

# TRANSCULTURAL NEGOTIATION IN DIFFERENT TRAFFIC ENVIRONMENT USING NON-DETERMINISTIC SOFTWARE

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## Abstract

Today translator software is created based of different algorithms. If the existing text translators can translate the words, sentence, phrase with a good precision; in case of speech translators there are problems because the translation is done in two steps: first the software of speech recognition is running, after that the software for translation. In case of a conversation the speech translator is translating the last sentence, making this sentence not related to the conversation. Being aware of the gap between the two types of translators, the scope of this paper is to show that a new approach is necessary to improve the quality of the speech translators. The authors propose recording the conversation by the translator software, creating a text-history, thus *enlarging the context and adaptation of the program* based on the topic of discussions. In this way the new sentence that needs to be translated is linked with the conversation and the version of translation will be chosen the one that apply to the context. Having a saved *history / log* it is possible to apply Computer-Aided Semiosis for translating homonym words.

## Keywords

Cross-cultural interaction; transcultural interfaces; Computer-Aided Semiosis (CAS); anthropocentric approach; Speech translator.

## 1 INTRODUCTION

Controlling the present-day software is shifting from text or mouse control to voice control. This was possible because of common speech interface that was promoted by VoiceXML group. Now there are stand-alone applications that can be controlled by using voice or there are operating systems that have the module of speech recognition and the OS transform the voice to controls for different application. For example you can write a document only by speaking with the computer. There is also the possibility to listen to an email or a report. These examples are possible because in the last time an effort was put in researching and improving *Speech-to-Text* and *Text-to-Speech* software. A Speech-to-Text program starts with a voice pattern adaptation, usually no more then 2 minutes is needed for the application to run the initial recognition tests. The Text-to-Speech algorithms have no problem in transforming the text, if it is correctly written in the source file. This paper aim is not to speak about these technologies but to describe the translator applications build on them and how could they be improved.

Nowadays there are different text translator applications that can be access using the internet or if the user has an Office software package. These applications can translate the words, sentences and phrases with a good precision. By good precision we mean that in general the user who reads the translated text understand the correct meaning of what the original text wanted to transmit. In general the problems that appear are: with rearranging of words from a language to the other; with correct according between subject and predicate, substantive and adjective, pronouns and verbs, etc.; with abbreviations. Another type of problems appears by misunderstanding of the meanings of the words. Different example can be found in [1]. Because of different meaning of words in a language based on the context there can be different versions when the words are translated. Normally only one version is the correct one, it is rare when it is possible to use two or three versions. A solution for solving the problem of choosing the correct version was proposed in [1]: *Computer-Aided Semiosis* or CAS.

The speech translator applications are composed of two or three modules: Speech-to-Text + Translator, if the user reads the translated text or Speech-to-Text + Translator + Text-to-Speech, if user listen the translated text. Because the current Speech-to-Text applications do not have a precision of 100% when the speech is transformed to text, the quality of the translated conversation is not so good compared with a text translation.

Text-to-Speech applications are transforming the text to speech almost perfect so this module will not affect the translation process.

When two people want to communicate and they don't know a common language they will need a translator that can translate text or speech. The normal interface to use is the one that can translate speech. Nobody will choose to lose time writing text or reading it from the interface. So, the *anthropocentric* approach is the translator that is composed of the modules: Speech-to-Text + Translator + Text-to-Speech. In case of a trans-cultural negotiation that uses a speech translator interface the translation quality is primary affected by the module Speech-to-Text. A second problem appears because the translator interface translates the current sentence spoken by a user. For solving the second problem this paper propose a new solution: *enlarging the context*. We propose enlarging the context by recording the conversation of the users that utilize the translator interface. In this way the application will understand the context and can *adapt to the conversation* and with help from the Computer-Aided Semiosis can choose the correct meaning of the words, therefore the correct version of translated speech will be generated.

This paper is divided in 5 sections. Section "Related Works" describes the nature of this paper and what other studies were done in recent years on the subjects like CAS and trans-cultural interfaces. In Section 3 is shown the current problems that nowadays programmers are faced when developing translators. Also, the section contains a scenario that can appear in traffic. Section 4 presents the Graphical User Interface of the voice translator and the final section is closing the paper with the conclusions.

## 2 RELATED WORKS

This paper is related with "Interface Agents for Transcultural Communication: A Framework" and almost all the IT terminology are explained in it. That paper is an "umbrella-paper" for this paper and other two. There all technical terms are explained in details in such a way that social scientists can understand them. It is presented the objective of programmers when developing trans-cultural and trans-disciplinary applications, the new approach for implementing such software. Also why we choose the prefix "trans" and not "cross". Paper "Interface Agents for Transcultural Communication: A Framework" contains a History section where it is described how trans-cultural communication concepts for developing applications evolved. It is shown why the new IT paradigms must be applied when creating trans-cultural and trans-disciplinary interfaces, for that reason we choose Computer-Aided Semiosis to be the concept used when programming our *Voice Translator Interface*.

Barbat et. al suggested in [2], CAS to be the new approach in developing anthropocentric trans-cultural applications. There paper contains different example of words and pictures that demonstrates the fact than they have altered meaning depending on the culture or the context in which they appear in a sentence. Because of different meaning of words there can be different version of sentence's perception, altering the translation from one language to another.

Some principal type of translation, translation as a social practice, translation as a form of intercultural communication, overt and covert translation and translation in a global culture are described by Stockinger in [5] Translation is defined as "a cultural form and as a cultural form it satisfies the specific social needs of a particular social group. It keeps foregrounding the ideas the social experience and the strain of thought of that particular group". For a professional practice, translation is defined as: "transferring the meaning of a text from a source language to a target language". Based on [4] translation can be divided in three principal types: intralingual translation or rewording, interlingual translation or translation proper and intersemiotic translation.

Subjects like Computing as Interaction, Agent-Oriented Software Engineering, Multi-Agent Systems, Trans-cultural interfaces, Broad-Band Communications, Socio-cultural Modelling, eSemiotics are treated in details in recent papers [2][5][6][7][8][9].

## 3 EXAMPLE AND EXPLICATIONS

### 3.1 Current problems of translators: Homonym and related terms.

In translation most of the problems that can be resolved by using CAS are for: homonym, homographs, homophones, heteronyms and capitonyms.

In linguistics, a *homonym* is one or a group of words that share the same spelling and the same pronunciation but have different meanings, usually as a result of the two words having different origins. Example: bark is the sound of a dog or the skin of a tree; band is a group or a range of radio frequencies or in algebra an idempotent

semigroup; dot is the punctuation mark or the geometric operator. *Homographs* are words that share the same spelling regardless of how they are pronounced. *Homophones* are words that share the same pronunciation regardless of how they are spelled. Example: to, too, two; there, their, they're; see, sea or will, wheel. *Heteronyms* are words that share the same spelling but have different pronunciations. That is, they are homographs which are not homophones. Example: desert can be to abandon or an arid region; row can be to argue / an argument or as in to row a boat / a row of seats. *Capitonyms* are words that share the same spelling but have different meanings when capitalized. They may or may not have different pronunciations. Example: polish is to make something shiny or Polish is a man from Poland; turkey is a bird or Turkey is a country in Europe; apple is a fruit or Apple is the software company.

In case of voice translation troubles become visible when somebody is using homophones or some capitonyms. For the text translation homonym, homographs, heteronyms and some capitonyms are hard to be translated in the correct form.

### 3.2 Trans-cultural discussion using a translating interface.

Below is a trans-cultural discussion, that can appear in traffic, between a German policeman and a foreign tourist that speaks English using a trans-cultural interface for translating the communication. The policeman's part starts with P and the tourist's one with T. After each break in the conversation, the interface performs the translation of recorded text. For each text there is a translated and a correct version. We assume that the voices are clearly understood by the Speech-to-Text module, consequently only the text translation is important. We will show how recording the conversation by creating a log will help in understanding the situation, so improving today's voice translators.

*Turist (T): Good morning Mr. Police officer.*

Translator: Guten Morgen Herr Polizist.

*Policeman (P): Guten Tag. Kann ich Ihnen helfen?*

Translator: Good day. Can I help you?

*T: I am lost. I need to go to the Hotel **Palace Hilton**. Can you please help me?*

Translator: Ich hab mich verlaufen. Ich muss zum Hotel **Schloss Hilton** gehen. Kannst du mir bitte helfen?

Correct: Ich hab mich verlaufen. Ich muss zum Hotel **Palace Hilton** gehen. Können Sie mir bitte helfen?

*P: Sie müssen **gerade aus** gehen und dann die erste Straße rechts. So erreichen Sie die **Hochstrasse**.*

Translator: You need to go **straight out** and take the first to the right. Then you will be on the **High street**.

Correct: You need to go **straight ahead** and take the first to the right. Then you will be on the **Hochstraße**.

*P: Meiner Meinung nach ist es viel einfacher wenn Sie nach dem Schild mit dem **Rentenversicherungamt** sehen.*

Translator: I think it will be much easier looking after the billboard with the **old age pension scheme office**.

Correct: I think it will be much easier looking after the billboard with the **Rentenversicherungamt**.

*T: Thank you, I think I can **manage** it.*

Translator: Danke, denke ich kann das **leiten**.

Correct: Danke, denke ich kann das **handeln**.

*T: A moment please. Because my meeting is on 17:00 I have a little time and I want to go for a walk. Can I park my car here? Is this a free parking zone?*

Translator: Ein Moment bitte. Weil meine Sitzung auf 17:00 ist, das ich eine wenig Zeit habe und ich möchte spazieren gehen. Kann ich mein Auto hier parken? Ist dies eine freie Parkenzone?

Correct: Ein Moment bitte. Weil meine Sitzung um 17:00 startet, habe ich ein wenig Zeit und möchte noch gerne spazieren gehen. Könnte ich mein Auto hier parken? Ist dies eine freie Parkenzone?

*P: Nein, Sie müssen ein Parkticket kaufen oder Sie bezahlen **Strafe**.*

Translator: No, you have to buy a ticket or you should pay **punishment**.

Correct: No, you have to buy a ticket or you should pay a **penalty**.

*T: I will not stay long*

Translator: Ich werde nicht lange **stehen**.

Correct: Ich werde nicht lange **bleiben**.

*P: Sind Sie nicht um die Ecke, **schon bewegen Sie sich auf dünnem Eis**.*

Translator: Are you just around the corner, **you skate on thin ice**.

Correct: Are you just around the corner, **you move on thin ice**.

*T: From where can I buy these **tickets**?*

Translator: Von wo kann ich **diese Karten** kaufen?

Correct: Woher kann ich **diese Parkticket** kaufen?

*P: Sie könne diese Tickets vom **Kiosk** kaufen oder indem Sie eine Sms mit dem Namen der Strasse, wo Sie geparkt haben, schicken. Mehrere Informationen finden Sie auf dem **Schild**.*

Translator: You can buy tickets from the **call box** or sending an SMS with the name of the street you where parking on. You get more information from the **poster**.

Correct: You can buy tickets from the **kiosk** or sending an SMS with the name of the street you where parking on. You get more information from the **billboard**.

*T: Is there a street where I should not leave my car?*

Translator: Gibt es vielleicht eine Straße wo ich mein Auto nicht lassen soll?

Correct: Gibt es vielleicht eine Straße wo ich mein Auto nicht lassen soll?

*P: Sie können Ihr Auto hier lassen, Sie werden keine Probleme haben..*

Translator: If you let your car here there will be no problems.

*T: Thanks for the information. Bye!*

Translator: Vielen Dank für die Informationen. Tschüss!

In the above text there can be seen where the actual software translators are wrong – the words in **bold**. The mistakes appear because of homonyms, names and common substantive used as names. Using CAS the interface will make a good decision when to translate common substantive or not (Hotel Hilton, Hochstraße).

If the translator will have the ability to record the conversation then the software will know when to use figurative speech or not (back-street has the meaning of dubious so the correct is *zweilich*), because the software will understand the context of the conversation. This situation is the same with the sentences that have figurative meanings, like “schon bewegen Sie sich auf dünnem Eis”, that’s why the correct form is “you move on thin ice” and not “you skate on thin ice”. So, if the conversation was stored by the trans-cultural application, after analyzing the context of it the software will realize that it is not a discussion about sports, hence the figurative version will be chosen.

When translating homonyms the current applications try to understand the context of the text needed to be translated because then will be an easy solution what connotation to use; that’s why recording the conversation is a good idea. If that suggestion will be used then the number of translation errors form the above conversation will drop significant. Tickets will not have the meaning as theatre tickets (*das Karten*) but as parking tickets (*das Parkticket*); the German word “Kiosk” will not be translated as “call box”, but as the English word “kiosk”; the German word “Strafe” will not be translated as “discipline”, but as “penalty”; and so on ...

#### 4 GRAPHICAL USER INTERFACE

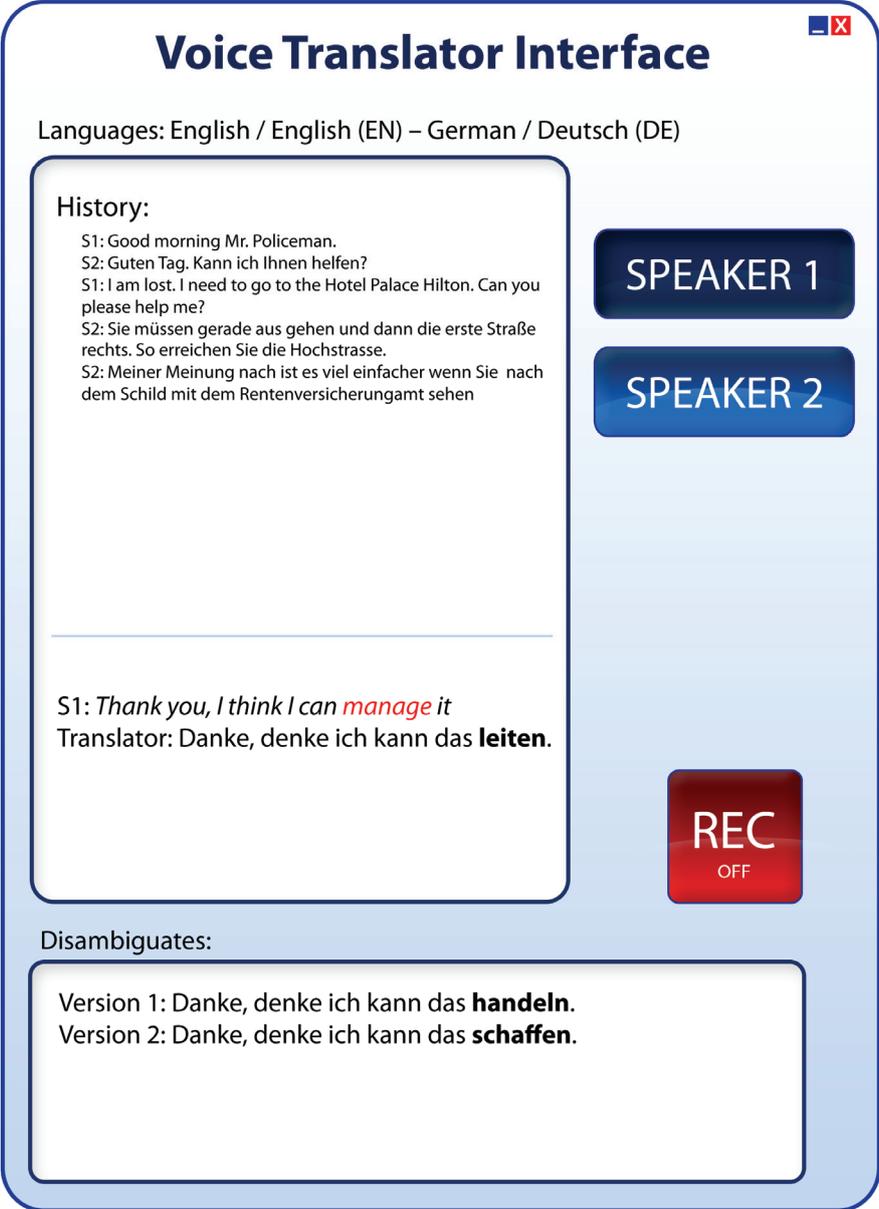


Figure 1: Graphical User Interface

Figure 1 presents the Graphical User Interface (GUI) of the translator application. As it can show we added the button Rec for recording the discussion. Also, we propose the History of the conversation to be displayed on the screen. The text area “Disambiguates” contains the possible meanings of the last sentence of a speaker. The GUI is created for smart phones of palms.

## 5 CONCLUSIONS AND FUTURE WORK

The *Voice Translator Interface* will improve the quality of voice translation because the software can adapt to the conversation. This adaptation is based on recording the discussion of the people who use it; in this paper the dialogue between the policeman and the foreign tourist. The recording itself do not require for the interface to have huge memory for storing because the format will be text, not audio. When somebody speaks, the Text-to-Speech module is running, so the text will be saved in the interface’s memory. This text represents the history, the log of the conversation. Based on the history, the interface will understand the context of the sentences that need to be translated and in case of homonym, homographs, homophones, heteronyms and capitonyms will recognize what sense is needed to be used.

The interface will be continually improved due to constant research in the three modules that is based on: Speech-to-Text, Translator and Text-to-Speech.

Future research goes in determination the correct number of last sentence to be regarded as relevant for the context of translation. Now, our interface is based on a constant number of sentences in recorded history (5 to 10), but a topic in a conversation can be changed from a sentence to another. The challenging problem is to know how to split the topics in a conversation, negotiation, discussion.

## 6 ACKNOWLEDGEMENT

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