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A context based decision making architecture for a navigation task

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Corrective learning is an interesting paradigm for on-line learning of a trajectory from non-verbal interaction. We propose a model of action selection based on corrective interactions between the robot and a teacher. By using the appropriate correction signal, a minimal solution is to learn specific contexts inhibiting the wrong actions in order to let the appropriate behavior be exhibited in any circumstances.

We present a solution to an action selection problem, where a mobile robot has to pick up objects in a given position of the environment. According to the size of the object, the robot must either go left or right to drop the object in the place A or the place B (see Fig:1).

The navigation task is based on a place cells [1] representation of the environment. When a new place cell is learned, a direction is associated to it. The robot can be corrected by the teacher at any moment. When the correction occurs, the system evaluates the order and, either a new place cell is recruited and the new direction is associated to this place cell, or a context is created and the winning place cell is inhibited. This inhibition allows the nearly winning place cells to express their directions, and so the robot can follow the correct direction without recruiting a new place cell.

The contexts are based on the sensory inputs of the robot (ultrasound, grip of the arm and the place cells activity). When a context is recruited, it is associated to the winning place cell. By this mechanism, only one context is recruited by place cell, but a context can inhibit as many place cell as needed.

This architecture allows us to solve the action selection problem in this environment by inhibiting the wrong place cell (and thus its direction) according to the size of the object. By allowing the contexts to block multiple place cells, the number of place cells required to obtain the correct behavior is reduced.

We present a model of action selection based on contexts guiding sensory-motor associations. This approach allows us to extend the place-cell/action model [2] to solve the action selection paradigm without involving any complex mechanism. In future work, we will introduce a planning process based on a cognitive map [3], and the contexts will be acting on the transitions and no longer the place cells recognitions.

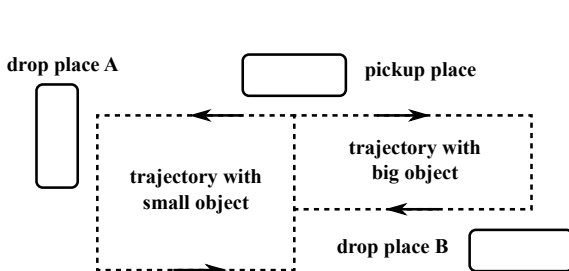


Figure 1: Example of contextual task in navigation.

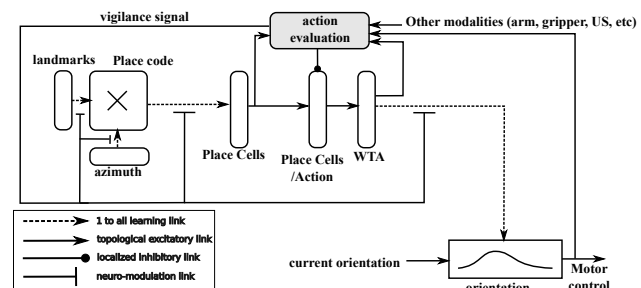


Figure 2: Architecture for place-cell based navigation with the action evaluation.

1 *

References

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