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1 Research Interests

My research interests are: the use of semantic annotations and relation detection in answer selection for dialog systems, integration of answer-selection using logical deduction present in **question-answering** systems in **dialog** systems, the maintenance of the **context** in question-answering systems in order to simulate dialog management systems, application of **transaction logic** (as a logic of state changes) and **f-logic** (frames+rules) in dialog knowledge management, **automatic generation of information utility functions** for ranking slots in frames for dialog systems, and the creation of **voice portals** as dialog management systems.

1.1 Past, Current and Future Work

My research so far has focused on logical formalisms for dialog management using plan-based approaches (Fodor, Huerta, 2006), standardization of dialog management markup languages and architectures for voice portals (Fodor, Huerta 2005, Fodor, 2006), dialog management approaches for decision processes (Fodor, 2007), and the use of semantic annotations and relation detection in answer selection for dialog systems.

SmartKom (Lockelt, 2004), TRINDIKIT (Larsson and Traum, 2000) showed that real dialog systems can be successfully developed over artificial intelligence planning techniques. This requires the conversation acts to be defined like any other planning action with preconditions and effects on the internal state (i.e. context of the conversation). Many times these dialogue systems do not leverage powerful artificial intelligence deduction systems or their logical formalisms were too simple to represent complex preconditions and effects. In (Fodor, Huerta, 2006) we developed a dialog system over Flora2 system to allow definition of complex types, default negation and quantifiers (universal and existential) over the expressions in the preconditions and the effects of the dialog acts.

One disadvantage of the finite state, the frame-based and the plan-based dialog management techniques is that the dialog manager has to manually develop the dialog (i.e. develop the state machines, the frames or the actions with their preconditions, generic state updates and post-conditions). The structures of the dialog are fixed, hard-coded by the dialog developer and the current dialogs do not optimize future dialogs. (Levin, Pieraccini, and Eckert, 2000, Williams, Poupart, and Young, 2005) developed probabilistic-based dialog management techniques to construct the dialog workflow automatically from an initial dataset of conversations for a specific domain (by using Markov Decision Processes, reinforcement learning, Partially Observable Markov Decision Processes or other statistical based methods). Most of these methods search for standardized way to represent a large range of conversational systems. However, due to the diversity of communication domains, I think that it is extremely difficult to achieve an optimum solution for all different dialog management techniques. In (Fodor, 2007), I tried to address a simpler problem: that of decision processes for classification which minimizes the number of take-turns. I construct a **decision tree** completely automatic from an initial set of dialogs in a specific classification domain (e.g. credit application screening). Each dialog verified by a human supervisor adds its contribution to the decision tree, influencing future dialogs.

My third interest area focuses on standardization of dialog management markup languages and architectures for voice portals (Fodor, Huerta 2005, Fodor, 2006). In (Fodor, Huerta 2005, we developed a voice portal architecture which loads the dialog workflow from a third party using a discovery Web service. All the current dialog acts are loaded into a dialog container using a component proxy approach (i.e. the entry in the container references a remote Web service that contains the actual dialog act).

2 Future of Spoken Dialog Research

I think that the field of dialogue management still needs a lot of research in order to be completely standardized and that automatic methods need to be applied for development of dialog.

A relatively new area for dialog management is application of semantic annotations and logical deduction for dialog management. In question answering, it was proved that the application of semantic annotations and logical deduction increased the accuracy of the results. The LCC system in the QA TREC competition acquired better results than all the other systems in the same competition. I believe that one of the main challenges we have to overcome in dialog management is the use of semantic annotations to improve the dialog experience. I think the solution lies in plan-based dialog systems incorporating answer selection using logical proves.

Another important challenge is to find automatic ways (e.g. machine learning techniques) to develop new spoken dialog workflows.

3 Suggestions for discussion

- Methods to integrate semantic information (e.g. Extended WordNet) in dialog management.
- Statistical methods to generate dialog systems using decision trees.
- A bank and a search engine for dialog workflows or dialog management services.

References

- E., Levin, R., Pieraccini, W., Eckert. 2000. *A stochastic model of human-machine interaction for learning dialog strategies*. In IEEE Transactions on Speech and Audio Processing.
- M., Lockelt. 2004. *Dialog management in the SmartKom system*. In Proceedings of KONVENS 2004, Vienna, Austria.
- Paul Fodor, Juan M. Huerta. 2005. *Web Services Voice Interaction Broker with Dynamic Dialog Management: a Dialog Container and Component Proxy Approach*, Greater Philadelphia Databases/Information Retrieval Day.
- Paul Fodor, Juan M. Huerta. 2006. *Planning and logic programming for dialog management*. IEEE/ACL 2006 Workshop on Spoken Language Technology.
- Paul Fodor. 2006. *Portal Voice Interface using RSS/Atom Streams*. Greater New York Area Data-

bases/Information Retrieval Day, Rutgers, United States (<http://dbirday2006.rutgers.edu/>).

Paul Fodor. 2007. *Dialog Management for Decision Processes*. In submission at 3rd Language & Technology Conference: Human Language Technologies as a Challenge for Computer Science and Linguistics, Poznań, Poland.

S., Larsson, D., Traum, 2000. *Information state and dialog management in the TRINDI Dialog Move Engine Toolkit*. In Natural Language Engineering, 6(3-4):323-340.

J.D., Williams, P., Poupart, P., Young. 2005. *Partially Observable Markov Decision Processes with Continuous Observations for Dialog Management*. In Proceedings of the 6th SigDial Workshop on Discourse and Dialog, Lisbon.

Biographical Sketch



Paul is currently a Ph.D. student working under the supervision of Dr. Michael Kifer in the Computer Science Department at Stony Brook University. He was born in Romania and has obtained his undergraduate

Computer Science degree from the Technical University of Cluj-Napoca, Romania.