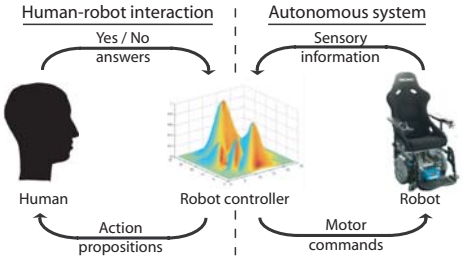
Semi-Autonomous Navigation of an Assistive Robot

Motivation

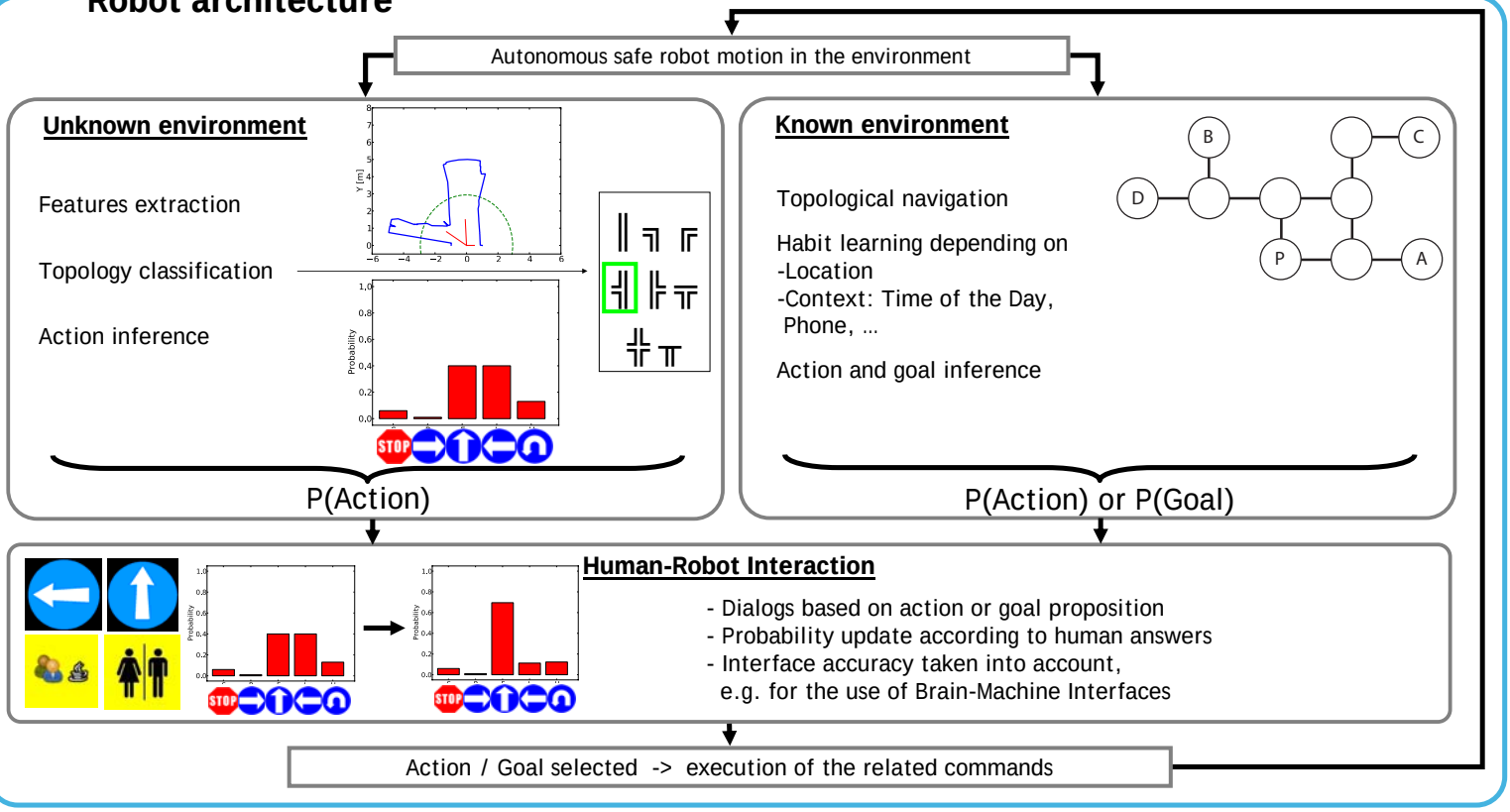
To develop an intelligent robot for navigation in known/unknown environments with the lowest user involvement.

The robot evolves autonomously, but requires user inputs at given places in the environment, e.g. crossings.

The robot proposes an action to the human, who either agrees or disagrees.



Robot architecture



Results

	‖	╕	╒	╡	╞	╥	╫	╙
‖	94.9%			3.6%	1.2%			0.3%
╕	0.1%	99.2%				0.7%	1.96%	
╒		0. 1%	99.1%			0.8%		
╡	0.3%		0.1%	98.5%	0.4%		0.7%	
╞					95.0%		4.5%	
╥		0.1%			0.13%	99.8%		
╫				3.2%	2.2%	0.1%	94.5%	
╙							0.1%	99.9%

Tab. 1: Confusion matrix of topology classification

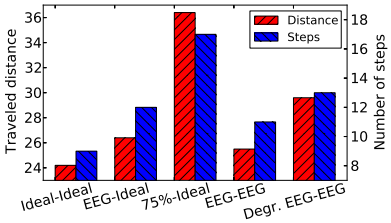


Fig. 1: Influence of interface accuracy and system knowledge on the robot navigation. *Step* = new topology recognized -> HRI

- Correct topology recognition
- Successful navigation
- User involvement reduced

Unknown environment

Known environment

	Global	Usual habit	Phone events	Unusual habit
Percentage of correct goal inference	90%	92%	69%	76%
Uniform	20%	20%	20%	20%

Tab. 2: Goal inference accuracy over 30 days of an indoor scenario with random habit change and random phone events

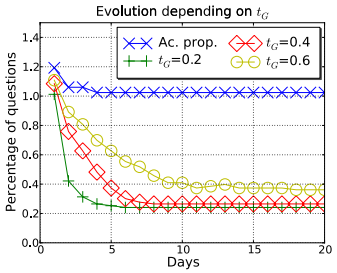


Fig. 2: Percentage of proposition made to the user given several threshold values for goal proposition.

- Correct user habit learning
- Goal directed navigation
- User involvement reduced

Acknowledgement

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IM Interactive Multimodal Information Management

FNSNF Swiss National Science Foundation

BACS

References

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