

Joana Paulo Pardal

Dept. Computer Science and Engineering
IST, Technical University of Lisbon
Spoken Language Systems Laboratory (L²F)
Lisboa, Portugal

joana.paulo.pardal@l2f.inesc-id.pt
www.l2f.inesc-id.pt/~joana

1 Research Interests

My research interests lie generally in the area of **spoken dialogue systems** with particular interest in **software engineering** techniques to **dynamically integrate structured knowledge sources**, like databases and **ontologies** (Paulo Pardal, 2007), and in **evaluation frameworks** to measure the improvements. The challenges of creating **coaching, tutorial, and educational systems** that can be used by the **general public** at their homes, schools, or museums are also part of my research.

1.1 Past research

My MSc thesis was on “automatic terms acquisition” (Paulo et al., 2004). I’ve taught object-oriented programming and design patterns, knowledge representation, artificial intelligence (AI), autonomous agents and multi-agent systems (Melo et al., 2006), and distributed systems (Pardal et al., 2008). When starting my PhD I’ve moved to spoken dialogue systems. Being a CS engineer from the field of AI I was interested on how to use ontologies to ease the extension of a system to new tasks, similarly to what is done with databases. Databases’ structure was used to extract domain knowledge and it allows the generic use of that kind of information reducing the coding time and adaptations needed to build new dialogue systems. With this task in mind, I worked on *OntoChef*, a cooking ontology (Ribeiro et al., 2006). The ontology was later enriched with the use of a natural language specific tool (Machado, 2007) through information extraction techniques. A collection of nearly 9000 recipes were extracted from Portuguese websites with a specially designed tool. They are to be converted into ontology-based format soon. To better understand how humans coach each others while cooking, a human-human cooking corpus was collected, where a person helped another one while s/he cooks a recipe (currently there are approximately 3 hours with 6 different participants, in 3 teams doing a ‘chocolate mousse’). This corpus is to be annotated with the requests made by the person executing the task and the relative answers, tips, and comments from the coach. This follows my previous work at Rochester (Gomez-Gallo et al., 2007).

1.2 Current research

Most practical dialogue systems are designed for a specific task, and even if the authors were concerned with possible future extensions, integrating new tasks is always a challenge. Dynamic integration of new tasks according to some kind of structured knowledge is an interesting research topic. The main goal of my thesis (Paulo Pardal, 2007) is to study how different levels of knowledge stored in ontologies can be used to facilitate the creation of new coaching dialogue systems capable of domain reasoning. I’m taking McGuinness’ ontologies spectrum (McGuinness, 2003) to split the ontology into increasingly complex knowledge levels.

The hypothesis being studied is whether ontologies can be used to enrich a coaching spoken dialogue system and be used in it in such way that the system can abstract the source of domain-specific knowledge – related to the tasks being coached – focusing only on the dialogue phenomena. The integration of ontological knowledge should be done with few architecture adaptations to the dialogue system so that when adding a new domain – a new class of tasks – minor changes in special modules are sufficient.

1.2.1 Case Study: Cooking Coach

Cooking is something that everybody ends up doing. Some have been cooking for a lifetime, some are just beginning. Most of the time the user’s hands are busy and dirty. In such a scenario, manually handling a recipe book is to be avoided. A system that helps the user by dictating the steps while hands and eyes are occupied with the cooking tasks is much desired. My goal is to develop a spoken dialogue system that provides assistance in reading the procedure and detailing all steps that may be unclear to a user lacking expertise. Based in our cooking experience, we built a prototype system that helps the user while cooking (Martins et al., 2008c). The system adapts itself to the users’ needs and expertise. It was built over *DIGA* (Martins et al., 2008b; Martins et al., 2008a), a spoken dialogue systems framework. Some experiments with CMU’s *Olympus* (Bohus et al., 2007) are currently being done.

1.3 Future research

The use of an ontology delivers another interesting result: the system could reason about the tasks and plans at hand. After saying 'Separate egg whites and egg yolks.' to the user, the system needs to know that the existing 'eggs' will disappear and give place to 'egg whites' and 'egg yolks'.

It should also make it easier to include different languages by translating (Graça et al., 2008) the cooking ontology and adapting the necessary linguistic resources (understanding and generation).

The integration of additional sensors in the kitchen could bring interesting enhancements like in DFKI's 'SmartKitchen' (Schneider, 2007) or the MIT's Media Lab 'intelligent counter' (<http://www.media.mit.edu/ci/>)

2 Future of Spoken Dialogue Research

Currently spoken dialogue systems are proposed only when no other input modalities are available (like when there is no access to a keyboard or when the user has some kind of special need – blindness, reduced accessibility, etc.) However, we should consider the use of speech whenever it is natural. That would be easier if interaction with these systems was more natural (more similar to human-human interaction).

When human-computer interaction approaches human-human interaction, people will feel comfortable on delegating some tasks to a digital helper while they will concern themselves with some other tasks. Managing priorities and knowing the right times to interrupt are important. The "uncanny valley", however, must be avoided.

Exploring the new emerging technologies and mobile devices (like iPhone or Android) is another path that is worth considering: integrating speech with new information from sensors can further leverage the current state-of-the-art, making the available interfaces easier to use and much more natural.

3 Suggestions for Discussion

- Teaching SDS (methods, frameworks, evaluation)
- SDS for Coaching (assist with task) and Teaching (tutorial and educational applications).
- Evaluation: universal metrics for comparing disparate systems, tasks, languages and modalities; expert systems against rapid development frameworks.

References

- D. Bohus, A. Raux, T. K. Harris, M. Eskenazi, and A. I. Rudnicky. 2007. Olympus: an open-source framework for conversational spoken language interface research. In *Proc. of Bridging the Gap: Academic and Industrial Research in Dialog Technology, workshop at HLT/NAACL*.
- C. Gomez-Gallo, G. Aist, J. Allen, W. de Beaumont, S. Coria, W. Gegg-Harrison, J. Paulo Pardal, and M. Swift. 2007. Annotating continuous understanding in a multimodal dialogue corpus. In *SemDial – DECALOG*.

- J. Graça, J. Paulo Pardal, L. Coheur, and D. Caseiro. 2008. Building a golden collection of parallel multi-language word alignment. In *LREC*.
- T. Machado. 2007. Extração de informação – introdução automática de receitas de acordo com ontologia. Master's thesis, IST, UTL.
- F. Martins, A. Mendes, J. Paulo Pardal, N. Mamede, and J. P. Neto. 2008a. Using system expectations to manage user interactions. In *PROPOR*, LNCS. Springer.
- F. Martins, A. Mendes, M. Viveiros, J. Paulo Pardal, P. Arez, N. Mamede, and J. P. Neto. 2008b. Reengineering a domain-independent framework for spoken dialogue systems. In *SET&QA4NLP*. ACL.
- F. Martins, J. Paulo Pardal, L. Franqueira, P. Arez, and N. Mamede. 2008c. Starting to cook a tutoring dialogue system. In *SLT*. IEEE/ACL.
- D. McGuinness. 2003. Ontologies come of age. In *The Semantic Web: Why, What, and How*. MIT Press.
- C. Melo, R. Prada, G. Raimundo, J. Paulo Pardal, H. S. Pinto, and A. Paiva. 2006. Mainstream games in the multi-agent classroom. In *IAT*. IEEE Computer Society.
- M. Pardal, S. Fernandes, J. Martins, and J. Paulo Pardal. 2008. Customizing web services with extensions in the STEP Framework. *International Journal of Web Services Practices - IJWSP*, 3(1).
- J. L. Paulo, D. Martins de Matos, and N. Mamede, 2004. *Terminology Mining with ATA and Galinha*, chapter 2. Edições Colibri, Lisbon, Portugal.
- J. Paulo Pardal. 2007. Dynamic use of ontologies in dialogue systems. In *NAACL-HLT Doctoral Consortium*.
- R. Ribeiro, F. Batista, J. Paulo Pardal, N. Mamede, and H. S. Pinto. 2006. Cooking an ontology. In *AIMSA*, LNCS. Springer.
- M. Schneider. 2007. The semantic cookbook: sharing cooking experiences in the smartkitchen. *3rd Interntl. Conf. on Intelligent Environments*.

Biographical Sketch



Joana Paulo Pardal is a 4th year Ph.D. student in Computer Science Engineering at IST, Technical University of Lisbon, under the supervision of Nuno J. Mamede (IST), H. Sofia Pinto (IST) and James F. Allen (U. Rochester). She holds a fellowship from FCT (Portuguese Nat. Science Foundation). Joana received a *licenciatura* in 2001, and an M.Sc. in 2004 both in CS Eng. from IST. Joana is a researcher at L²F INESC-ID since 2001. She is a Lecturer at IST since 2002. She is a student member of ISCA, ACL and AAAI and participates on CMU's DoD reading group. She has worked abroad thrice: in Clermont-Ferrand, France (Summer 2004); Rochester, NY, USA (Fall 2006), Cambridge, MA, USA (Fall 2008, Winter 2009). She enjoys traveling, cooking, gardening, playing Nintendo Wii, and eating at good restaurants.