

# COMUNICA - A Voice Question Answering System for Portuguese

Rodrigo Wilkens<sup>♣</sup>, Aline Villavicencio<sup>♣</sup>, Daniel Muller<sup>◇</sup>, Leandro Wives<sup>♣</sup>,  
Fabio da Silva<sup>♣</sup>, Stanley Loh<sup>♡</sup>

<sup>♣</sup>Institute of Informatics, Federal University of Rio Grande do Sul (Brazil)

<sup>◇</sup>Conexum (Brazil)

<sup>♣</sup>DFL (Brazil)

<sup>♡</sup>IntextMining (Brazil)

{[rwilkens](mailto:rwilkens@inf.ufrgs.br),[avillavicencio](mailto:avillavicencio@inf.ufrgs.br),[wives](mailto:wives@inf.ufrgs.br)}@inf.ufrgs.br, [conexum@conexum.com.br](mailto:conexum@conexum.com.br),  
[fabio@df1.psi.br](mailto:fabio@df1.psi.br), [sloh@terra.com.br](mailto:sloh@terra.com.br)

## 1 Introduction

Question Answering (QA) has received considerable attention in recent years, as can be seen by the initiatives devoted to the task, such as the TREC<sup>1</sup> and CLEF<sup>2</sup>. The task of a QA system (such as [1] for English and [2] for Portuguese) is to automatically answer a question in natural language, searching for information in a given data source (e.g. a database, or corpora from a given domain). This is a challenging task as question types can range from lists to facts and definitions, while answers may come from small data sets such as document collections, to the World Wide Web. In this context, the COMUNICA system is a voice QA system for Brazilian Portuguese with search capabilities for consulting both structured and unstructured datasets. One of the goals of this work is to help address digital inclusion by providing a way to overcome (a) difficulties in accessing written information (for visually challenged users), (b) lack of computational resources (for users in remote or computerless areas) and (c) computational illiteracy. The domain chosen to evaluate the system is that of municipal information from the FAMURS database.<sup>3</sup>

The system is currently under development, and the architecture is divided into 4 main modules: speech recognition, text processing, database access and speech synthesis. For continuous speech recognition of the users' requests we use an automated phone service. This module uses statistical models to perform signal analysis and word sequencing. The recognition uses 2 ontologies to validate the candidate words in the input: (a) a general purpose and (b) a domain ontology, which in this case contains information related to taxes from FAMURS.

The transcribed input is then processed by the natural language processing module to determine which type of query the user performed and what is the likely type of answer. To do that the system uses mostly lexical and syntactic

<sup>1</sup> <http://trec.nist.gov>

<sup>2</sup> <http://www.clef-campaign.org>

<sup>3</sup> <http://www.famurs.com.br>

information from the PALAVRAS parser [3] about e.g. the particular pronoun (wh-word), subject and other verbal complements in the sentence. The system also uses the two ontologies for gathering additional information about nouns (such as hyperonymy and synonymy). Based on this information the system selects from a set of pre-defined question patterns linking concepts of the domain ontology with SQL commands, the one which contains the largest number of concepts in common with the input. If such pattern is found, the SQL command is executed in the structured database, and the retrieved values will be returned using some pre-defined answer patterns. Otherwise, the system uses the ADS Digital Company Virtual Assistant (VA) [4] to search the unstructured data (e.g. Frequently Asked Questions), using the lexical information to locate the answer associated to the most similar question. This answer is written in natural language and will be returned to the main module of the system. If no similar question is found according to a predefined degree of similarity, the VA returns a standard answer.

Finally the text output to the user is synthesized, resulting in an audio file that is transmitted through the server. The internal communication among the different components of the system is done through Web services implemented in HTML/PHP. This allows the modules to be developed and tested independently.

## 2 System Demonstration

This is an ongoing project, and a working version of the system will be demonstrated through some examples from the FAMURS domain. Users will be able to observe the modules interactions, and experience the benefits of natural language interaction for accessing database information.

## Acknowledgements

We thank the financial support of the Brazilian agencies CNPq, FINEP and SEBRAE for the COMUNICA (FINEP/SEBRAE 1194/07) project.

## Referências

1. Nyberg, E., Mitamura, T., Carbonell, J.G., Callan, J.P., Collins-Thompson, K., Czuba, K., Duggan, M., Hiyakumoto, L., Hu, N., Huang, Y., Ko, J., Lita, L.V., Murtagh, S., Pedro, V., Svoboda, D.: The javelin question-answering system at trec 2002. In: TREC. (2002)
2. Amaral, C., Figueira, H., Martins, A.F.T., Mendes, A., Mendes, P., Pinto, C.: Priberam's question answering system for portuguese. In Peters, C., Gey, F.C., Gonzalo, J., Müller, H., Jones, G.J.F., Kluck, M., Magnini, B., de Rijke, M., eds.: CLEF, Springer (2005) 410–419
3. Bick, E.: The Parsing System Palavras - Automatic Grammatical Analysis of Portuguese in a Constraint Grammar Framework. PhD thesis, Aarhus University (2002)
4. Duizith, J.L., da Silva, L.K., Brahm, D., Tagliassuchi, G., Loh, S.: A virtual assistant for websites. *Revista Eletronica de Sistemas de Informação* **3** (2004)