SimpleDS: A Simple Deep Reinforcement Learning Dialogue System

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Source

 H. Cuayáhuitl. SimpleDS: A Simple Deep Reinforcement Learning Dialogue System. International Workshop on Spoken Dialogue Systems (IWSDS), 2016. [https://arxiv.org/abs/ 1601.04574]

Plan

- Reinforcement Learning for Dialogue Systems
- Introduction to Reinforcement Learning
- The SimpleDS Dialogue System
- Results

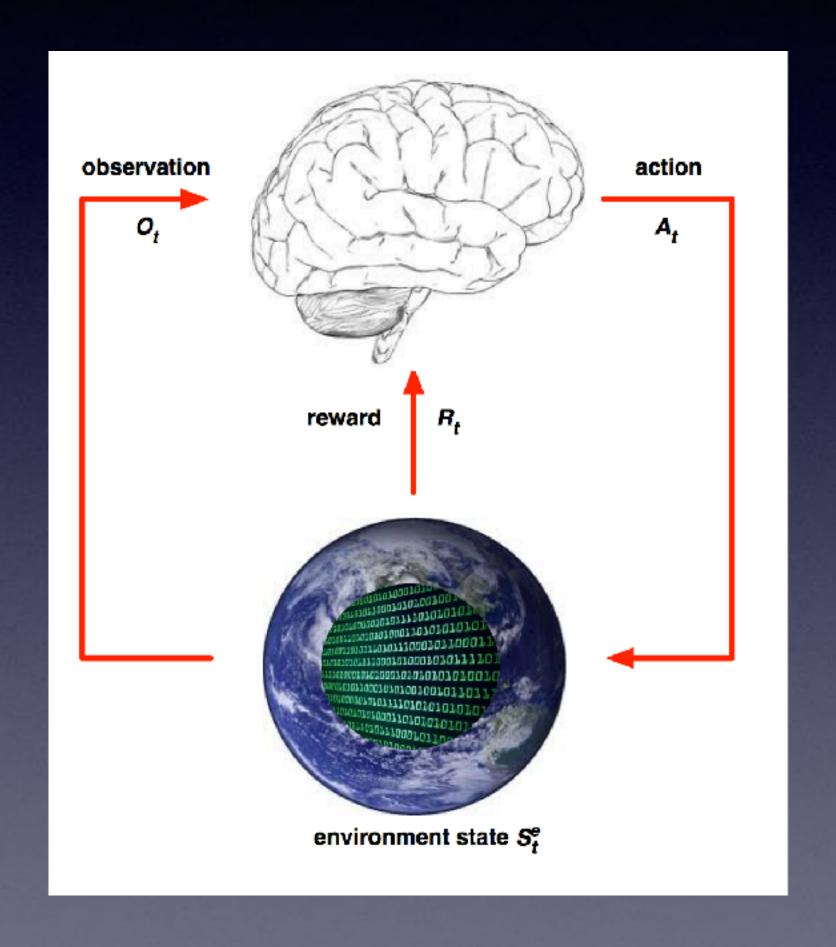
Reinforcement Learning for Dialogue Systems

Environment State	Action	Verbalisation
0,	Salutation	
0,	(greeting)	Hello!
0,	Request	What type of food, price range,
0,	(food,price,area)	and area are you looking for?
		[reasonably priced mexican
		food in the east of town]
0,0,0,1,0,1,1,0,0,0,0,0,0,0,0,0,0,0,0,0	ImpConfirm	Okay, reasonably priced
0, 0.78, 0, 0, 0, 0, 0.31, 0, 0, 0, 1, 0.36, 1, 0.25, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 57, 0, 0, 0.82, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,	(food,price,area)	mexican food in the east.
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0	Retrieve	
0,0,0,1,0,0,0,0,1,0,0,0,1,0,1,0,0,0,0,0	(info)	Let me see.
0,	Provide	Restaurant X is an excellent
0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	(known)	choice. It is located in Y.
1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,1,1,0	AskFor	
0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	(more)	Anything else?
		[no]
0,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	Salutation	
0,0,0,0,0.72,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0	(closing)	Okay, talk to you soon. Bye!
0,		
0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,1,0,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0		

Table 1 Example dialogue using the policy from Fig.2, where states are numerical representations of the last system and noisy user inputs, actions are dialogue acts, and user resposes are in brackets

Introduction to Reinforcement Learning

- Agent and Environment
- Observation and Action
- Reward



The SimpleDS Dialogue System

- Diagram of SimpleDS
- Learning setup
- Code at GitHub: https://
 github.com/cuayahuitl/
 SimpleDS

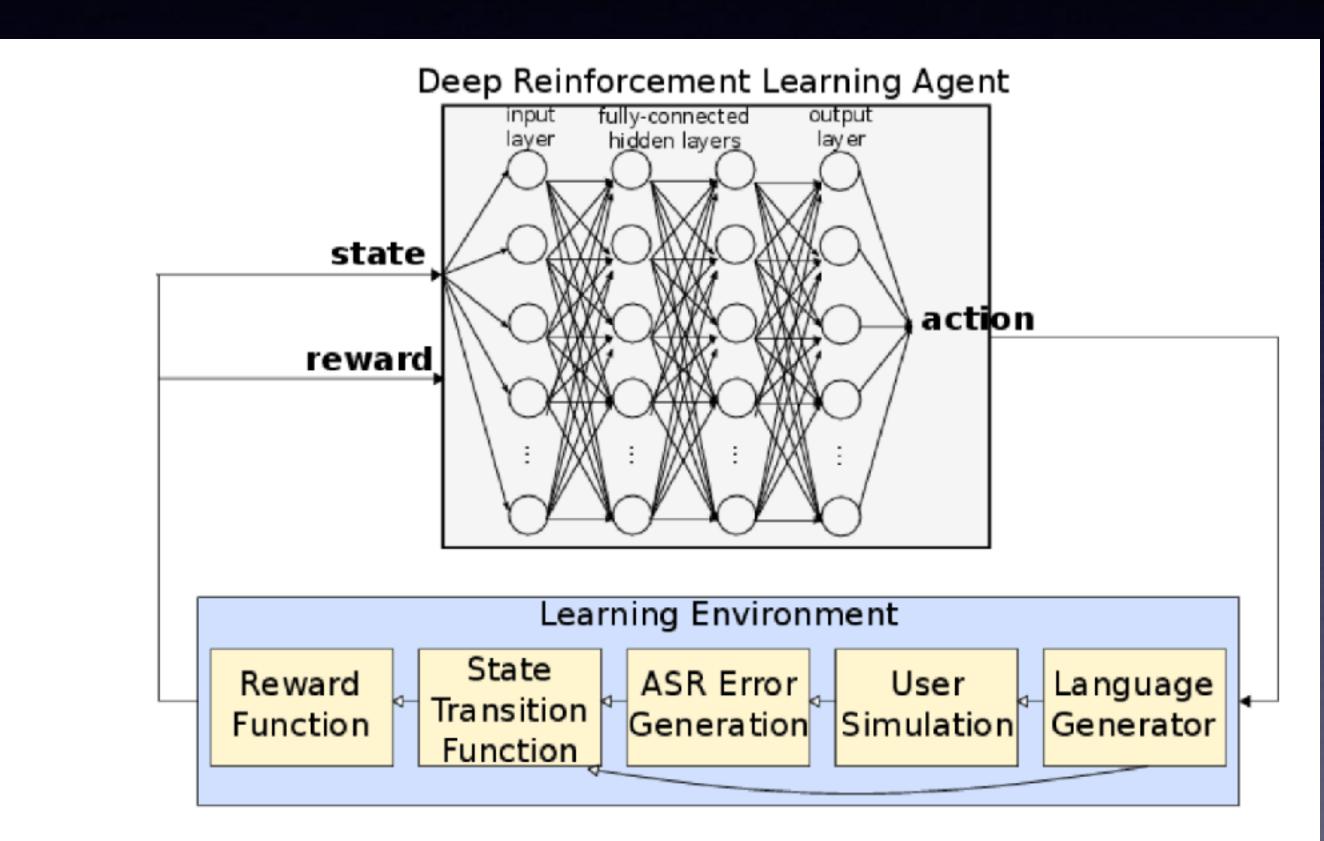


Fig. 1 High-level architecture of the SimpleDS dialogue system—see text for details.

Results



Fig. 2 Learning curve of the SimpleDS Deep Reinforcement Learning agent–see text for details.

Summary

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