Talk2Me – Decision Support via AI and Voice Recognition in Prehospital Trauma Care

Master´s thesis proposal

Introduction

Prehospital care may be described as *"care provided before hospital care"* and is mostly associated with care provided by ambulances or helicopters. It is often also associated with acute situations where quick transport to a hospital is needed, but prehospital care includes much more than this. It can be care provided at ships or oilrigs, in combat zones or during disasters, but also non-acute care provided and finished in a patient's home. Typical for prehospital care is the wide clinical spectrum, sometimes rough and exposed working environment, and that the distance to medical back-up at hospital etc. may be very far away – sometimes several hours of transport. Furthermore, for instance for ambulance personnel, care must be carried out both inside and outside of the ambulance – and also during transport in a heavily moving vehicle. In this project, *Talk2Me*, we will focus on ambulance care and the design and evaluation of a technical solution utilizing speech recognition and synthesis using Artificial Intelligence (AI) / Machine Learning (ML).

Speech recognition and synthesis to support informed decisions and care processes

Introduction of various CDSS (Clinical Decision Support Solutions), including AI/ML based, is very important and a great opportunity to improve care, documentation, quality and of course patient outcome. In prehospital care, such as ambulance care, the work situation is often such that it is difficult or even impossible to document or read information while caring for a patient. As a result, information is not entered into the digital patient record or other IT support quickly enough, or maybe not at all if the patient is critically ill. In order to enable that information is used in the best possible way in real-time calculations or decision support, which may be essential and thereby very important for the patient's immediate care, information must be made available to the computing devices employing AI algorithms etc. without unnecessary delay – i.e. in real-time. Similarly, and for the same user reasons, it may be difficult or even impossible to optimally use information supporting and guiding the care process if it is only presented on a screen, e.g. support for structured working methods, processes and procedures (such as ABCDE). There may for instance be problems reading the screen due to varying light conditions, a bumpy road, or that all focus must be on the patient. Consequently, we end up in a situation for a critically ill patient where decision support and clinical guidance is of outmost importance, but where we due to a non-optimized working and technical solution cannot take advantage of relevant information and modern technology like AI in real-time. This must be taken care off!

To address this problem, the project *Talk2Me* was initiated. In this project the long-term goal is to use natural speech for information retrieval as well as digitized process support and instructions "in the ear" of the personnel involved in the care of the patient i.e. speech analysis and speech synthesis in real time. In Figure 1 a simplified illustration of the "software stack" responsible for speech recognition and synthesis as well as care process support representation and conversation between "data format" and speech is illustrated. Figure 1 also illustrates the stack and its integration with supporting information and presentation sources including ePR (Electronic Patient Record) via mobile data communication.

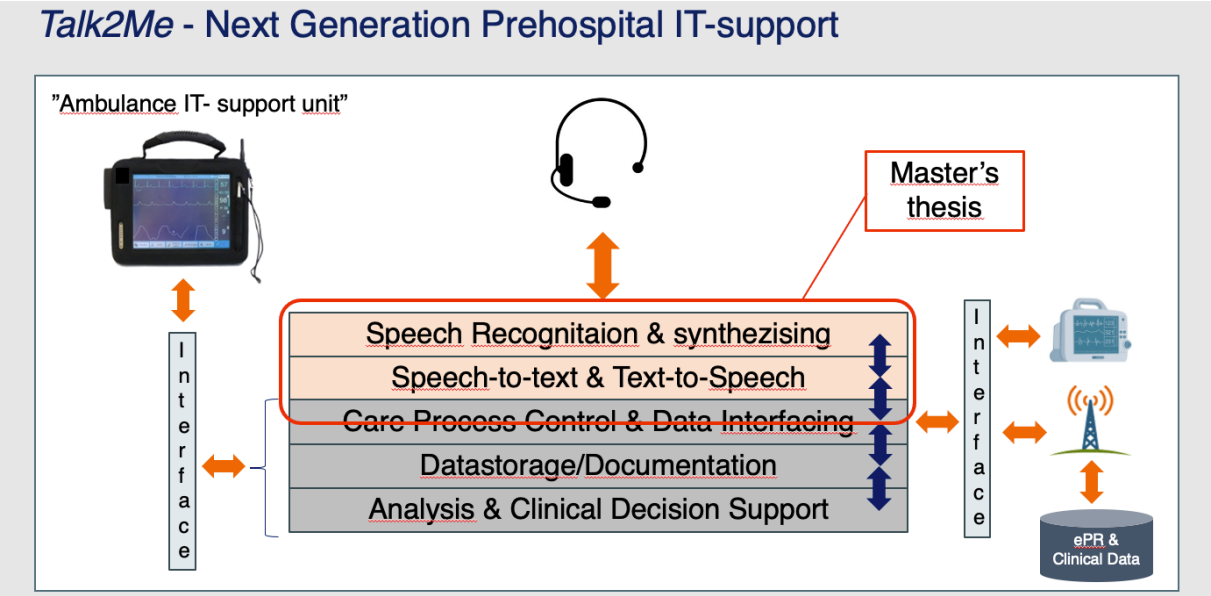

Figure 1. The Talk2Me concept as part of the ICT infrastructure in an ambulance.

Scope of master's thesis project

This master's thesis deals with design, testing and evaluation of software for speech recognition and analysis but also to document the care process in a structured way and provide information to real-time clinical decision support algorithms running in the background. Furthermore design, test and evaluate speech synthesis for presenting structured clinical process support (e.g. ABCDE parts of PHTLS) and real-time results from background calculations (e.g. an OSISP model, see https://doi.org/10.1016/j.aap.2015.04.032). The speech software may be commercial or open source software. An ongoing project within the Advanced Topics in Biomedical Engineering SSY267 course in MPBME will act as a pre-study on this.

Finally, the project includes design of a demonstrable prototype. The concept of *Talk2Me* is illustrated in Figure 1 where it is part of the complete ICT infrastructure of e.g. an ambulance. Any type of platform like tablet or smartphone may be used for the demo. Details will be defined during the project.

Links

ABCDE https://www.resus.org.uk/library/2015-resuscitation-guidelines/abcde-approach
PHTLS https://www.naemt.org/education/phtls
Dragon https://www.nuance.com/en-gb/healthcare/physician-and-clinical-speech/dragon-medical.html

Supervisors and Examiner

Stefan Candefjord, Main supervisor, Assistant Professor, Dept. of Electrical Engineering, Chalmers stefan.candefjord@chalmers.se , 031-772 15 49

Anna Bakidou, Co-supervisor, PhD Student, Dept. of Electrical Engineering, Chalmers and University of Borås, bakidou@chalmers.se , anna.bakidou@hb.se , 076-174 36 72

Bengt Arne Sjöqvist, Professor of Practice emeritus, Co-supervisor and Examiner, Dept. of Electrical Engineering, Chalmers, bengt.arne.sjoqvist@chalmers.se , 070-787 77 97