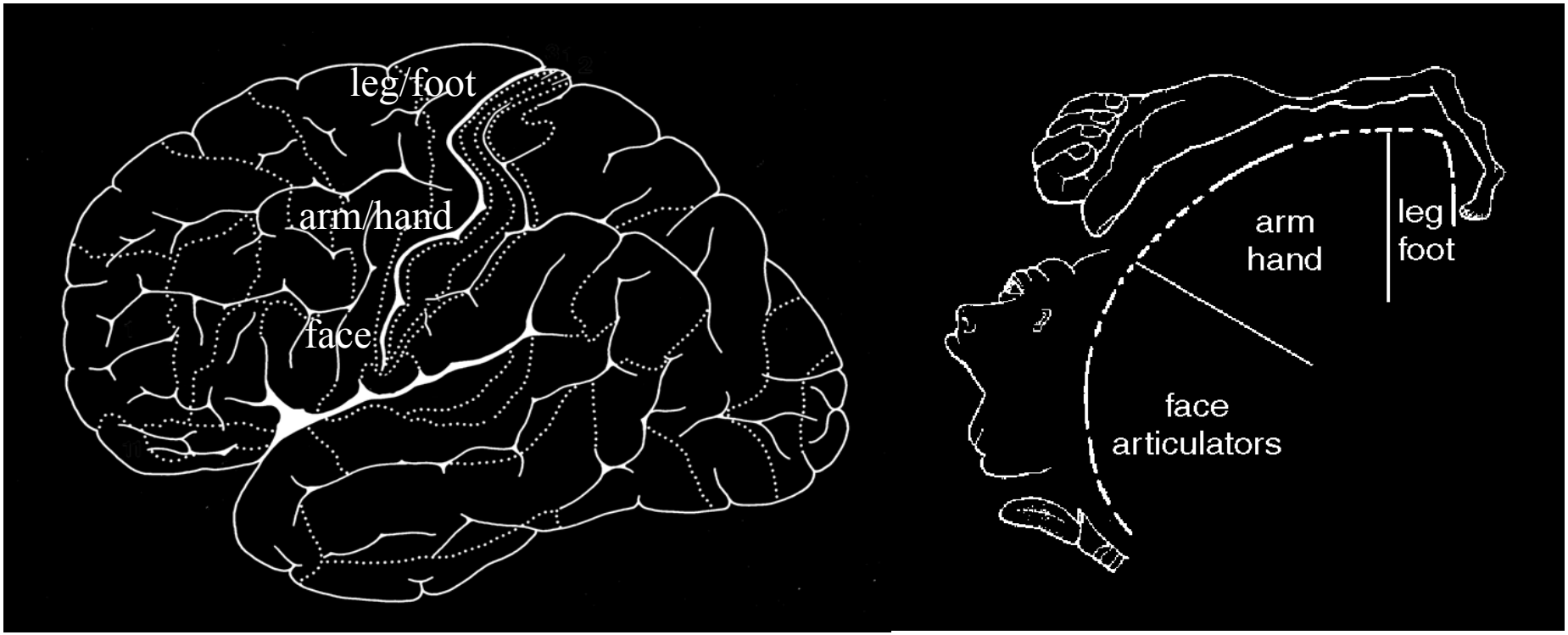
Action representation in the cortex





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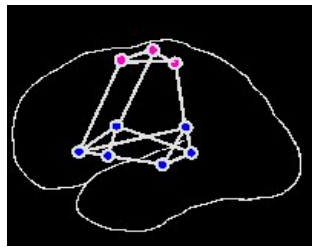
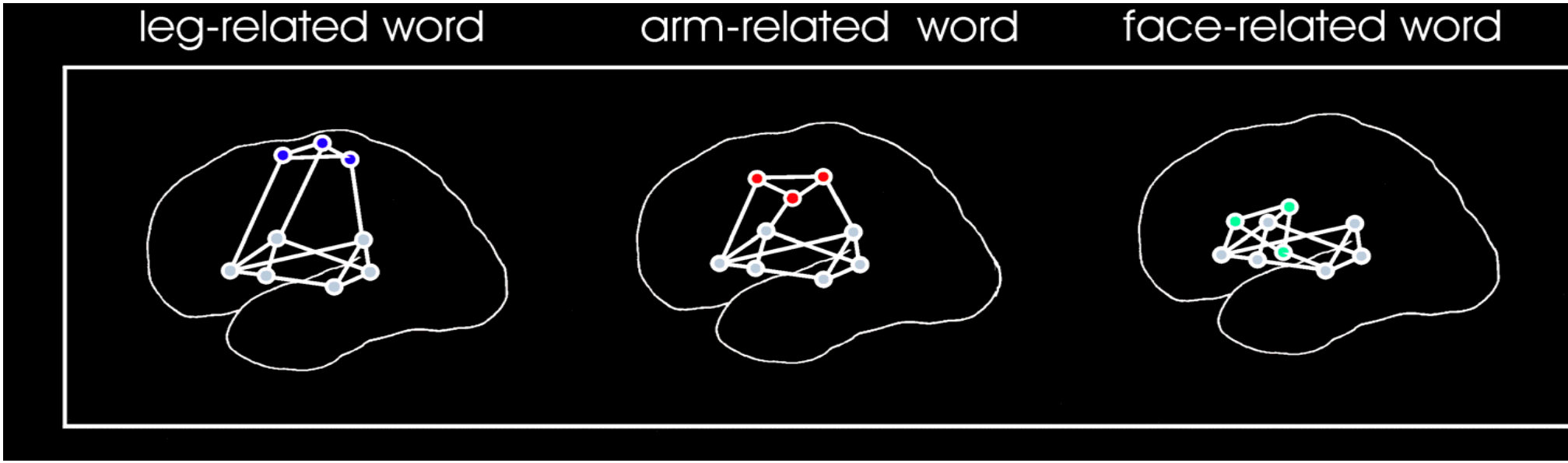
Actions and word webs





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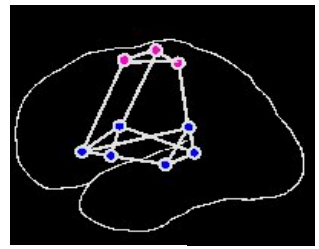
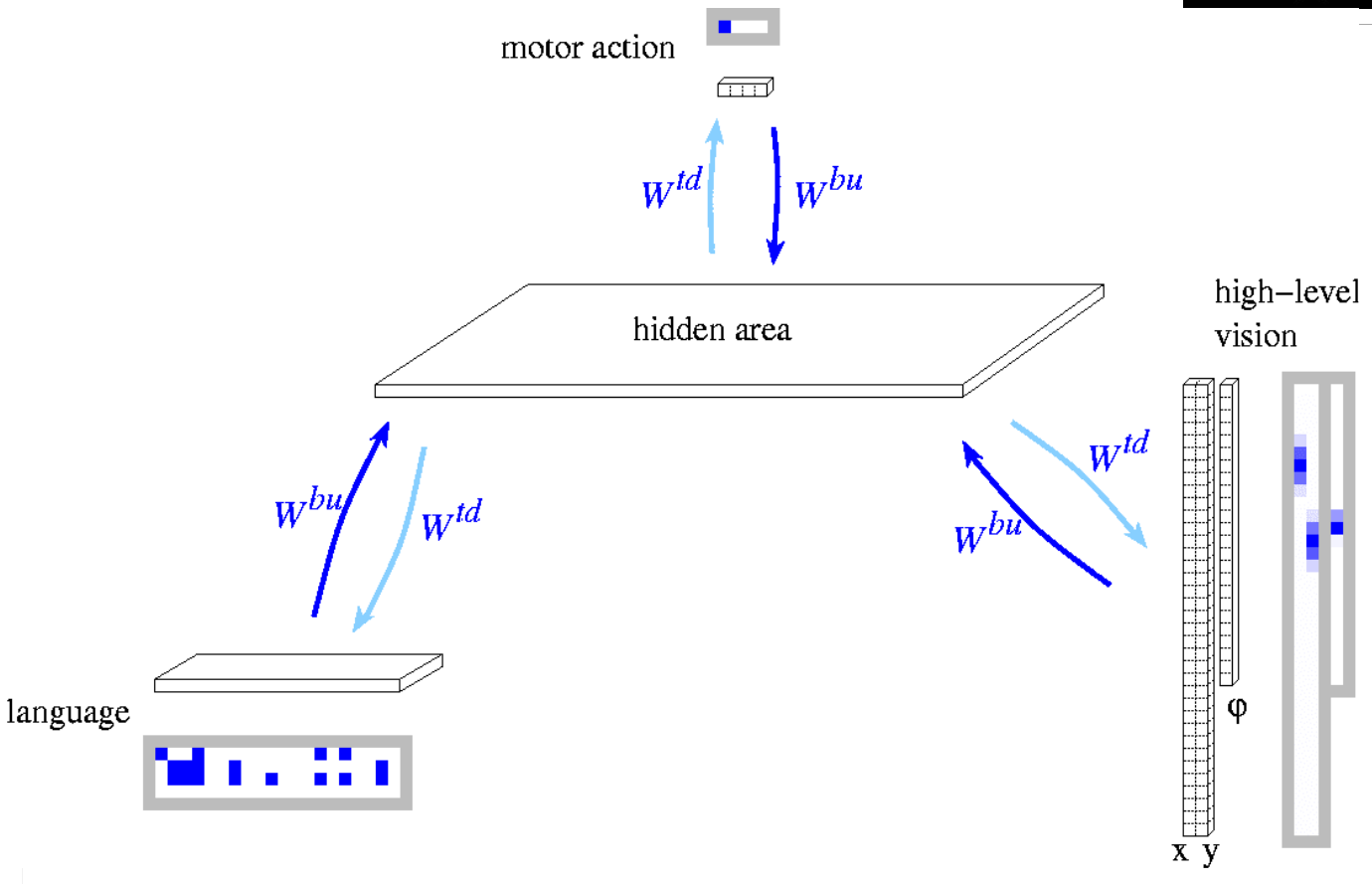
Association Network for Vision, Motor and Language





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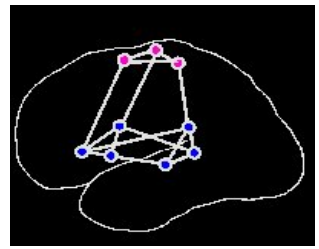
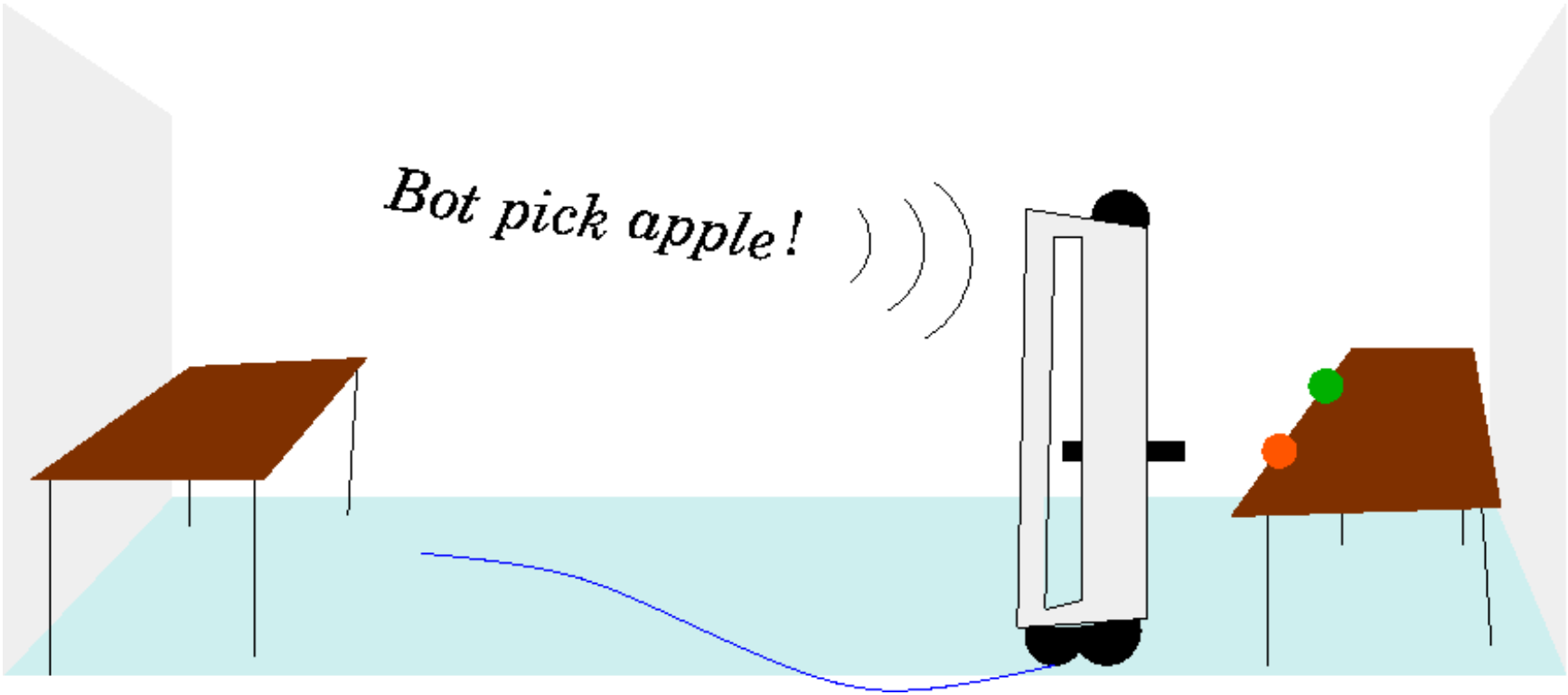
MirrorBot scenario





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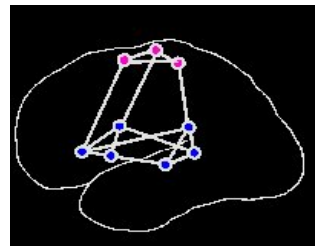
Areas of Task-Specific Activations



	‘go’	‘pick’	‘lift’
Action Production:			
Action Recognition:			

Activations agree with the Somatotopy-of-Action-Words Model and MirrorNeuron Concepts

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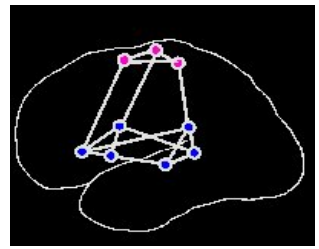
MirrorBot won Machine Intelligence 2003 of British Computer Society

Conclusions



- Action-related meaning of words is reflected by specific focal activation in frontal cortex
- Computational models for these findings realised for language, vision, action based on Mirror Neuron properties
- Further work on neural multimodal integration

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