A Barrier-Free Platform to Help Elderly People to Help Themselves

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Abstract. The proportion of elderly people in German society has been
increasing for decades. As a result Germany, and other industrial coun-
tries as well, are currently facing large demographic changes in terms
of age structure and population size, changes that will only increase in
the future. Furthermore, especially in bigger cities, the traditional family
structures with more generations living together are disappearing.
Starting from these observations, the project *Barrierefreie Cloud für Se-
nioren - WirlmKiez* (translated: A barrier-free Cloud for Seniors - We in
our neighbourhood), funded by the German Ministry of Education and
Research, aims to develop a platform where elderly people can get in
touch with and help each other with everyday problems and issues. We
plan to realise a virtual neighbourly help especially for elderly people
who have no or very little social contact. Persons using the platform will
be able to either provide support to others ("I can help to hang curtains",
"I can help gardening", ...) or they can request for help ("I need to go
to hospital for 4 days, who can take care of my cat"). The app will run
on computers, smartphones, and tablets and will be very simple to use
and appropriate for seniors. Its main features are creating a proposal or
request by using natural language. Behind the scenes we will use shallow
information extraction (IE) to extract the core information. After this
we store the extracted information plus additional meta information like
time and location on a central server (cloud). In the final step a gener-
ated request or proposal is offered to adequate users of the system, e.g.
people who live nearby and are able to help or need help and connecting
the persons in the end.

Keywords: Barrier-free, seniors, conversational interface

1   Introduction

Seniors often need support in everyday situations especially for tasks that require
a certain amount of physical fitness. Especially duties in the domestic home like
cleaning windows, hanging curtains, cleaning wardrobes, lifting furniture, etc
can be very dangerous or even impossible.

Furthermore the possibility of medical treatment from illness, falls, or other
physical impairments is significantly increased with age. As a result older people

are more vulnerable [Birgit Hibbeler , 2013], and therefore reluctant to take on regular responsibilities, e.g. keeping animals is often not possible without a larger support circle.

On the other hand, especially in western industrial cities, local social networks may not be very tight, friends may have moved away or died, and the traditional support structures found in so-called multi-generational families are becoming rare nowadays. As a result, the quality of life of elderly people suffers crucially. Among other things, hobbies and habits may have to be abandoned, and volunteer activities can no longer be carried out. Therefore, these impairments affect not only seniors, but also people who rely on them. Although people from the broader neighbourhood would often gladly help and respond quickly, in larger cities with higher anonymity, people are afraid to approach each other.

2   Our Goal

A still widespread misconception is that older people do not use modern information technology [Hartmut Wandke et al, 2012]. Statistics on Internet show a large growth for the *generation 60+*. In February 2011, 35.3% of that group used the internet actively, 17% already used the mobile internet[1]. Furthermore there are studies like [Meredith Skeels , 2006] which show that tablets are appropriate for users with less or no experiences with computers in general. Also the use of touch panels [Atsuo Murata et al, 2005] and spoken language [Daniel Sonntag et al, 2010] seems to be appropriate especially for seniors.

Our main goal is to develop a platform where elderly people can get in touch with and help each other with everyday problems and issues. In the long term we hope to realize a virtual neighbourhood to provide help for people who have no or very little social contact. The general functionality is very simple: people can make requests or offers for assistance to a bulletin board on the platform, which in turn can then be seen by other people and possibly answered. The main requirements of the platform are:

- User-friendliness and accessibility for people with little experience in dealing with computers or suffering of physical limitations (i.e., barrier-free usage). This point is especially important for the acceptance of the system by seniors.
- Protection of data privacy and security: Especially seen in the context of the latest news about the surveillance of online data, people are not willing to give away any personal data without sufficient protection and security.
- Location-based offers and requests: The users of the system should not be bothered by content that is not important to them.

We further hope that the system will also effect a connecting function in the neighborhood and hence cause an immediate increase in the quality of life of older people. They can perform again simple activities such as the cleaning of curtains and meet people from the immediate neighborhood at the same time. In that

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[1] http://de.statista.com/statistik/kategorien/

way the social environment renews, the isolation that is getting stronger with age can be reduced. Also the social participation of older people is strengthened by providing and accepting help. Furthermore health hazards are avoided as dangerous activities are taken over by or done in cooperation with people of the neighbourhood.

3 The Approach

Our approach consists of a cloud-based system in which the technical components are embedded as shown in Fig.1
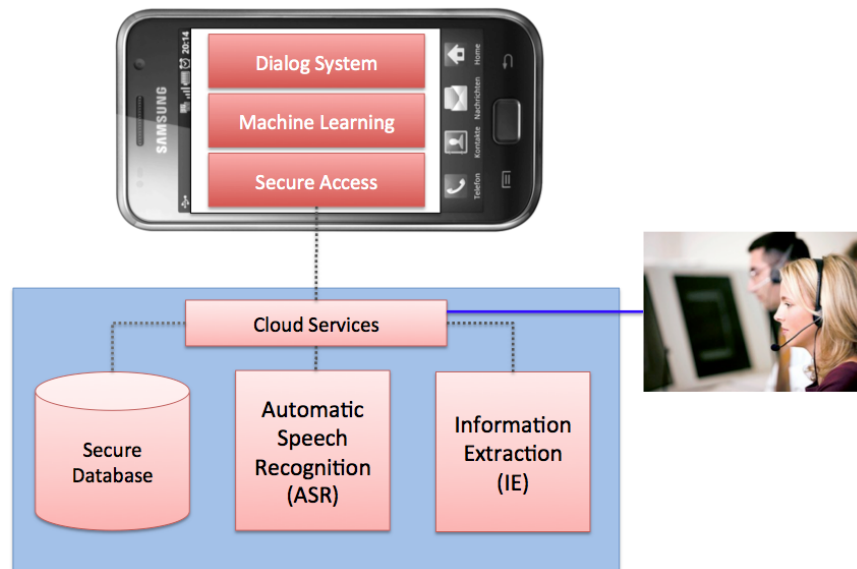
Fig. 1. The main concept of the system

We will realize the main goal, a barrier-free user experience, through a combination of three components:

- Automatic Speech Recognition (ASR) and Speech Synthesis
  [Marc Schröder et al, 2011] to transform speech into text and vice versa.
- Information Extraction (IE)[Jerry Hobbs et al., 2010] to extract the main information from the recognised text.
- Dialog System[Sven Schmeier, 2011] to ask the user for more information.

The process works as follows: A user talks to the system in the way he/she wants to: no commands need to be learned or recognized. The recorded speech is processed by the ASR component and the result is passed to the IE unit. The

IE unit extracts the information that is needed to fill an action template. Action templates consist of a type – in general this is the kind of request or offer – and typed slots that need to be filled (see Fig. 2)

Table 1. A partially filled action template from the sentence I need someone to help me take down my curtains at the last day in July. The person should come between 10 and 12 am.

Feature	Value
Type	Request
Subject	Take down curtains
Date	31st July 2014
Time-Frame	10:00 to 12:00 am
Time needed	n/a

If template slots cannot be filled, the Dialog System is activated and the user is asked (repeatedly) to complete the information. In our example the system would ask something like: *Do you have a rough estimate about how long the task will take?* The user's answer will then be processed and, if the template is filled completely, it will be stored in the system's Secure Database and pushed to possible helpers living around the location of the requesting user.

Additional components are:

– Machine Learning: The Machine Learning component tracks the users behaviour and tries to detect certain patterns in the requests. Examples for patterns are regular requests, automatic slot filling for similar tasks, alternating questions in the Dialog System to ensure a more natural process, etc.
– Secure access: For security we will use https connection and if possible we will make use of appropriate encryption methods [Roger Needham et al, 1994].

To secure the ecosystem in general, new users will be manually checked by customer agents.

4 Scientific and Social Impact

The use of the system, largely through natural language interaction adds substantial value for the target group of seniors compared to other existing (social) platforms in many respects. However, during the project, we will closely work together with the BAGSO (German Federation of Senior Citizens' Organisations) to ensure that it adds needed value. The whole development process will be carried out with the assistance of seniors, i.e. the targeted user group. Field tests to determine the parts in the system that need to be improved for everyday usage will conclude the project. At the end, our industrial partner will develop and release the final product based on our research.

In Fig.2 the different layers of the envisioned platform, services and goals are shown.
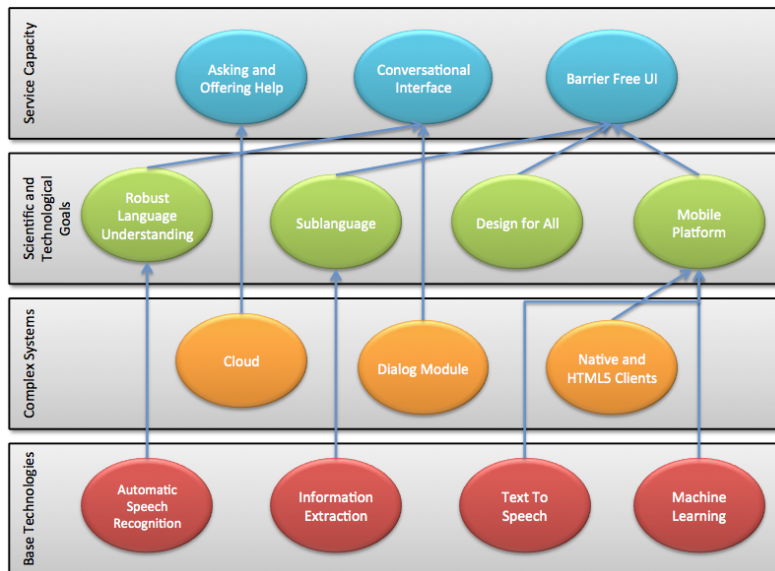
Fig. 2. The different layers, modules and services in detail

5 Acknowledgement

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