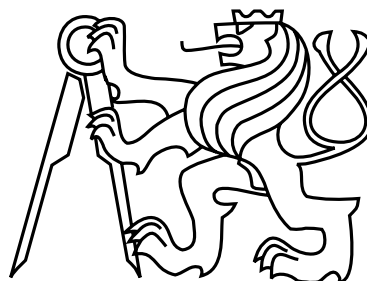


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Bachelor thesis

Foreign Language Telephone Communication Tool

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Study Programme: Software engineering and Management

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Declaration

I hereby declare that I have completed this thesis independently and that I have listed all the literature and publications used.

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Abstract

The goal of this bachelor thesis project is to design and implement the application which allows the user to communicate through telephone in a language which he or she does not know. The user prepares some yes or no questions for the call or some other simple ones including some predefined phrases. This preparation is translated into the target languages and synthesized by TTS. The user learns the essential amount of the foreign language or at least, his prepared answers. During the call, the user triggers a playback of these phrases and listens to the answers.

Abstrakt

Cílem této práce je navrhnout a implementovat aplikaci, s jejíž pomocí bude uživatel schopen uskutečnit jednoduchý telefonní v jazyce, který sám nezná. Na tento telefonát si připraví otázky s odpověďmi ano nebo ne, popřípadě podobně jednoduché včetně předpřipravených frází. Tato příprava je přeložena do cílového jazyka a syntetizována pomocí počítačového hlasu. Uživatel se naučí naprosté základy jazyka, a to především připravené odpovědi, aby mohl porozumět odpovědím od volané strany. Během hovoru pouze spouští syntetizované otázky a poslouchá odpovědi.

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Chapter 1

Introduction

Humans use various kinds of communication for example: verbal, visual, written word etc. In today's age of globalization and the Internet a huge part of our social interaction goes through social networks, telephone, movies and radio.

Even so, verbal communications is still our main part of social life. It is an instrument how to be very precise in interaction with other people.

However, on our planet we have a wide range of languages. Due to this variety people around the world tend to have a problem to understand each other. Despite efforts to create international auxiliary language¹ there are most spoken languages (no distinction of group of related languages or dialects): Chinese, Spanish, English and Arabic [3].

Nevertheless, according to Euro-barometer 2005: Europeans and languages [4]. Which had collected data about Europeans of their knowledge of foreign languages it was found that about half of Europeans can converse in an other language in addition to their mother tongue. Regardless differences among European countries are not negligible. The most widely spoken foreign language mentioned was English².

This diversity makes a gap which should be filled.

Idea. The idea is to prepare for a call, so as it would go in the way the user predict. That means the user has to prepare and translate some question. In these questions he or she prepares simple answers. Finally the most important is to tell the called what he or she expects as the answer to avoid getting an answer which the user would not understand. Naturally, the user needs to learn these simple answers.

The goal of this bachelor thesis project is to design, implement and test this idea. Tests have to focus on both call sides. Therefore participants from the Czech Republic called to agents in Italy from whom we were able to get a feedback. Nevertheless, the agents did not know who and how would call them at first. They had just prepared some task instructions and were asked to speak only Italian.

The participants got ready for a call in Italian by FoLaTeCo tool.

¹The most spread auxiliary language is Esperanto published by Ludwig Lazarus Zamenhof in 1887.

²Exclude Slovakia. There was not English mentioned not even as third most widely spoken language.

Organization of the thesis. In chapter 2, I discuss the existing solutions for communications in foreign language, some classical language guides and the latest technologies in mobile phones and the Internet. At the end of this chapter I give a very easy introduction to machine translation.

In chapter 3, I introduce the main idea and techniques, then some available low cost technologies suitable for implementations like free on-line translators or TTS converter.

Chapter 4 is about implementation. I describe the realization, focusing on interesting solutions, namely choosing and extensibility of translator and how it is implemented. Also I show a simple example how to use API to get translations of any text and finally TTS conversion. Chapter 4 takes a brief introduction of how data are stored on hard disk.

Chapter 5 describes user test from test preparations to test settings. The test itself and its evaluation follows and then I discuss the findings.

Moreover, in chapter 6 the completed work and the method are evaluated. Finally, I mention some possible future works.

Chapter 2

State of the art

In this chapter I discuss various ways of how to communicate in a foreign language including some language guides, a book for showing pictures instead of speaking and finally Google Translator in Conversion Mode. At the end of chapter I also mention the machine translation of written or spoken word.

2.1 Language Guides

Generally they are small paper books containing elementary words and phrases. Guides are usually divided into several sections according typical to situations that may be useful for users. Users are made to learn quite a lot of new words and phrases or to learn the structure of the book to be able to seek in them quickly during the conversation. The individual sections are not generally in any particular order. That makes it quite difficult to find something without using the contents.

On the other hand, you can expect that they are grammatically correct.

The major disadvantage is that the books give no guide of how to handle the answer you get, user cannot be sure, if he or she understands the response. In the book I had [11] there are no given responses.

2.2 Grammar I have no problem

“Grammar I have no problem”¹ is a Czech patented invention. It is a paper translator consisting some basic grammar, numbers and about three hundred elementary words. This idea is very similar to a language guide, but it is printed on one big sheet of paper. According the words of the author, it only takes a few hours to learn to work with GJNP. This solution has many language mutations with the same text order in each language version.

For those who frequently travel to different countries is preferable to learn GJNP system and use learnt procedures in other language versions.

By combining predefined parts of sentences and words, the user should be able to create simple sentences.

¹An original Czech title “Gramatika JÁ NEMÁM PROBLÉM”.



Figure 2.1: GJNP sheet of paper. Original figure taken from [21].

2.3 Global Picture Dictionary

“ICOON – if you can’t say it, show it!” [25]

The quotation written above describes accurately the idea. If the user does not speak in given language just shows a picture. The book is divided into several sections according to prepared situations. The picture dictionary should offer possibility of how to answer by pictures.

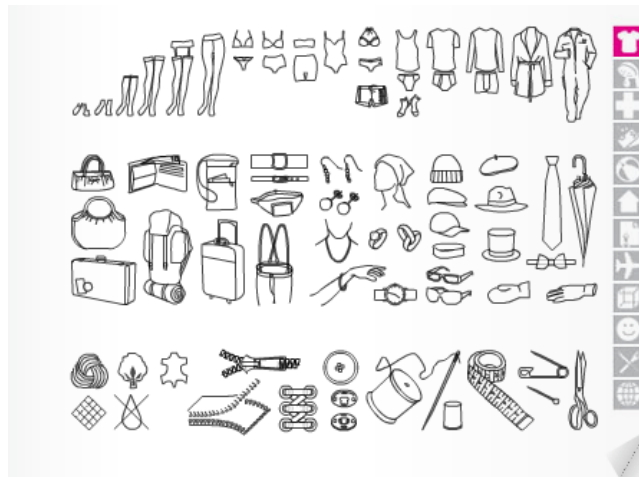


Figure 2.2: Paper version. Picture taken from [26].

ICOONs solution is also available as application on iPhone. Just a few clicks bring you to a group picture you want.

This is a very universal solution for frequent travellers.

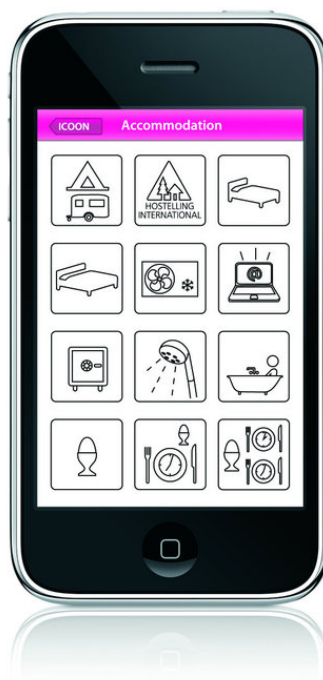


Figure 2.3: Version for iPhone. Taken from [27].

2.4 Machine translation

The aim of machine translation is to translate a text or speech from one language into another without human intervention.

Today's machine translation (MT) systems are very precise in a particular profession because this allows, us to focus on very specific phrases in the domain than in ordinary texts.

2.4.1 Types of MT

- Bilingual system – Translates between two particular languages.
- Multilingual system – Translates among any given languages.
 - Unidirectional.
 - Bidirectional (The most preferred option.).

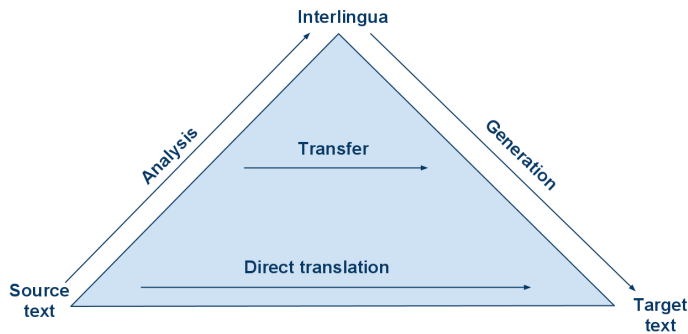


Figure 2.4: Machine translation pyramid using interlingua.

Direct machine translation approach This approach is practically bilingual and uni-directional. Direct machine translation translates the text directly into the target language without any deeper analysis.

Interlingua approach This approach translates the source text into more than one target language. Such a translation requires understanding of the source text for correct transfer from Interlingua to target language. Interlingua is an artificial or auxiliary independent language.



Figure 2.5: Interlingua machine translation.

Empirical machine translation approach Empirical approach uses a large amount of data. These data contain a text and its translation.

Today's mainstream type is a statistical machine. It is based on statistical modelling from bilingual text analysis. For example Google Translate is based on statistical machine translation.

2.5 Google: speech input

2.5.1 Speech input in Chrome for Google translate

At the end of April 2011 with Chrome 11 stable release it was implemented a speech input through HTML for Google translate².

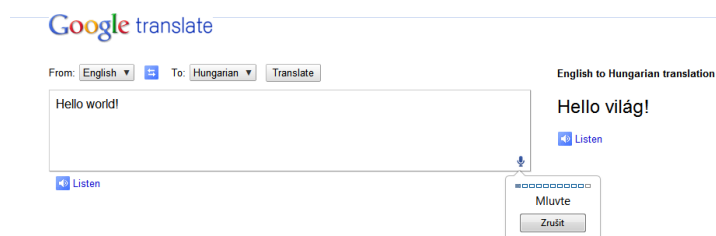


Figure 2.6: Google Chrome 11 speech input.

2.5.2 Google Translate for Android

During IFA 2010 Google introduced a new experimental technology called “Conversation Mode” in Google translate for mobile devices. This application simultaneously translates a speech-to-speech input.

The user can use this application to make a simple live conversation with somebody else. For using the Conversation Mode the user has to push the recording button and speak. This recording is sent to the server where it is translated and you get the text translation and its audio transcription for playback. The same procedure with the other person follows.



Figure 2.7: Google Translate for Android. Taken from [6].

²Just from English input so far.

Chapter 3

Analysis and design

In this chapter I describe the main idea how to make a phone call in a language you do not speak. Then I introduce Wizard-of-Oz technique whose behavior is very similar to that used in FoLaTeCo tool.

3.1 Idea

The idea of this method lies in preparedness for a call. Mainly in leading the called to answer as expected. For a better view I show how a question should not look like and on the other hand how it should be like.

Examples of bad question

Do you have a room available?

- On what date?
- No we are overbooked.
- We have 2 double rooms and one lovely suite.
- *or whatever else.*

As it is seen it is quite hard to predict the answer – this is caused by an open question and not offering the expected answers. This question does not lead the called to answer in the way the user will be able to understand without deeper knowledge of language.

Examples of better question

How many beds are there in the available room? Please answer one, two, three or more.

- One.
- Two.
- More.

This is a well prepared question. It has only a few possible answers shrunk into 3 expected answers. It is very unlikely that the user will get another answer that he or she predict.

The actual preparation and call can be divided in the following steps.

1. Prepare prompts and expected responses.
2. Translate these statements.
3. Learn pronunciation and some basics to understand responses.
4. Make a call.
5. Say a prompt.
6. Try to understand answer.

The goal of this thesis project is to implement the several steps (see above) which should allow the user to make a simple phone call in the language he or she does not know. From previous steps result in the following system requirements.

System requirements:

- Input prompts.
- Input expected answers.
- Translate these inputs.
- Synthesize these translated inputs.
- Playback for learning.
- Playback prompts to the called.
- Record a call.
- Save a session.
- Load a session

3.2 Wizard-of-Oz

Wizard-of-Oz technique allows testing of unimplemented parts of the system. During the test a human simulates a particular part of the system. It is very useful to examine drafts and techniques before they are fully implemented. It is suitable for speech interfaces.

The “Wizard” observers users the action and simultaneously simulates the system behavior on the user’s input. The user can just see the changes on his screen caused by the “Wizard”.

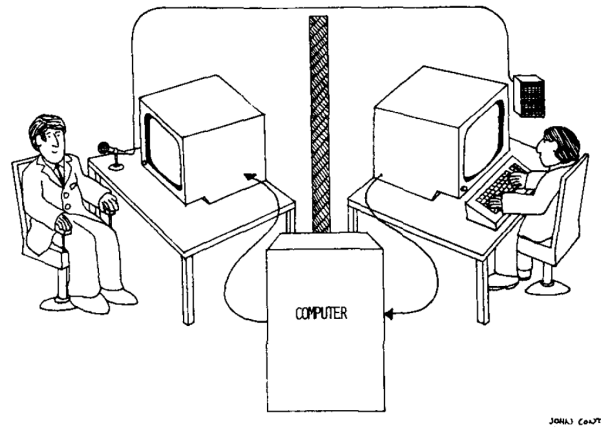


Figure 3.1: Illustration of Wizard-of-Oz technique. Figure taken from [22].

This technique allows to obtain information about interaction on the undeveloped system and to prevent future from some user experience problems.

The FoLaTeCo tool can be considered as Wizard-of-Oz. The user gives “Wizard” some data in his or her mother tongue. They are translated, synthesized and finally played to the called just on the user’s click. There is no need for direct speech interaction of the user with the called.

3.3 UI design

I have used a wireframes template for Google docs created by Morten Just¹ to create a proposal of the user interface. For the result see the following figures 3.1 and 3.2.

The page for phrase creations contains several inputs. Such is “Group” for a logical call division and natural inputs for prompts and expected responses. As the arrangement of the call has a tree-like structure, it is displayed in the appropriate graphical object.

¹Taken from mortenjust.com/2010/04/19/a-wireframe-kit-for-google-drawings/.

Creating call frame

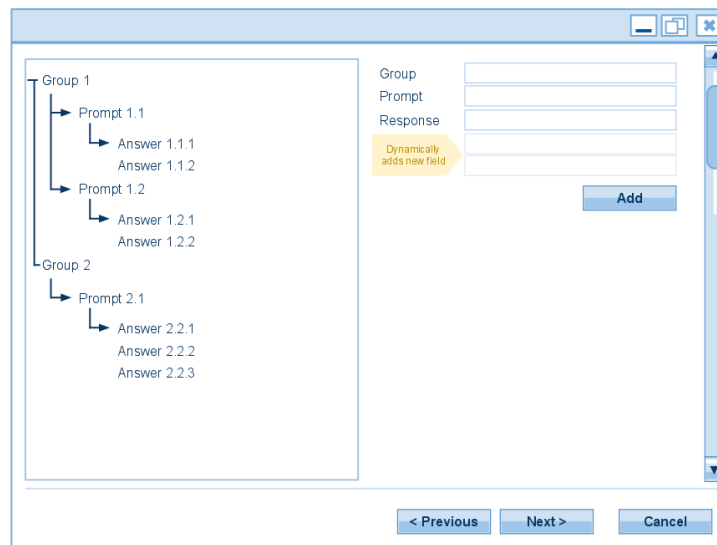


Figure 3.2: Wireframe of GUI for creating a call frame page.

Calling page contains a simple set of controls for call managing and grouped sets of buttons, which inject the wave file into the Skype.

Making a call

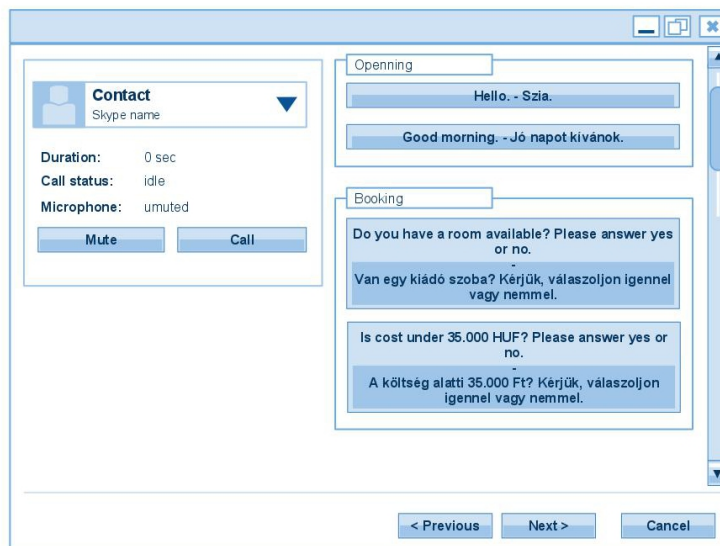


Figure 3.3: Wireframe of GUI for calling page.

Chapter 4

Implementation

The application uses open source cross-platform (Linux, Mac OS X, Windows and mobile systems.) framework Qt 4.7. It is mainly used for developing application with GUI and also for command-line-like tools. Qt is natively based on C++ language. The framework has additional modules for working with SQL, XML, threads, networking and a unified cross-platform file handling etc.

The project has been created under the Microsoft Visual Studio 2008 IDE.

4.1 Architecture

4.1.1 Wizard

As I have mentioned in chapter 3 the process can be diverted into a few separate steps such as preparing the statements, learning, calling, etc. According to this division the whole application is implemented as linear Wizard (or Setup assistant).

Wizards are very useful in leading the user over not so trivial tasks. Every step in Wizard represents a step in the process of making a phone call. Next advantage is that unaware users cannot jump over one step.

4.1.2 Translator

In this subsection I discuss the implementation of Strategy pattern on choosing a translation service and consequently, how a response should be parsed to get a translated sentence.

Google translator API is accessible over SSL connection. Qt framework requires installed OpenSSL¹. Otherwise the connection is not established. Therefore I have decided to implement an extensible solution by using Strategy design pattern to remove this dependency.

¹<http://www.openssl.org/>

4.1.2.1 Strategy template

The strategy pattern defines a family of algorithms where each of them is encapsulated, and makes them easily interchangeable. During the application runtime it is determined which algorithm is used without the client's noticing the change.

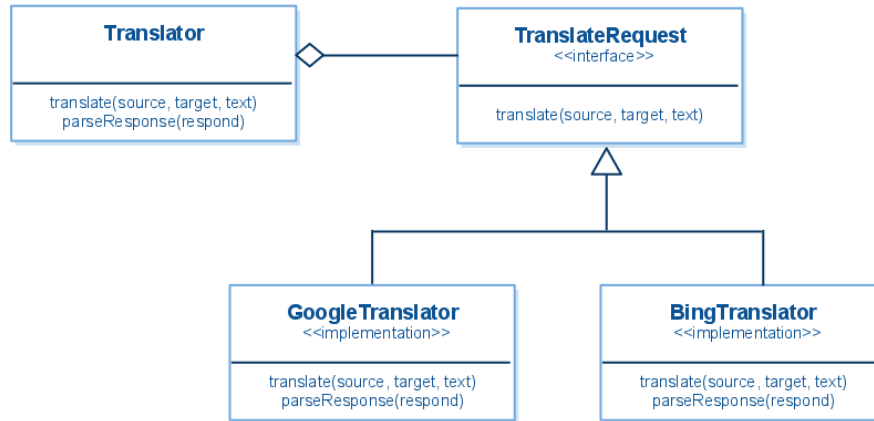


Figure 4.1: Implementation of Strategy design pattern.

Classes **GoogleTranslator** and **BingTranslator** are implementing virtual methods (`translate` and `parseResponse`) from **TranslateRequest**. Class **Translator** communicates with the client and chooses according to the request which translation service will be used. So far the option is made according to the fact if SSL is available or not.

4.2 Translate service

4.2.1 Google Translate API

Google Translate is a tool that enables other people to translate their own text to an other language by using API. Google translate API is now in the latest version 2. For using API you need to get² your unique API key.

Now I want to describe how to translate your own text through Google Translate API using REST. This provides access to a service endpoint providing translations.

For a single translation use URI <https://www.googleapis.com/language/translate/> with parameters mentioned below:

Request parameters:

callback Specifies JavaScript handle function when response is received.

format Defines type of returned response HTML or plain text.

²<https://code.google.com/apis/console/>

prettyprint Your API key.

q Text to translate.

source Source language.

target Target language.

Simple example: I would like to translate the sentence “Virágaim szépek.” from Hungarian into English.

```
https://www.googleapis.com/language/translate/
v2?
format=text&
key=<YourAPIKey>&
prettyprint=true&
q=Virágaim+szépek.&
source=hu&
target=en
```

If the query has been processed, I should get the following response.

```
1 {
2   "data": {
3     "translations": [
4       {
5         "translatedText": "My flowers are beautiful."
6       }
7     ]
8   }
9 }
```

Listing 4.1: Google translator respond for success translation

4.2.2 Microsoft Translator V2

The Microsoft Translator is similar to the service providing language translation.

For using API you need to get³ your own unique appBingId key. Now I describe how to use Bing API through HTTP service. Microsoft offers a few public methods for work with translations.

For single translate use URI `http://api.microsofttranslator.com/V2/Http.svc/` with parameters mentioned below:

³[<http://www.bing.com/developers/>](http://www.bing.com/developers/)

Request parameters:

appId Your Bing AppID.

text Text to translate.

from Source language.

to Target language.

contentType Defines type of returned response HTML or plain text.

Simple example: I would like to translate sentence “Virágaim szépek.” from Hungarian into English.

```
http://api.microsofttranslator.com/V2/Http.svc/
```

```
Translate?
appId=<YourAppId>&
text=Virágaim+szépek.&
from=hu&
to=en&
contentType=text/plain
```

If the query has been processed, I should get the following response.

```
1 <string xmlns="http://schemas.microsoft.com/2003/10/Serialization/">
2   My flowers are beautiful.
3 </string>
```

Listing 4.2: Bing respond for success translation

4.3 Skype

The Skype is free peer-to-peer application for Internet calling, video calls and instant messaging.

SkypeOut is a paid service for calling to regular telephone networks.

SkypeIn is a paid service for receiving calls from regular telephone networks.

4.3.1 Skype API COM wrapper

The Skype API uses a message-response architecture. However this API is wrapped by MS COM which provides more elegant access to the Skype interface. As COM wrapper is an object-oriented component it makes it easy to build in today's applications.



Figure 4.2: Skype API COM wrapper.

4.3.2 Injecting wav file

Skype API enables to inject the user's own wave file to voice input instead of capturing it from microphone. Wave file requires being in precise format [15]:

File: WAV PCM.

Sockets: raw PCM samples.

Frequency: 16 KHz.

Sampling: 16 bit.

Channels: 1 (mono).

4.3.3 Recording calls

Skype API supports recording income and outgoing transmissions to external wave file. Unfortunately the injected waves are not captured. Therefore an explicit recording is needed.

4.4 Text-to-Speech

4.4.1 Google TTS

In 2009 Google put into operation a TTS feature in Google Translate. So far no official API for TTS is provided. However, on web pages [20] of Weston Ruter a method how to get converted TTS in mp3 file was published .

He noticed that a request query is a simple HTTP GET (REST) request. For the present maximum text length for conversion 100 characters are allowed otherwise, you get Error 404. The service is also limited by the number of queries in a short unit of time. TTS has only one type of voice and does not support all translatable languages at Google Translate.

For single TTS convert use URI http://translate.google.com/translate_tts? with parameters mentioned below:

Request parameters:

t1 Target language.

text Text for conversion.

4.4.2 Acapela

Acapela is the group of experts interested in TTS. Their solution contains about 25 languages. Acapela Group has implemented over eight hundred projects all over the world.

They offer many voices in different kinds of quality in the given language. Furthermore they provide API request through HTTP protocol. They allowing, tuning of selected voice.

For a successful conversion TTS it is necessary to set up a POST request including the most important options of your unique identifier, type of voice (language), text, output file format, etc.

A great disadvantage of this solution is enormous usage fees.

4.5 SoX

SoX is the cross-platform command line sound processing program. Its main features are converting among various sound files, applying sound effects, playing and recording. In FoLaTeCo tool SoX is used to convert TTS in mp3 to expected wav file for Skype. Thanks to command line interface it is easily controlled.

Qt consists the QProcess class which enables to execute external processes. The following simple example shows calling external SoX processes for conversion from mp3 to wave.

```

1  QProcess *soxProcess = new QProcess(this);
2  QString program = "c:/sox/sox.exe"; // path to bin
3  QStringList listOfArguments;
4
5  listOfArguments << "c:/tts.mp3"; // original file
6  /* convert options: 16 b, ratio 16KHz, channels 1 */
7  listOfArguments << "-b" << "16" << "-r" << "16k" << "-c" << "1" ;
8  listOfArguments << "c:/tts_converted.wav"; // output file
9
10 proc->start(program, listOfArguments);

```

Listing 4.3: Calling external process for sound file conversion.

The following example demonstrates how to call an external SoX process to merge multiple wav files.

```

1  QProcess *soxProcess = new QProcess(this);
2  QString program = "c:/sox/sox.exe"; // path to bin
3  QStringList listOfArguments;
4

```

```

5  listOfArguments << "-M" <<"c:/skypeIn.wav"; //original file
6  listOfArguments << path0 << ... << pathN; // files to be merged
7  listOfArguments <<"c:/skypeInMerge.wav"; // output file
8  listOfArguments <<"delay"<<"0"<< time0 << ... << timeN; // times
9
10 proc->start(program, listOfArguments);

```

Listing 4.4: Calling external process for sound file merge.

4.6 Persistent data format

In this section I discuss how the data are stored on hard disk.

4.6.1 XML

XML is a general markup language produced by W3C. It consists of simple text data enriched by the user's defined tags. XML are in the machine readable form – this is why many applications offer API for XML data processing.

SAX reads a document serially and callbacks are reported sequentially to handle the given tag.

DOM is an objected-oriented parser. DOM API allows access and modification through data model tree in computer memory.

In my application I have choosen DOM parser.

4.6.1.1 Example of session XML

This example describes how information of session is stored.

In the first tag a short description of user's session is saved. It is followed by native and target language and finally link to the file where all prompts and responses are described.

```

1 <session description="User test - Mihi">
2   <languages>
3     <from>en</from>
4     <to>it</to>
5   </languages>
6   <frameCall>buttons_2011-05-15_11-24-42.xml</frameCall>
7 </session>

```

Listing 4.5: XML format of session

4.6.1.2 Example of frame call XML

This example describes how the phrases are stored.

The first tag `GroupBox` says what the name of the group for prompts and answers is. The following tag stores information about a prompt in mother tongue and the target language. Tag `Button` contains relative paths to original and converted sound files. Each tag has an attribute `language` which defines the language of the following sentence. The language is described by standardized abbreviation.

```

1 <Buttons>
2   <GroupBox name="Opening">
3     <Button src_orig="/sessions_data/2011-04-13_14-49-10_0.mp3"
4       src_conv="/sessions_data/2011-04-13_14-49-10_0.mp3.wav"
5       id="0">
6       <native language="en">
7         Hello, I do not speak Italian,
8         I speak by computer, Please answer by offered answers.
9       </native>
10      <translation language="it">
11        Ciao, io non parlo italiano,
12        io parlo di computer, per favore rispondi con risposte
13        offerte.
14      </translation>
15    </Button>
16  </GroupBox>
17  <GroupBox name="Accommodation">
18    <Button src_orig="/sessions_data/2011-04-13_14-49-10_1.mp3"
19      src_conv="/sessions_data/2011-04-13_14-49-10_1.mp3.wav"
20      id="1">
21      <native language="en">
22        Is there free room for me at university dormitory?
23        Please, answer yes or no
24      </native>
25      <translation language="it">è
26        C spazio libero per me al dormitorio universitario?
27        Si prega di rispondere is o no.
28      </translation>
29      <Answer path="/sessions_data/2011-04-13_14-49-10_2.mp3"
30        native="Yes">i
31        S
32      </Answer>
33      <Answer path="/sessions_data/2011-04-13_14-49-10_3.mp3"
34        native="No">
35        No
36      </Answer>
37    </Button>
38  </GroupBox>
39 </Buttons>

```

Listing 4.6: XML format of phrases

Chapter 5

User tests

The test goal is to find out if users are able to get some information from the called, the called understands the question and responds as required. On the caller's side the test includes these parts choosing: languages, preparing statements that user intends to ask the called, learning fundamental basics of a foreign language and finally a call.

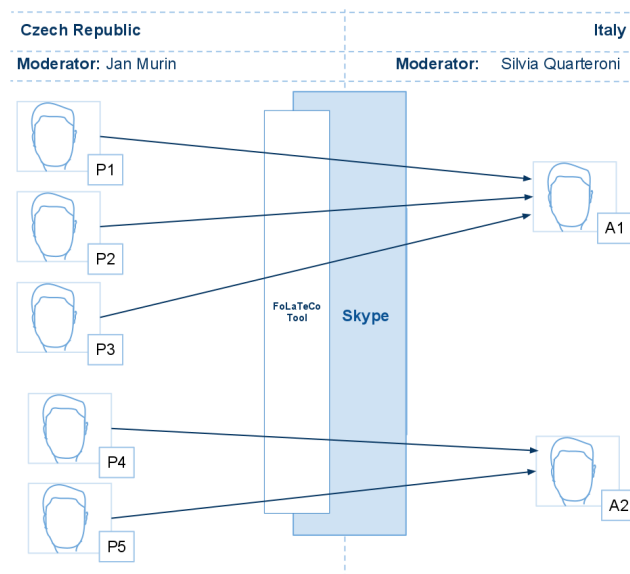


Figure 5.1: Test settings.

The previous figure 5.1 shows the test settings. In the Czech Republic we had 5 participants talking with one of the agents using FoLaTeCo Tool.

The participants were asked to prepare a call to a person who was responsible for accommodation in dormitory and meals in mensa. After that they called to the agent. The agent had prepared a task instruction how to response on participants question. Nevertheless, the agents did not know who and how would call them at first. The agents were allowed to speak

only in Italian. The agents could work on anything else during the test time. Agents were after that, interviewed by an Italian moderator.

The tests were held in a quiet room without disturbing elements. The testing was performed in two days.

The Skype account was available for all participants and they started with a new session in the FoLaTeCo tool.

- Moderator in the Czech Republic: Jan Murin.
- Moderator in Italy: Silvia Quarteroni.

5.1 Characteristics of participants

All the target participants were bachelor students and one PhD. student.

The main condition for participating in the user test was the presumption that they did not understand Italian and their computer skills were on better level than beginner. Another condition was to have some basics in English. No other languages were relevant for the test. For screener [see appendix B](#)

The agents were employees of DEI – Politecnico di Milano. They were recruited by the moderator of the Italian side.

5.2 Pre-test interview

The goal of the interview was to verify which language participants could truly speak and how they communicated abroad.

Participant 1. The best communication skills of the participant were in English, according to him. In past he learnt Spanish and German. Abroad he relies on speaking English.

Participant 2. He could communicate in English and slightly in German. He relies on English but he is able to learn quickly a few basic words and phrases.

Participant 3. The participant speak just English. Before going abroad he tried to learn some basic phrases e.g. “Hello”, “Thank you”, etc. Despite this very fundamental basic he also relies on speaking English.

Participant 4. Besides English the participant admitted some knowledge of French. He just relies on speaking English.

Participant 5. The participant spoke English and German.

5.3 Tests

In this section I describe the issues in each test. For the test participant scenario [see appendix C](#) and for the task instruction for agents [see appendix D](#)

5.3.1 Participant 1

Participant felt a bit confused by labels “Group”, “Prompt” and “Response” on the page of creating phrases. He prepared only yes or no answers, so he had no problems to understand the called.

In his words he had a little problem to take in the role. The participant would appreciated more predefined phrases.

5.3.2 Participant 2

He did not get the field for “Description of session” on the page for creating a new session. The participant did not get what the button “Add” was doing and if it added a new edit line or adds sentence into the call frame on page for creating phrases.

He made some notes during the call on piece of paper and also he wanted to prepare a call frame on a piece of paper. The Participant missed functionality to mark the answers.

5.3.3 Participant 3

The participant was confused by “Start new call”. He did not know if it the dialed the called immediately on the page for Creating a new session. He noticed and understood the prepared statement including the labels for creating new prompts. He expected to create group first, not simultaneous data entry for the whole branch of tree. The participant was afraid if the next button after Review page would not begin call immediately.

5.3.4 Participant 4

The participant was a little bit unsure if he could add a new “Group”. Furthermore he was disappointed with a restriction only for 100 characters at “Prompt” which was caused by the used technology. The participant complained about the default focused button on enter was “Next” not “Add” and he also expected more interactive data entry. On the Review page he complained about not aligning prompts and responses.

This participant created more open questions in comparison to the others. Nevertheless he was able to understand or deduce the answers.

The participant also missed the functionality of marking answers.

5.3.5 Participant 5

This participant would like to see more rows in the call tree and formatting the Review page seemed weird to him. The participant also complained about missing responses during the call.

Generally the participant missed in the application something for making notes, functionality for creating quick questions during the call and the participant would appreciate some more default prompts.

He made notes during the call on piece of paper. He understood most of the responses.

5.3.6 Calls

For call transcript [see appendix E](#) or on the attached DVD the call recordings are available.

5.4 Post-test interview – participants

5.4.1 Participant 1

1. How did you understand the called? Why?

I did not have a problem to understand called because they were forced to answer very simply, yes or no.

2. In which language did you think you were interacting with the called? English or Italian and why?

Due to yes or no answers I think I interacted in English because I had to create question in English. I knew that the called is from Italy but I triggered buttons labeled in English.

3. Did you feel you want to add something during the call according its progress or did you feel bound by the already created prompts? What and why?

I had not considered an option to ask anything else. I was glad that I got some answer. I think for getting basic information this is an ideal solution.

Of course, creating prompts with a view of a simple answer was not always, so easy.

4. Anything else you wish to add?

Nothing.

5.4.2 Participant 2

1. How did you understand the called? Why?

Thanks to the fact, I could have learnt the prompts and response before the call, I had no problem with understanding the called.

Nevertheless I would appreciated some check boxes for marking the exact response.

2. **In which language did you think you were interacting with the called? English or Italian and why?**

The interaction seemed quite pleasant; I felt that I could speak normally English.

3. **Did you feel you want to add something during the call according its progress or did you feel bound by the already created prompts? What and why?**

I do not think so. Basically I called in a language that I cannot speak. The responses were in Italian too, so any advanced answer would not be a right solution anyway. During creations of the call frame there was only one phrase prepared. I think if there had been more phrases it would have made the creation of prompts and responses easier. Unfortunately, I forgot to say goodbye.

4. **Anything else you wish to add?**

At the beginning I was confused by the button “Add” – I was not sure if it was an add prompt or if it added a new field for the answer.

5.4.3 Participant 3

1. **How did you understand the called? Why?**

At one moment I had a problem to understand the answer but by repeating the question I made the called pronounce the answer better again.

2. **Did you feel you want to add something during the call according its progress or did you feel bound by the already created prompts? What and why?**

I missed something like “Pardon, I did not catch the answer.”

3. **In which language did you think you were interacting with the called? English or Italian and why?**

In Italian because I had to understand the answers in Italian.

4. **Do you have something to tell or idea?**

You should prepare more default statements.

5.4.4 Participant 4

1. **How did you understand the called? Why?**

Very well, I had no problems.

2. **Did you feel you want to add something during the call according its progress or did you feel bound by the already created prompts? What and why?**

Yes. I have missed some text field for a quick question and according to the prompt “Please wait, I am preparing a new question.”

3. **In which language did you think you were interacting with the called? English or Italian and why?**

Italian. The call was in Italian.

4. **Do you have something to tell or idea?**

Maybe I would be a little scared by using this application in real life, but I would use it if there were no other option.

5.4.5 Participant 5

1. **How did you understand the called? Why?**

Adequately.

2. **Did you feel you want to add something during the call according its progress or did you feel bound by the already created prompts? What and why?**

There was no way to create another question during the call. Furthermore the fail safe button for the called something like “If you do not understand the answer, say XY, ...”.

3. **In which language did you think you were interacting with the called? English or Italian and why?**

English.

4. **Do you have something to tell or idea?**

There is no possibility to continue the conversation after some unexpected answer. Fail safe button was missing.

5.5 Post-test interview – agents

5.5.1 Agent 1

1. **How did the system sound?**

The sentences were mostly disconnected. Maybe it was a translation error.

2. **Was the system easy to understand? Why?**

See above.

3. **Was it natural to speak with such a system? Why? Why not...?**

Not at all; the intonation was not normal, which made you talk as if it were a stranger, or even worse.

4. **Did you think you were helpful to the caller? Why?**

Yes, because I answered their questions.

5. **Was there any information you thought that was important but you were not able to give it?**

Some time the questions were very specific. When the questions were more generic, I skipped the additional information.

5.5.2 Agent 2

1. **How did the system sound?**

Not natural, but generally comprehensible.

2. **Was the system easy to understand? Why?**

Not so much, as the intonation did not suggest whether the sentences were statements or questions.

3. **Was it natural to speak with such a system? Why? Why not...?**

No, it took time to understand the sentence and it made you want to reply yes or no.

4. **Did you think you were helpful to the caller? Why?**

Their questions were very specific; yes or no questions didn't "allow" me to elaborate on this.

5. **Was there any information you thought that was important but you were not able to give it?**

Yes, most of them. I felt like replying yes or no.

5.6 Findings

According to the user test analysis these issues have been found.

Too many languages. During the pilot test the participant was able to choose from all the supported languages from Google Translate. It was very hard to choose right languages from so many options. So there were chosen only a few well supported languages.

More interactive input for phrases. Some participants complained about a simple not enough supporting user interface for phrases input e.g. changing position of prompt, editing, etc.

Review is confusing. Participants also complained about the review page layout. They found it unclear. For a new simplified design see figure 5.2.

More default phrases. According to the user test analysis I have found out that the participant appreciated a better guide how to create prompts or more predefined phrase.

Answers that the user expects are not shown during a call. This was a little bit uncomfortable for a few participants.

Quick question during a call. Some participants would appreciate if they could make a quick question during a call.

5.6.1 Suggested solutions

A few participants complained about a confusing layout of the Review page. I have simplified displaying the answers – the user can see only one at a time and the user can switch among them. I have left the prompt unchanged in order to maintain the context of conversation.

Prepare

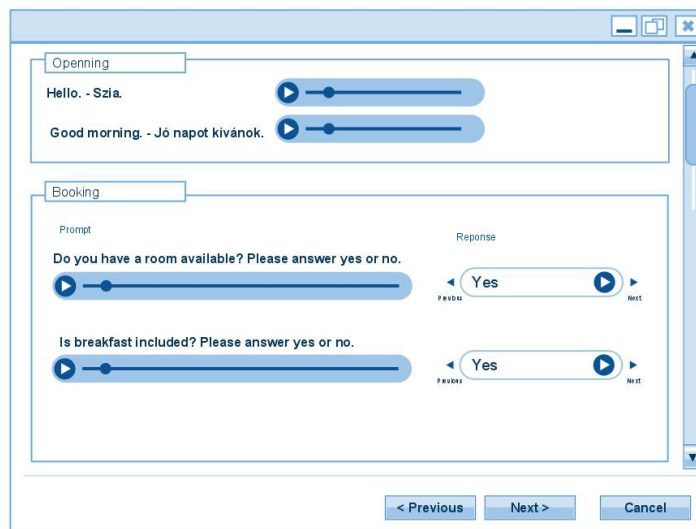
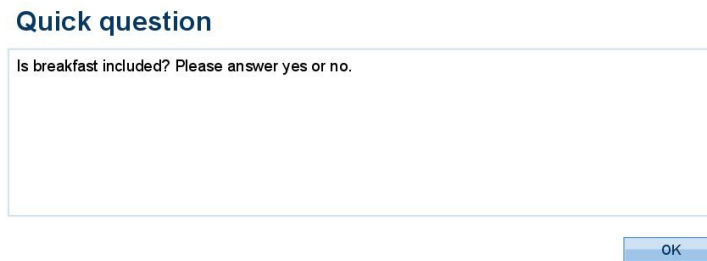


Figure 5.2: Redesign wireframe for call review.

I have decided to make a modal window for writing a new question, to avoid accidental trigger of another prompt. While new question is being written some default message should be played to the called e.g. “Please hold on. I am preparing a new question.”



Quick question

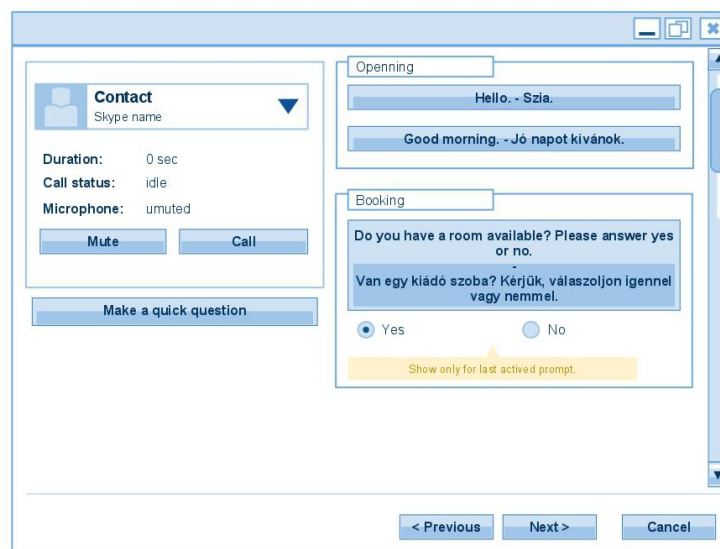
Is breakfast included? Please answer yes or no.

OK

Figure 5.3: New modal window for creating quick question during the call.

A new design for the calling page. On figure 2.4 see a new part for marking the response and a new button for a quick answer.

Making a call



Contact
Skype name

Duration: 0 sec
Call status: idle
Microphone: unmuted

Mute Call

Make a quick question

Opening

Hello. - Szia.
Good morning. - Jó napot kívánok.

Booking

Do you have a room available? Please answer yes or no.
Van egy kiadó szoba? Kérjük, válaszoljon igennel vagy nemmel.

☒ Yes ☐ No

Show only for last active prompt.

< Previous Next > Cancel

Figure 5.4: New design of page for calling including the marker for response.

Chapter 6

Conclusion

In this thesis project I have implemented a tool which allows the users to make a simple call in a language they do not understand. This solution includes a preparation of prompts and expected responses in mother tongue, translation of these phrases into target language and TTS, simple review to learn the language basics. A call is mediated over the Skype. During the call the prompts are played back as the user triggers.

The necessary part of this thesis was to realize a user test.

6.1 Evaluation

According to the user test all participants managed to get some information from the called. They were able to determine an approximate price of dormitory and food and some other information.

None of the participants got to death end during the test and all of them understood most of the responses from the agent.

Nevertheless, I noticed most of the participants did not get into the role because they were fully focused on creation of phrases and forgot the basic phrases like greeting and farewell.

Furthermore, I would like to say that more enthusiastic participant made more natural prompts than others. They did so despite getting an unexpected answer.

According to the facilitated interviews I deduce that agents were satisfied with the responses they had given to the participants. Agent said that voice from TTS sounded comprehensible but not natural. They also felt a little bit uncomfortable that they were bound by expected answers.

The application is usable but in a few steps it makes the user a little bit uncomfortable namely the page for Creating phrases and the page for Review. This should get better after deploying new version with fixed issues found in the user test.

6.2 Future work

According to the user test analysis used this technique is usable for managing simple calls. Therefore, I think about designing some new more complex graphical user interface for desktop application or developing and deploying this solutions on mobile platform.

Other option is to use the results of this technique of asking question in some other domain such as the automatic system for user responds including speech reorganization. According to my results the agents did not try to answer the unexpectedly. Due to this assumption the domain of words that the machine translation should expect shrinks drastically. And it makes the estimations of the translation more precise.

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Appendix A

List of used abbreviations

API	Application Programming Interface
COM	Component Object Model
DEI	Dipartimento di Elettronica e Informazion
DOM	Document Object Model
DVD	Digital Versatile Disc
FoLaTeCo Too	Foreign Language Telephone Communication Tool
GJNP	Gramatika já nemám problém
GUI	Graphical User Interface
HTML	HyperText Markup Language
HTTP	Hypertext Transfer Protocol
IFA	Internationale Funkausstellung Berlin
MS	Microsoft
MSDN	Microsoft Developer Network
PCM	Pulse-code modulation
REST	Representational State Transfer
SAX	Simple API for XML
SoX	Sound eXchange
SQL	Structured Query Language
SSL	Secure Sockets Layer
TTS	Text-to-speech

W3C World Wide Web Consortium

XML Extensible Markup Language

Appendix B

Screenener

- I have at least basic of these languages:
 - English,
 - Spanish,
 - Italian,
 - other.
- My computer skills are:
 - Beginner,
 - Advanced,
 - IT professional.

Appendix C

Test scenario for participant

Carefully read this entire scenario. During the test, use a “think aloud method”.

Task. You have an application able to make call in language you do not know. You know following:

- You are going for one semester study in Italy. You were advised to accommodate at university dormitory.
- Dormitory adress:

Via Giovanni Batista Piranesi, 27
55049 Viareggio (LU)

- Please, try to find out as many information as you can about:
 - accomadion (occupation, price, etc.),
 - mensa(price, openning hours, location, etc.),
 - any other relevant information you consider as important.
- Hint 1: The average price for accommodation on dormitory is in Italy €300-470 per month. Price per meal €2-5.
- Hint 2: Try make a question like “Do you like an ice-cream? Please response chocolate, vanilla or other.”.

Appendix D

Task instruction for agents

Pretend you are somebody who is responsible for giving the information to whoever calls. The rest of the page contains a snapshot of what you “know”.

Please speak Italian with the caller.

On purpose we do not mention any dates so that we can recycle this cheat sheet. Please assume that the nearest days are discussed.

Dormitory information:

Address:

Via Giovanni Batista Piranesi, 27
55049 Viareggio (LU)

Short-term stay, for immediate booking:

- Monday: 3 double rooms (€50/night)
- Tuesday: 3 double rooms (€50/night)
- Wednesday: no room left
- Thursday: 2 double rooms (€50/night)
- Friday: no room left
- Saturday: no room left
- Sunday: 2 double rooms (€70/night)

Long-term stay (€350/month):

- Summer semester: 10 single rooms
- Winter semester: 5 single rooms

Room amenities:

- Bed linen provided
- Internet connection
- Kitchen

Transportation: Unknown to you.

Mensa information:

Within the dormitory complex

Meals served:

- Breakfast (€2.30)
- Lunch (€4.50, or €3.50 primi piatti)

Meals served only to approved people.

Hours of operation:

- Breakfast: 7.30 – 10.00
- Lunch: 12.00 – 14.30

Transportation: Unknown to you.

Appendix E

Call transcripts

Key. *Italics* marks synthesized text.

E.1 Participant 1 – P1

Agent 1: Hello.

Pronto

P1: *Hello, I do not speak Italian, I speak by computer. Please answer by offered answers.
Ciao, io non parlo italiano, io parlo di computer. Per favore rispond con risposte offerte.*

P1: *I am going to study in Italy and I want to find some accomodation.
Ho intenzione di studiare in Italia e voglio trovare un alloggio.*

P1: *Do you have free room for me? Please answer yes or no.
Non vi è spazio libero per me? Si prega di rispondere sì o no.*

Agent 1: Yes.

Sì.

P1: *Is the price of your rooms for 1 person under 100 euros per a day, yes or no?
È il prezzo della vostra camera per 1 persona, sotto i 100 euro per un giorno sì o no?*

Agent 1: Yes.

Sì.

P1: *Is on your university mensa, please answer yes or no?
È sulla vostra mensa universitaria, si prega di rispondere sì o no?*

Agent 1: Yes.

Sì.

P1: *Can you tell me if price of one food is about 5 euros, please answer yes or no?*

Potete dirmi se il prezzo di un alimento è di circa 5 euro, si prega di rispondere sì o no?

Agent 1: Yes.

Sì.

P1: *Thank you for information.*

Grazie per le informazioni.

P1: *Have a good time, see you.*

Avere un buon momento, ci vediamo.

E.2 Participant 2 – P2

P2: *Hello, I do not speak Italian, I speak by computer. Please answer by offered answers.*

Ciao, io non parlo italiano, io parlo di computer. Per favore rispondi con risposte offerte.

P2: *What is the prize for a room. is it 200-300 or 300-400, 400-500 or 500-600.*

Qual è il premio per una stanza. è 200-300 o 300-400, 400-500 e 500-600.

Agent 1: 300-400.

300-400.

P2: *Is there single room, or double room? single, double, more.*

C'è camera singola o doppia? singola, doppia, di più.

Agent 1: Double.

Doppia.

P2: *Price of food? Less than 2 euro, up to 5 euro, more.*

Prezzo del cibo? Minore di 2 euro, fino a 5 euro, più.

Agent 1: Up to 5 euro.

Fino a 5 euro.

E.3 Participant 3 – P3

P3: *Hello, I do not speak Italian, I speak by computer. Please answer by offered answers.*

Ciao, io non parlo italiano, io parlo di computer. Per favore rispondi con risposte offerte.

P3: *Is there free room for me at university dormitory? Please, answer yes or no.*
C'è spazio libero per me al dormitorio universitario? Si prega di rispondere sì o no.

Agent 1: Yes.

Sì.

P3: *How much euros is one room for month? Is it between 300-470? Please answer Yes, Less or More.*

Come euro molto è uno spazio per mese? E 'tra i 300-470? Si prega di rispondere Sì, più o meno.

Agent 1: Yes.

Sì.

P3: *How much euros is one room for month? Is it between 300-470? Please answer Yes, Less or More.*

Come euro molto è uno spazio per mese? E 'tra i 300-470? Si prega di rispondere Sì, più o meno.

P3: *Is it 300-400 or 400-470? Please answer first or second.*

È 300-400 o 400-470? Motivi di primo o secondo.

Agent 1: Yes, about 350.

Sì, circa 350.

Agent 1: Between 300 and 400.

Tra 300 e 400.

Agent 1: Between 300 and 400.

Tra 300 e 400.

P3: *How long is the nearest mensa open? Till 2 p.m. ? Please answer Yes or No.*

Quanto tempo è la più vicina mensa aperta? Fino a 2 pm? Si prega di rispondere sì o no?

Agent 1: Yes.

Sì.

P3: *How much euros is one lunch menu? Is it between 2-5? Please answer yes or no.*

Come euro molto è un menu a pranzo? È between 2-5? Si prega di rispondere sì o no.

Agent 1: Yes.

Sì.

P3: *Thank you for your time and your help. Hope to meet you soon. Bye.*

Grazie per il vostro tempo e il vostro aiuto. Spero di incontrarvi presto. Ciao.

E.4 Participant 4 – P4

P4: *Hello, I do not speak Italian, I speak by computer, Please answer by offered answers.*

Ciao, io non parlo italiano, io parlo di computer, per favore rispondi con risposte offerte.

P4: *I would like to know information about the available dorm rooms.*

Vorrei sapere informazioni sulle camere dormitorio disponibili.

Agent 2: There are available three rooms on the Monday, three rooms on the Tuesday, two on the Thursday and 2 rooms on Sunday.

Sono disponibili tre stanze doppie il Lunedì, tre stanze doppie il Martedì, due doppie il Giovedì e due doppie la Domenica.

P4: *Please repeat the answer.*

Si prega di ripetere la risposta.

Agent 2: There are available three rooms on the Monday, three rooms on the Tuesday, two on the Thursday and 2 rooms on Sunday.

Sono disponibili tre stanze doppie il Lunedì, tre doppie il Martedì, due doppie il Giovedì e due doppie la Domenica.

P4: *How many days before the start of the semester should I arrive? Please answer the number of days.*

Quanti giorni prima dell'inizio del semestre devo arrivare? Si prega di rispondere il numero di giorni.

Agent 2: I don't have this information.

Non ho questa informazione.

P4: *How many people will I share the room with? Please answer the number of people.*

Quante persone che condividono la camera con? Si prega di rispondere il numero di persone.

Agent 2: Due

Two

P4: *How far is the dorm from the university? Please answer the duration.*

Quanto dista il dormitorio della università? Si prega di rispondere alla durata.

Agent 2: I don't have this information.

Non ho questa informazione.

P4: *How much does the food in mensa cost? 0 to 3 euros, 3 to 6 euros, 6 to 10 euros.*

Quanto costa il cibo in mensa? 0-3 euro, 3 a 6 euro, 6 a 10 euro.

Agent 2: 3-6 EUR

Da 3-6 EUR

P4: *Thank you very much and see you before the winter semester when I arrive!*

La ringrazio molto e ci vediamo prima del semestre invernale quando arrivo!

Agent 2: You're welcome.

Prego.

E.5 Participant 5 – P5

P5: *Hello, I do not speak Italian, I speak by computer, Please answer by offered answers.*

Ciao, io non parlo italiano, io parlo di computer, per favore rispondi con risposte offerte.

P5: *How many beds are in cheapest room?*

Quanti posti letto sono in più conveniente ed economica?

Agent 2: Double rooms for 50 euro

Stanze doppie a 50 euro.

P5: *Is the cheapest room available? If not, tell me how many beds are in the available room.*

È il più conveniente in camera? Se no, dimmi quanti posti letto sono in camera disponibile.

Agent 2: Two beds.

Due posti letto.

P5: *Is the price for the available room bellow 350 Euro?*

È il prezzo per la camera a soffietto 350 Euro?

Agent 2: Il prezzo è per un mese.

The price is for one month.

P5: *In which floor is the available room situated?*

A che piano è situato lo spazio disponibile?

Agent 2: I don't have this information.

Non ho questa informazione.

P5: *Is the toilet inside the room?*

È il bagno all'interno della stanza?

Agent 2: I don't have this information

Non ho questa informazione.

P5: *Is the shower inside the room?*

È la doccia all'interno della camera?

Agent 2: I don't have this information.

Non ho questa informazione.

P5: *Is there a kitchen inside the room?*

C'è una cucina all'interno della stanza?

Agent 2: Yes.

Sì.

P5: *Is there kitchen in the building?*

C'è da cucina nel palazzo?

Agent 2: No.


No.

Appendix F


DVD content



 `bin` – *executable files*

 `callRecords` – *call records in mp3*

 `src` – *source file of the application*

 `thesis`

 `src` – *source file of this in L^AT_EX*

 `thesis.pdf` – *PDF version of this text*