

CS/SE 6361 – Advanced Requirements Engineering, Spring 2012

Project Phase I: Requirements Elicitation: Initial Understanding

Due Date: March 1 (Thursday)/March 6 (Tuesday) – Interim Project I submission & presentation

March 27 (Tuesday) – Final Project I submission

The hardest single part of building a software system is deciding precisely what to build. No other part of the conceptual work is as difficult as establishing the detailed technical requirements, including all the interfaces to people, to machines, and to other software systems. No part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later. [Brooks, 1987]

I. Summary

As people get older, they tend to experience difficulties with hearing, speaking, vision and memory loss, and muscle weakness. Among other things, Augmentative and Alternative Communication (AAC) is a branch of study to assist or help people with communication difficulties. It comprises of many techniques, including sign language, gestures, visual aids, pictures, symbols, text-to-speech electronic communicating devices, and so on. It was aimed to help people who only had difficulties in speaking or speaking clearly - in communication. It has found many potential applications in helping people with development disabilities, speech and hearing disorder, autism, dyslexia, aphasia, and so on. The same technique can be used for every age, including the *elderly* people who have difficulties in communication. To help the elderly or anyone who has more than just speech disorder, it is necessary to go beyond the current realm of AAC and identify all the physical and mental disorders and provide a means or a way of alleviating them.

With so many devices, such as communication boards, hearing aids, etc., which not only prove costly but are also bulky and difficult to use (not to mention their bad aesthetic appeals), the user has been looking for a better solution. The recent advent of mobile communication and a whole new market of mobile applications make the use of new generation touch-screen cellular phones, an excellent platform for hosting such an application. It claims to be a cheap and yet an 'easy to carry and use' solution.

This project is intended for helping the elderly population suffering from communication difficulties, such lack of hearing, speech impairment and unclear speech, as well as low vision, weak memory, etc. So, it expands the initial scope of AAC, which is to deal with speech disorder, and takes into consideration the elderly or anyone who suffer from speech, hearing, memory and/or vision impairment up to varying degrees. Many software vendors are eager to offer such a system. In particular, HOPESoft, Inc. aims to pioneer such an application in this highly burgeoning market.

The company has gathered some initial requirements from potential customers, app stores, past studies and statistics. However, the company is well aware that they haven't yet clearly characterized what their customers really want, not to mention who their real customers might be. Consequently, the requirements definition is only preliminary, sketch, imprecise, incomplete and possibly inconsistent. It is also well aware that getting the right requirements the first time will be the barometer to successfully completing the entire development effort, reducing market release time, establishing its reputation and ultimately to satisfying their customers.

Due to this criticality, HOPESoft, Inc. is looking to a renowned consulting firm for help. As requirements engineers of the consulting firm, you are to deliver a detailed requirements description which captures real customers' real needs/wants as *precisely, concisely and conceptually* as possible.

II. HOPE (Helping Our People Easily): Preliminary Definition

II.1 The Domain, Stakeholders, Functional and Non-Functional Objectives

In the application domain, the communication typically consists of the following people and events/situations.

An *elderly* with speech, hearing, vision or memory loss, as well as muscle weakness, often stays either in a home (living alone or with a family) or in a hospital/nursing-home setting. The *daily living activities, such as washing, taking a bath, going to the restroom, eating/drinking, walking and transferring to the bed*, are the typical activities that are of concern to them and they often have to call/communicate-with people around them for fulfilling these.

An *assistive person* is one that is either a disabled person or a non-disabled person with whom the user wants/needs to communicate. This person responds to the elderly requests and sometimes also initiates conversation about a topic or an activity like going out to eat.

The elderly frequently communicate using common *greetings*, such as “hello”, “bye”, “nice to meet you” and “sorry”, along with such basic questions as ‘What is your name?’ and ‘Where am I?’. In a typical scenario, where a person wants to communicate a message to the elderly having hearing loss and a weak memory, s/he uses visual aids like *pictures* and *icons*, together with text and/or speech on top of it, to reinforce the meaning of an item – say showing a sign or picture of a restaurant, along with the name of the restaurant and saying the name loudly, to indicate the place where they will go out to eat. The elderly, on seeing the picture, may more easily recognize the place as it is difficult to remember the location by name alone. Our perception, thought and reasoning process seems highly visual, rather than only linearly textual and the mind seems to function best when all senses work in as much a complementary manner as possible. This increases the necessity to provide *multi-dimensional vocabulary*, in terms of *icons, pictures, sound, speech, text, sign*, and so on.

Apart from the basic communication messages, the elderly also want to perform other activities or express an opinion about something like – ‘I want to watch Television’, ‘I want to drink Cola’, ‘I am not feeling well’, and so on. The elderly should initiate communication by navigating among various categories. A *category* is a descriptor containing the multi-dimensional vocabulary items having a similar meaning, relation and/or purpose. A *disjoint category* is one that does not have its items overlap with any other category. An *overlapping category* is one that has one or more of its items overlap with items in other categories. Categories can be either activity-based or item-based at the root level, e.g., items as in ‘Food’, ‘Drink’, ‘People’, etc., and activities like ‘I want to eat’, ‘I want to go’, etc.

An important part of elderly communication is handling *emergency* situations. It is more often the case that the elderly living alone requires prompt medical attention in cases of health emergency as well as

quick response in cases of fire, theft, etc. The system must be capable of providing an easy interface for emergency calls like 911, to any emergency contacts, as well as send messages fast to a nearby response department like a hospital.

Just like the elderly user, the system should be easily *usable* by the assistive person, e.g., by providing a good *search* interface, through which that person need not know the entire system and can bring up any part by just visiting the search page. A sentence should be generated by a *minimum* amount of navigation of the system.

A real life problem describing the application domain can be found in the ‘scenario’ presentation on the course web-site.

II.2 Software System Requirements: Functional Requirements

The purpose of HOPE is to provide a platform for helping the elderly, the disabled – having unclear speech, hearing loss, weak vision and/or memory loss, in day-to-day communication, and weak muscle. This platform shall assist the users by:

- Providing a way for the users to select proper categories and navigate through various dimensions of vocabulary,
- Generating desired sentences and representing them pictorially as well associating with a sound/voice,
- Placing emergency calls and messages,
- Giving a specific meaning to each picture to reduce the ambiguity, as a picture can be worth a thousand words and a thousand interpretations,
- Making each vocabulary item available through a search interface,
- Allowing to change the orientation/display of the vocabulary in terms of colors and icon size,
- Integrating already available technologies like alarm clock in a meaningful manner,
- Displaying relevant or most frequently used items before other vocabulary items,
- Making a previously generated sentence repeatable without regeneration,
-

Overall, the system should also make the vocabulary organization such that the user can use it in many contexts and sentences are generated in fewer clicks.

II.3 Software System Non-Functional Requirements

In the assistive communication device/application, in addition to the functional requirements, non-functional requirements should also be taken into account. They include:

- The system should be *usable*;
- The system should be *quickly understandable* (the learning time should be very low) and very *easy to use*;
- The vocabulary organization should be *clear* and *intuitive*;
- The navigation of the system should be *seamless* and *evident to all users*;
- New sentence generation should be done as *dynamically* and with as much *flexibility* as possible;
- The number of clicks that a user has to press to generate a sentence should be kept *minimal*;
- The communication system to be built should reflect as closely as possible the way users communicate in the real world (see the domain theory above);

- The system should provide an appropriate level of *performance*: the elapsed time between the click of an icon and the sound generation should be *minimal*; emergency calls and messages should be *fast* and *accurate*;
- The sentence building should be done as accurately as possible (considering grammatical constraints of natural language);
- The system should be *customizable* to every user in the context of making sense of a visual clue as the user wants, how s/he wants to view the clues and what speech should be generated (if the user wants to generate it); and
- The system should be easily *extensible* to accommodate the following typical variations: variations in interface, language, definitive needs of the user, new features, new hardware, etc.

III. The Deliverable

Your description should be elegant and comprehensible. Your deliverable should be available as both on-line (one URL per team member) and offline specifications (submission of one copy per team). You can choose to use an (extended) IEEE-style format for the deliverable, in which the major sections typically include: Introduction, Main Body (items below, for this project), Glossary (Definitions and Acronyms) and References – Use of the WRS template is strongly encouraged (See also "Document Templates - general IEEE" on the course web site).

1. Issues

Describe any issues (e.g., incompleteness, inconsistency, ambiguity, redundancy, unsoundness) that you encounter in the informal preliminary definition. Also describe how you have resolved such issues.

Describe what your choice is and why you have made that particular choice (i.e., because that particular choice is good with respect to some *reasons - design rationale*).

As an example of requirements incompleteness, system extensibility can be enhanced additionally by allowing a participant to add a partial category. In order to resolve the issues, you might need to use your own "creative imagination", but based on your own teamwork.

2. Improved Understanding

Prepare a clarified definition of the preliminary definition given as much as possible, while discovering and resolving any possible defects per your discussion in 1. Try to clarify both the domain description and the system description, while establishing the traceability/dependency between the two.

3. A Prototype

Build a prototype of your HOPE (a mockup will do for this phase).

A (preliminary) user manual should be developed, which should become more complete and consistent at the end of the 2nd phase of the project.