Robotics

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Each Robot is a physical Intelligent Agent(IA) (Rizk et al., 2018).

1 Motion planning

Footnote URL [1]

2 Dynamic behavior of robots /interactive behavior

In general, the dynamic behavior of a robot is defined by how the robot exchanges energy with the environment. This energy exchange can be characterized by of a set of motion and force variables at the point of interaction (also called interaction port). By imposing a specific relationship between the motion and force variables we can thus regulate the energy exchanged between robot and environment and reshape its inertial behavior. Tagliabue et al. (2017).

3 Decision making / Planning

Decisions related to robot actions, information sharing, and coalition formation, are essential to the successful deployment of robots in real world environments.

Challenges robotic decision making

- Environment uncertainty

- robot actuating

- sensing diversity

- system scalability

- real-time processing

- limited computational resources

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[1] https://reader.elsevier.com/reader/sd/pii/S0921889017300313?token=274CA5DAF1EA551A247936EE31A9C602A9B2AAD9

Decisions that make robot deployment successful

- robot actions

- information sharing

- coalition formation

4 Cognitive robotics

`https://en.wikipedia.org/wiki/Cognitive_robotics`

4.1 Knowledge acquisition

A more complex learning approach is "autonomous knowledge acquisition": the robot is left to explore the environment on its own. A system of goals and beliefs is typically assumed.

A somewhat more directed mode of exploration can be achieved by "curiosity" algorithms, such as Intelligent Adaptive Curiosity(see `http://www.pyoudeyer.com/oudeyer-kaplan-neurorobotics.pdf` and `http://science.slc.edu/~jmarshall/papers/cbim-epirob09.pdf`) or Category-Based Intrinsic Motivation.[3] These algorithms generally involve breaking sensory input into a finite number of categories and assigning some sort of prediction system (such as an Artificial Neural Network) to each. The prediction system keeps track of the error in its predictions over time. Reduction in prediction error is considered learning. The robot then preferentially explores categories in which it is learning (or reducing prediction error) the fastest.

5 Terms and Definitions

Foraging   Foraging robots are mobile robots capable of searching for and, when found, transporting objects to one or more collection points.

References

Yara Rizk, Mariette Awad, and Edward W. Tunstel. Decision making in multiagent systems: A survey. *IEEE Trans. Cogn. Dev. Syst.*, 10(3):514–529, 2018.

Andrea Tagliabue, Mina Kamel, Roland Siegwart, and Juan I. Nieto. Robust collaborative object transportation using multiple mavs. 2017.