

Sujet de Stage Master 2 Recherche SIPT 2015-2016

Qui parle? Construire une maison intelligente prenant soin de ses occupants grâce à la reconnaissance du locuteur
(Who is speaking? Making an intelligent house aware of its inhabitants by speaker recognition)

Encadrants : Michel.Vacher@imag.fr Francois.Portet@imag.fr
Solange.Rossato@imag.fr

Laboratoire LIG-GETALP, Bâtiment B, 41 rue des Mathématiques,
B.P. 53, 38041 GRENOBLE Cedex 9

Sujet du stage/Internship proposal A smart home is a residence featuring ambient intelligence technologies in order to help its dwellers in different situations of common life by trying to manage their comfort and security through the execution of actions over the effectors of the house. The proposed study follows studies conducted in this framework during the ANR Sweet-Home (Système Domotique d'Assistance au Domicile, 2009-2013). This projects aimed at controlling an home automation system by vocal commands thanks to a smart controller [1].

Recordings were made in a real apartment (DOMUS) with several rooms each equipped with microphones. Many people played realistic scenarios of daily life in this apartment (sleeping, getting up, toileting, preparing a meal, lunch, relax, go out ...). This allowed us to gather a realistic corpus [2] containing the main sound events of the every day life and to draw meaningful conclusions about the challenges such a system must overcome [3]. Microphones are set up in the ceiling and speech recognition is a difficult task [4].

Therefore, one of theses challenges highlight the necessity to use a recognition system continuously adapted to the task in order to optimize the performances and to only react to vocal commands uttered by the occupant of the housing (and not by a visitor) because a majority of persons don't wishes anybody can interact with their home for security reason. Moreover, speaker identification is a crucial context information for context inference (location and activity of the person). Robotics may be an other scope of application.

A preliminary study showed that speaker recognition is challenged when sentence duration is very short as in the case of a keyword or a vocal command [5]. The proposed study will contribute to the following questions:

- what kind of data can be used for model training (read data or spontaneous speech)?
- what is the influence of speech duration for precision recognition? Is the duration of a keyword enough?

Main steps of the proposed study:

- state of the art of the domain,
- data collection from existing corpus [2] and new records in a smart home using a wizard of Oz,
- development of a system using available libraries like ALIZE [6],
- evaluation of the method.

Desired competencies:

- C/C++ language, basic concepts in signal processing

Mots clés/Keywords : smart home, speaker recognition, automatic speech recognition, ambient intelligence, adaptation to the user

Lieu du stage : LIG, équipe GETALP, 41 rue des Mathématiques, campus universitaire.
Indemnité de stage prévue.

Bibliographie :

- [1] Making Context Aware Decision from Uncertain Information in a Smart Home: A Markov Logic Network Approach. P. Chahuaara, F. Portet, M. Vacher, *Ambient Intelligence*, 2013, Dublin, Ireland. Springer, LNCS, 8309, pp.78–93.
- [2] The Sweet-Home speech and multimodal corpus for home automation interaction, M. Vacher, B. Lecouteux, P. Chahuaara, F. Portet, B. Meillon, and N. Bonnefond, in *Proc. of the 9th edition of the Language Resources and Evaluation Conference (LREC)*, Reykjavik, Iceland, 2014, pp. 4499–4506.
- [3] Evaluation of a context-aware voice interface for Ambient Assisted Living: qualitative user study vs. quantitative system evaluation. M. Vacher et al., *ACM Transactions on Accessible Computing*, 2015, (DOI: 10.1145/2738047), 7(2):5:1-5:36.
- [4] Multichannel Automatic Recognition of Voice Command in a Multi-Room Smart Home : an Experiment involving Seniors and Users with Visual Impairment, M. Vacher, B. Lecouteux, F. Portet, in *Proc. Interspeech*, pp.1008-1012, 2014.
- [5] Speech and Speaker Recognition for Home Automation: Preliminary Results, M. Vacher, B. Lecouteux, J. Serrano Romero, M. Ajili, F. Portet and S. Rossato, *The 8th International Conference on Speech Technology and Human Computer Dialogue*, Bucharest, Romania, 2015, pp 180-190.
- [6] ALIZE 3.0 - Open source toolkit for state-of-the-art speaker recognition. A. Larcher, J.-F. Bonastre, B. Fauve, K. A. Lee, C. Levy, H. Li, J. Mason, J.-Y. Parfait, *Interspeech*, 2013, 2768-2772.