

The brazilian sign language english language essay

[Linguistics](#), [English](#)



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and is a language of signs, as used in different countries, presents rules account for the formation of the signs and the organization of these structures and phrases speech. Unlike spoken languages, the primary organizers of sign languages are hands that move in space in front of the body and articulate signs in certain locations in space (SECRETARY OF EDUCATION, 2008). Research on sign languages have shown that these languages are comparable in complexity and expressiveness any oral languages. These languages express ideas subtle, complex and abstract. Your users can discuss philosophy, literature or politics, and sports, work, fashion and use them with aesthetic function to poetry, stories, drama and humor (FELIPE, 1997). Thus we have, for the deaf, the LBS is their mother tongue and Portuguese (writing) the secondary language is one that is perceived difficulty of much deaf community in learning Portuguese. This difficulty is due, among others, lack of sense of reasoning based on phonemes as we (listeners) do (associating the phoneme to grapheme; association is completely arbitrary to the deaf flag). This type of difficulty is the motivation for the creation of tools that assist deaf in learning and understanding of texts written in Portuguese. Moreover, there is also the need for listeners to learn sign language, primarily educators who must ensure compliance with the Federal Decree 5626, of December 22, 2005, which states that students must have a deaf education bilingual, in which the Brazilian Sign Language is the first and Portuguese, in written modality, the second.

Chapter 1. INTRODUCTION

2.1 Purpose

The primary objective of the project is to produce a translator able to analyze a text in Portuguese and generate a graphical output in an avatar that performs the corresponding

signals in LBS. A translator that we named "Translator Poli-Pounds." The translator must not only make a word for word translation, but do the consideration of syntax and context to the output approaches the maximum possible natural expression in LBS. Besides the basic function and more direct, which would support the deaf to understand a text in Portuguese, this translator can be used in some contexts or other products such as: ? Learning tool to learn POUNDS listener; ? Learning tool for deaf learn Portuguese; ? Generator power for video POUNDS increase the accessibility of websites. The translation result, it would be corresponding to "text in POUNDS" should also can be stored in order to create a form of digital encoding of POUNDS

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1. 2 Motivation As explained, the deaf in Brazil usually communicate by POUNDS, this being the language of these people, while Portuguese is like a second language. Given the significant proportion of this population that has difficulty reading and understanding texts in Portuguese, it would be desirable to obtain them access content encoded in LBS. Thus, this project aims to provide an alternative to this problem. However, not only the instant translation is desired, but also expect translation result, coded in pounds, is a product that can be manipulated Chapter 1. INTRODUCTION 3 by other tools aimed at deaf audience, in order to enable the creation of a legacy digital encoded POUNDS. In Brazilian academy there are other projects with similar goals, however, in general, these are not available to the general public, except for publications academic articles. Therefore, another goal of the project is the publicity of the results, including tools produced, so that they are public for use by all. The availability to the general public includes not

only end users, but any developers working on related projects, and to meet this audience another project goal is to develop the system in a modularized, so that certain modules may be reused independently. For third parties to take advantage of these modules in the construction of new systems is also fundamental to our system of release on a free license so that permits. This is because the situation when something is available and anything that sets the can be made, the rule of nothing is allowed until they receive specific permission. In this context arise licenses used in open source software, also called open source systems (open source), which ensures the user access to código fonte system, allowing them to make changes to adapt the software to their needs, helping with the development or even generate a new product with Based on the original. Thus, to encourage and facilitate the production of new tools that meet the needs of the deaf community, our systems will be published on licenses free.

1. 3 Related Work

In this section talks about other jobs that have similarities with the proposed project, highlighting the differences, advantages and disadvantages of each.

Dictionary Accesses Brazil A related work widely used in the deaf community is the dictionary POUNDS Accesses of Brazil (LIRA; SOUZA, 2008), which is an online tool query signals from Portuguese words. The dictionary is in fact quite complete, But our proposal presents several differences. First, the fact translate complete sentences and not just words. Furthermore, our vocabulary is expansível and scalable for display output generated computationally, as opposed to video, and Our dictionary module also presents a formal model based on signals in XML, so that it can be reused for other applications.

Falibras Falibras is a project done by the Institute of

Computing at the Federal University of Alagoas (CORADINE et al., 2007) whose purpose is very similar to ours: to make a Portuguese translator for LBS, with animated output. The project went through various developments, starting with a purely lexical and translation of short phrases, after implementing parsing and ambiguity reduction, then modularizing components. There is also an alternative approach to translation based memory. The problem with Falibras is that despite being very easy to find several related articles, there is nothing available to the end user, neither the developers. There are tools that actually help to community deaf in general, and that is the difference with our project, provide tools for the open-source community. TLibras Another translator Portuguese-POUNDS we find is the TLibras (LIRA, 2003), project OSCIP coordinated by Brazil and accessibility that has 3 different teams: one of LBS, the FENEIS (National Federation of the Deaf Education and Integration) one of NILC-USP for Natural Languages (Interinstitutional Center of Linguistics Computational) and computer graphics, the very accessibility Brazil. This project has more than 20 people, which demonstrates the complexity of the present proposal work. They planned three stages, beginning with texts in Portuguese, adding recognition voice in the second, and the third in implementing digital TV. The process of translating the TLibras uses the UNL (Universal Networking Language) (UCHIDA, ZHU, 2001) to bridge between languages. The UNL is a proposed intermediate language for translations, an interlanguage (top of the pyramid of Vauquois cited Conceptual Aspects of the section) to which all languages and can be translated be translated. That is, to use the UNL, the project team had to

TLibras basically do a mapping of various texts POUNDS to UNL, including morphological information, syntactic and semantic, and then the bridge would be made because the UNL-Portuguese translation already exists. A module is quite interesting TLibras which proposes creating primarily a 3D avatar that speaks POUNDS, which could be used in various applications through an entry in the Notation-Pounds (which was not specified in the article read). However, This project uses technologies not easily compatible with the Web, and as our aim is to have a translator available via internet, using this avatar would be infeasible (always would be generated videos, which consume a lot of resources). However, one difficulty we had was the fact finding nothing available to public of this project, though its release was scheduled for 2004. All we found was a story of Monica's gang translated that into (LIRA, 2003) that was referenced as a restriction of the initial stage, the only text that would be transcribed UNL was for a small comic with 5 sentences. Rybená The player Rybená (FERNEDA; COSTA; ALMEIDA, 2003) is a web tool that promises to translate texts of web pages for LBS through his animated avatar. A highlight of this work is the possible integration with mobile phones to send torpedo, although only 4 handset models are currently supported 1. This translator was the only one who could actually test, as there is a version functional on your site. However, we found that its use is not very intuitive and translation was performed word for word, creating the so-called Portuguese signaled what syntactically very different from LBS and therefore, the deaf tend not to accept. Not to mention that the Rybená is a commercial product, disagreeing with our free philosophy. 1. 4

Organization This document is divided into the following sections: 1 According

to the Rybená own site. Available at: http://www.rybena.com.br/produtos/devices_list.jsp?ckRybená=marked. Access on

05/12/2010

Chapter 2 - Conceptual Aspects: the basics are set to be

discussed throughout the document, the characteristics of LIBRAS,

concepts of formal languages and translation methods; Chapter 3 -

Technologies Assessed: studies on APIs and existing tools that have been

evaluated and, among some of them, used in the project; Chapter 4 -

Project Specification: In this section you define the requirements of design,

use cases and explanation of some decisions. In particular define the

architecture of the system with its divisions into modules, specifying the

functions each including a template definition herein of data encoding the

signals; Chapter 5 - Implementation: This chapter describes the

methodology and technical details on the implementation of the modules

specified in the architecture; Chapter 6 - Testing and Evaluation: This

chapter describes the main tests performed to validate the functionality of

the translator; Chapter 7 - Conclusions: This chapter assesses the project's

results and highlights future projects that will be based on this project;

Appendix A - Grammar free-of-context to model the Portuguese; Appendix B

- Organization of enclosed CD. Chapter 2 CONCEPTUAL ASPECTS 2. 1

POUNDSThe Brazilian Sign Language is the language used by deaf people to

communicate in Brazil. Sign languages are not much different from spoken

languages, being as complex and expressive as they are. The LBS is present

at all levels of analysis of other languages, but also have their own grammar,

its own syntax and its own vocabulary. The main difference compared to

languages spoken is the fact of being POUNDSa language visual-spatial,

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which is done through gestures and expressions with hands, head and body, perceived by sight. It is therefore different from Portuguese for example, which is an auditory-oral language uses sounds as perceived by hearing.

2. 1. 1 The morphology of the signal

The formation of a signal is defined basically by five parameters, which refer to the hands: configuration, location (or pivot point), motion and orientation of palms, and a fifth that refers to the use of non-manual features, which include facial expressions, mouth movements, gaze direction, which allows the expression of a significantly greater number of linguistic information. The configuration of the hand refers to the shapes of the hands, which may be the dactylology (Digital alphabet) or other shapes made by the dominant hand (right hand for righties) or by both hands. Since the location is the place in the body or space, in which the signal is articulated, the hand can touch any part of the body or be in a neutral space. The movement involves both the internal movements of the hand, the wrist movements in directional space, and the set of movements in the same sign. The orientation of palms is the direction in which the palm of the hand points to produce the signal. It may be upward, downward, into the body, forward, to the left or right. Finally, traces involve non-manual facial expression, body movement and look. Signs like CUTE, cute and handsome, for example, are represented by the same configuration, position, orientation and movement of the hand, however have different facial expressions.

2. 1. 2 Conventions Written form

This section describes the conventions we adopt throughout the paper as the representation of LBS in written form. One. Signs in POUNDS are represented by uppercase letters in Portuguese. Exs: CASA BALL. 2nd. Two or more words separated by hyphens represent a single

signal. Exs.: CORTARCOM-KNIFE, EAT APPLE3rd. When a word is represented by Datilogia (manual alphabet), it appears separate letter by letter. Exs.: M-A-R-C-E-L-O4th. Number agreement / staff or place is made with elements subscribed to signals. Ex: JOÃOa MARIAb aDARb THIS (the verb to agree with the pointsb, which refer to John and Mary, respectively). 5th. Facial expressions / body and adverbs of intensity are given envelope the signal. Exs: ANDARrapidamente, S IMbalanca head ???? 6th. Why do not usually have an ending to differentiate between male and female and singular or plural signs, they will be represented with an @ in the end. So AMIG @ means " friend", " friend", " friends" or " friends."

2. 1. 3 SignWriting

The notation for writing in POUNDS described in section 2. 1. 2 is the alternative usually used by several articles and studies in this field, since there is no official form of graphic representation. However, as is evident, this brings notation little or no information about the morphology of the signals used, this is from the lexeme CASA is impossible to imagine how it would be a corresponding signal, in contrast, the Portuguese words are formed by a sequence of syllables represent sound units well known, allowing the reader to " synthesize" the sound the word, even without ever having seen it before. But there is also a notation write enable sign language form clarify the morphological features of the signal, being named SignWriting, and that can be used to write any signs of sign language, the example of our alphabet Roman also allows the writing of several different languages. This system was invented in 1974 by American Valerie Sutton, a dancer who two years earlier had developed DanceWriting. With a symbol SignWriting you can specify characteristics of the signal as position, shape of the hand, the

finger joints, facial expressions and body etc.. an exampleSignWriting of text can be seen in Figure 2. 1. Figure 2. 1: Figure 2. 1: Example of text

SignWritingThe system began to receive attention in Brazil since 1996, as one ofmost relevant works on the subject Illustrated Encyclopedic Dictionary Trilingual (Capovilla; RAPHAEL, 2001), whose author is the psychologist responsible for the adaptation of SignWritingfor POUNDS; another important work is the Manual SignWriting (SUTTON, 2003), which is an American adaptation of the work originally written by the Valerie Sutton, being focused on showing SignWriting in the context of LBS. One of the main advantages of SignWriting is to enable deaf to write intheir own language, without having to resort to phonetic writing oral language tosymbolize the signs. However today the acceptance by the community of notationdeaf is still low, being considered one of the main reasons that its complexitymakes it difficult to learn. Another fact noted by the group is that in practice several signs of LBS are difficultto write in SignWriting the difficulty of determining the values of attributesforming the symbol SignWriting, and this, we believe, can also be a reason fornot receptive to SignWriting. Also joins the fact that, unlike pounds, a creation SignWritingartificial, made by listeners as a solution to be assimilated by the deaf (althoughthe assumption that there is some involvement to an enhancement of this SignWritingsense). 2. 1. 4 Classes grammaticalClasses or categories correspond to grammatical paradigms on a body ofwords. Through these new paradigms are obtained from other lexemes. ThereAlso paradigms connecting elements different parts of speech. The examplecites to number agreement between nouns and verbs. The set of grammatical categories of LBS is well mapped in Portuguese,

there is only one in each category is not present in another. The following observationson categories of LBS (FELIPE, 1997):? VerbsBasically, there are two kinds of verbs: those who do not agree and thatform (also called plain and non-plain, respectively). Those who do not agreeare always in the infinitive, being simpler. Ex: U. S. OFFICE WORK. As for those who agree, they can do so in three ways: One. Concordance number-staff: The orientation mark people's speech. The starting point agrees with thesubject and the final, with the object. Eg = 1sPERGUNTAR2s " I ask you" is different from 2sPERGUNTAR1s= " You ask me" 2nd. Gender agreement (person, animal, thing): hand configuration changes; Eg for signs of the verb walk, " walking person", " car walking", " animalwalks " 3rd. Compliance with the location: occurs with verbs designating actionsbegin or end at a certain place. The simplest explanation isthrough instance, to indicate that something was placed on the table work must, before signaling the verb 'put', represent the table at some pointarticulation, the sign of the verb must then be carried out having as destinationthe pivot point signal table.? The classifiers are classifiers settings hand, replacingname that precede them, can come along to the verb to classify the subject or objectwhich is linked to the action of the verb. So classifiers are markers in POUNDSof gender agreement: PERSON, ANIMAL, THING. the classifiersANIMAL PERSON for and can have plural, which is marked up to represent twopeople or animals simultaneously using both hands or making a motionrepeated for the number.? Article in Portuguese If there is no direct counterpart of classifiers POUNDSIn this language there is no corresponding article.? pronounsOne. personal pronounsThis subcategory of pronouns in POUNDS not only has the

ratingssingular and plural, but to indicate more precisely the right amountmany people's speech. For example, there are signs for: EU, U. S. 2, WE 3, 4 WE, WE-WE-ALL and GROUP. The same goes for the second(YOU) and third (IT) people. Full list: first person (singular, dual, trial, and plural quatrial): U. S., WE-2, WE-3, WE-4, GROUP WE-WE-TOD @;(b) second person (singular, dual, trial, and plural quatrial): YOU, YOU-2, YOU-3-4 YOU, YOU GROUP-YOU-TOD @;(c) third person (singular, dual, trial, and plural quatrial): @ EL, EL @ -2, EL @ -3, EL @ -4, @-EL GROUP, EL-TOD @ @2nd.

Demonstrative pronouns / adverbs of placeThe demonstrative pronouns and adverbs of place have basically thesame signal on LBS. @ EST / HERE, @ ESS / and THEN THAT / THERE are madepointing to the appropriate locations accompanied by a look at thesame. 3rd. interrogative pronounsThe pronouns WHICH, WHO, WHY, WHAT are generally used in the earlysentence, while WHAT, HOW, TO, WHAT, WHERE and WHO (meaning" Who is?") Are used in the end. Where both the pronouns question words or there is a facial expression indicating that the sentence is in the interrogative form.?

adjectivesAdjectives usually come after the noun they qualify and represent thecharacteristic iconic form.? adverbsAdverbs of intensity or so and have no signs themselves are indicatedmodifying the speed or repeating several times the sign referred to. Since there is no time stamp in verbs, adverbs TODAY PAST (or YESTERDAYYesterday) and FUTURE (TOMORROW) are generally used in the earlysentence to give this idea. 2. 1. 5 syntactic structure in POUNDSAccording Tables (1999) order based on LBS is present SVO (Subject-Verb-Object). Order base, for any reason that this structure could be understoodorder and other orders that can be derived from this and

not otherwise. This does not mean that the most common order is SVO. There are many situations in which the OSV order is better (in which the phenomenon occurs: topicalization, which consists in highlighting the issue first, contextualization) or SOV. Briefly, in POUNDS allowed to SVO, SOV and OSV (the latter two with restrictions). These constraints are, in general, due to the requirement of concordance between verb and subject / object and the presence of non-manual markings. SOV is preferable figure in sentences where certain "iconic" as in PIE WOMAN PUT-IN-OVEN. That is, there is shown first and then the cake is placed in the oven. This order is useful to first locate themselves objects in space and then signal action, linking them. Eg JOA Oa MARIA b a DAR b BOOK. OSV is also widely used (many point to as the most common order, as BRITO (2006)), because it represents the topic-comment order, allowing first that explain the context for the caller then explain the action that occurred. It is quite common since there are no restrictions on its use.

2. 1. 6 Degrees of Complexity POUNDS

Considering all these characteristics and difficulties, we set that would be a definition of LBS in different complexity levels, where each level adds an extra layer of complexity to the language. This scale was divided into 2: one only analyzes the signal and its internal aspects (lexical level) and other analyzes sentence structure as a whole (syntactic level). The purpose of this scale is also serving guide to an iterative implementation of labor, increasing the complexity of each level. Figure 2. 2 shows the grading level of the word and figure 2. 3, the level of the sentence. Figure 2. 2: Graduation POUNDS - word level Figure 2. 3: Graduation POUNDS - sentence level

2. 2 Linguistics

2. 2. 1 Grammars for Natural Languages

A formal language is a set of strings, where

each string can be formed combining the symbols of an alphabet?, then forming a subset of? * (all possible combinations of symbols). A grammar is a set of rules that define the formation of these chains, so a grammar defines a language. So being, there is an equivalence relation between grammars and languages, as on there is always at least one matching the other. The linguist Noam Chomsky in 1959, defined a hierarchy with four types of grammars (Languages) and the type 0 (recursively enumerable languages) that no presents no restriction and each subsequent type 1 (context sensitive languages), 2 (context-free languages) and 3 (regular languages) more restrictive than the above. That is, both for grammars for languages such as: Type 3? type 2? type 1? tipo 0. (Chomsky, 1959) Besides the correspondence between languages and grammars, there is correspondence those with recognizers which accept sentences belonging to the corresponding language and not reject the sentences corresponding to the language; matches are regular languages \$ finite automaton, context-free languages \$ automaton stack; \$ recursively enumerable language Turing machine. A grammar must be able to produce all sentences syntactically possible the corresponding language and must be unable to generate sentences syntactically invalid for the same language. However, because of the enormous complexity of languages natural, you can not find a perfect grammar that represents a language, and any grammar defined in the context of natural languages approximation of reality, ie, generate and recognize some sentences invalid. Jobs linguists have sought to analyze the syntactic structure of sentences through syntactic tree (FIORIN, 2005), which leads us to the use of free grammars context because these correspond to

stack automata, which are able to recognize structures in trees. Chomsky himself has also developed the theory of grammar transformational to perform analysis and natural language processing syntactic based on context-free grammars (Friedman et al. 1971).

CHAPTER 2. CONCEPTUAL ASPECTS

Furthermore, the use of context-free grammar for describing a natural language, What at first appears to correspond to an unrestricted grammar, is given by the fact that the use of higher types imply a very high computational complexity for sentence recognition, making its use impractical in applications where the processing time is important, for most of them. In (LUFT, 2002) we have a job of a linguist who seeks to generate a description of the Portuguese with the use of production rules of context-free grammars also presenting the syntactic structures analyzed in the form of trees.

2.2.2 Grammars transformational

The theory of transformational grammar was created and described by Noam Chomsky in his book *Aspects of the Theory of Syntax* (Chomsky, 1965) that seeks to create a general theory of linguistics showing the inherent substrate common to all languages Human (this set of standards is the very foundation "language", the innate ability any human being to learn their mother tongue) (LYONS, 1970). Chomsky makes a significant step towards formalizing the theoretical area of language, however this still falls short of formalization necessary to use on computers. Thus, researchers sought to interpret the computing proposal of Chomsky, filling gaps and making changes when necessary something to make it computationally tractable. The first proposal of formalizing Transformational grammar was presented by the book (Friedman et al., 1971), written in 1971. Originally Chomsky describes three

types of language representation: Generative grammar (linear generation of sentences)? Phrase structure grammar (generating sentences with nesting)?

Grammar transformativeA transformative grammar consists of: Sentence structure? Dictionary (lexicon)CHAPTER 2. CONCEPTUAL ASPECTS 17?

TransformationsThe phrase structure grammar is a context-free ordered in the same way that context-free grammars, but with some additional restrictions. The nodes of the trees, which describe the syntactic structures may be qualified for complex symbols. A complex symbol is formed by a list of " feature value +" where value = *, +, -, * Being a sign of uncertainty, the obligatory presence of + and - of mandatory absence (and presence of ausência feature). Features can be of the following types: Category: verb, noun, article etc.? Inherence: subjective qualification, as HUMAN ABSTRACT, THING, ANIMAL, ANIMATED etc..? Context: describes a tree that is a subtree in the parse tree, can obligation to determine the presence or absence of a particular element (qualified by feature class or inherently). The dictionary transformational grammar comprises a set of definitions features of a redundant set of rules and a set of lexical entries, each of these inputs being formed by a vocabulary and a complex symbol (Vocabulary is formed by several words). The lexical insertion is the process by which one enters the vocabulary tree nodes that so permits. The insertion must be done through the analysis of complex symbols (a word has a complex symbol, which must be compatible with the complex symbol node that will be inserted). Analysis for transformation to occur, a particular structural description (Structural description) must be present in the tree; beyond said a test is carried out inclusion complexes between symbols (from the description of the tree

structure). For a lexical insertion occurs, a contextual feature must be determined present in the tree, and besides if one performs compatibility testing complex symbol the lexical entry and element (element node is where lexical insertion occurs) Example of transformation: PLADEL TRANS / / IDSD% 2 INDEF N |-SG |%. / / Description of the structure/ / Which applies the transformation SC ERASE 2. / / Structural change applied Changes can also be conditional change. Looks like this: IF restriction THEN ELSE shift change. Besides the transformations, the third component of transformational grammar can also count on a control program, which is actually a program whose instructions are as defined transformations, namely the control program is a form of order transformations and determine on which points they are applied. Examples of control programs: 1) CP PASSIVE. / / PASSIVE applies the transformation/ / Change is made if any sub-tree/ / Condition with the structure defined in the transformation. 2) CP PASSIVE, FLIP, regdel. / / Apply various transformations 3) CP I. / / Apply all the transformations of the set I / / For each existing tree S / / This is done cyclically until / / Can not operate any more change As a programming language, the driver also has control elements, which are: IN, RPT (repeat), IF, FLAG, GOTO, TRACE, STOP. It is based on these studies is that it is perceived that the transformative grammar is a powerful tool in the analysis of syntactic structures and already considers predicted various aspects relevant to translation processes, an example is in fact the verb POUNDS have an agreement as to be subject THING, ANIMAL OR MAN. This is a case here to be treated with the features of inheritance. CHAPTER 2. CONCEPTUAL ASPECTS

19 It becomes clear here that a translator itself can actually be in a

programControl transformative grammar that would invoke the appropriate transformations, appropriate times in the appropriate paragraphs. 2. 3 Machine TranslationThe problem of the translation of a text into another done by machines is a problem with various solutions adopted by many pesquisadores (Vauquois, 1976). One approach was widely used for the translation rules, namely rules are defined morfológicas, syntactical or semantics to bridge the gap between the two languages. This method requires high knowledge of languages, and large participation of specialists in them to create the rules. Currently, it is said that we are in the " era of statistical translation," which follows a different approach by the rules. This " new era" were a basis of statistical models whose parameters are derived from the analysis of a language corpus, consisting of several texts in the two languages (Brown et al. 1990) and is widely used for solutions of translation today (LOPEZ, 2008). However, as further explained in section 4. 3 the statistical method is not the most suitable for the case of translation POUNDS. Within the field of translation rules based on a scale of complexity level and sophistication can be described by pyramid Vauquois (Vauquois, 1976) (Also called a triangle Vauquois) which has a slightly modified version shown in Figure 2. 4. It has levels for the translation, and as higher in the pyramid, the more " deep" is the analysis of language and therefore better translation would be performed. In the case of this figure, the original pyramid was divided into four levels. The first level, morphological, is only based on a translation words, ie based on only one dictionary. This type of translation is poor because it disregards any sentence structure or relationship between words. The second level is the syntactic analysis that performs the

syntax of the language, then considering these aspects mentioned. The third level corresponds to a study of semantic features text, taking into account the meaning of words, enabling a reduction of ambiguity below present levels and identifying linguistic expressions. The top pyramid would be a perfect translation, using a single intermediate language in which the other languages can be described completely. Figure 2. 4: Pyramid Vauquois - a modified version

Chapter 3 TECHNOLOGIES EVALUATED In various parts of the project we rely on existing technologies in order for more agility in development and greater quality in the final work obtained, striving to leverage the existing solutions to solve particular problems more peripheral our system, i. e. those which are not directly related translation algorithms. In this section we describe the technologies that were examined in this context, being some selected and used by us.

3. 1 Morphological Analyzers

Were raised possible morphological analyzers for Portuguese to which to base the implementation of some morphological analyzer that satisfied raised to the interface, which handles relations between syntactic analyzers and Morphological. Both analyzers were evaluated and the MXPOST JSpell. We studied the completeness of the information provided by each facility and the degree of integration planned for with the other modules of the project. The conclusions were: MXPOST The good of truth, unless a morphological analyzer, a program is MXPOST labeler (tagger), ie, it applies labels to the words they are presented, so based on a set of training data that it provided a learning supervised. Using the work " Taggers NILC's" 1 in which researchers applied MXPOST the training of morphological labels attached to texts in Portuguese, one may use the program to discover the morphological

classes of words in the languagePortuguese. 1 NILC's Taggers. Available at: . Access on 05/12/2010CHAPTER 3. TECHNOLOGIES EVALUATED 22The results presented MXPOST high success rate in tests. An example pair of input / output MXPOST trained: Input: The red cars hit the post. Output: Os_ART carros_N vermelhos_ADJ bateu_VERB no_PREP + ART poste_NHowever, the MXPOST has some limitations that led us to preteri it. Firstly, it would be easy to use it as a library: the existing classes hadlittle intuitive names and found no documentation beyond also not beopen-source and therefore not being able to see your source code in Java. Furthermore, theinformation provided by the program are limited and may be insufficient becauseit only returns the morphological class: no returns gender, number, or tense andtransistividade for verbsJSpellAnother alternative was the JSpell2. This is a morphological analyzer codeopen, which presents greater opportunities and information in its output. For example, given a lexeme entry if it matches more than one interpretation, all are presented. Even if there is no derivation itself to the lexeme(le it is a word unknown to the JSpell), it returns a set of possiblesolutions. In English, these solutions are approximate sequences of letterscalls near misses, and is just as JSpell the means; during the project describedherein, however, the nature of the information represented, treatedAs the " approximate solutions". The above example shows how the JSpell is complete varieties over the universearound a lexeme, but says nothing about how the lexeme itself is described by the tool. An explanation follows: for each possible interpretation, to be exact lexeme, referring to approximate solutions, it informed the dictionary form of the word, itscategoriaEXEMPLOS p .. or link description and information

relevant to the category (eg: forverbs, one pertinent information would be the number, person, etc., while for nouns, gender, etc.). 2 JSpell. Available at: <= http://natura.di.uminho.pt/wiki/doku.php?idtools:jspell>. Access on 05/12/2010. CHAPTER 3. TECHNOLOGIES EVALUATED 23The only problem is that it was made into Portuguese of Portugal. A big advantageJSpell of an outflow with more information: If there is doubt or several possibilities for a particular word, it shows alloptions; Gender and number; Tense; Identification of suffixes and prefixes of compound words3. 2 Tools GraphicsTo implement the synthesizer signal is essential to use computing technologiesgraphically, these tools being divided mainly into two categories: modeling tools that generate three-dimensional models and APIs that handlethese models at runtime. Below is a listing of the tools researched and considered in this process, including tools that fall into one of two categories or evenboth. FlashAt first we considered the possibility of using technology to be awidespread, both among and between users and developers up byobserve translation solutions for LBS (CORADINE et al., 2007) using Flash. However, with the use of Flash more suitable for 2D, it was observed that althoughwould be relatively easy to create an animation of a talking avatar POUNDS, wouldcreate a very complex model with segmented morphological unitsso they could be synthesized and integrated at runtime, for this typeTask 3D models show themselves much more appropriate. CHAPTER 3. TECHNOLOGIES EVALUATED 24BlenderBlender is a suite of 3D content creation open source, available under the GNUGeneral Public License (GPL) for all major operating systems. Besides allowing the modeling of 3D objects, also contains a built-in game engineallowing the

manipulation of objects in real time, including usingscripts in Python (which is equivalent to the tools that define the type gráficosAPI). In this regard, one of the latest tool was made in the production of a game, Yo Frankie!, available for download, including the project files of Blender. The site of the tool has ample documentation, so we start learning through their tutorial on the wiki site 3. Furthermore the group held purchase book Mastering Blender (MULLEN, 2009), which discussed in depth issues related to the game engine, since the user community in general can find more focused on how to use Blender 3D modeller. Following these sources we build an animation of a hand, being built based on a hand model downloaded from the Internet, the model contained only the "Skin" and we created the armor structure (bones) to the model and the manipulation Armour was generated video with animation. Figure 3. 1: Sample screen of Blender One disadvantage of using Blender is that there seems to be no way of integrating the result into an environment like the web or even generate a standalone without the user himself has Blender installed on your machine. Another supposed disadvantage is the high learning curve of Blender feature for which it is famous. Shows is that the community recognizes that Blender is not designed to be easy or intuitive, but to be a tool high productivity as soon as you master it. However in our experience with environment, this difficulty ended up being much lower than expected due to this overall impression.

Processing It consists of an open source Java API for generating interactive applications 3D simplest usage generally didactic, which allows direct manipulation of models OBJ format text, supported by virtually all 3D modeling tools. Its main advantage is the ease of learning, but has serious

limitations, the impossibility to handle designs which have bones that are used to create linkages and movement restrictions between parts of the model to be animated; in general it can be said that is not suitable for handling animated characters, although sufficient for practical and other graphics applications, such as puzzles by example. Another advantage is that the resulting application is actually an applet, or one Java application integrated with web browsers. Panda3D Like Processing, Panda3D is also an open source API for manipulating runtime of graphical models. Its advantage is that it is a professional tool, has been developed and used by Disney and Carnegie Mellon University's Entertainment Technology Center. One of the main advantages of Panda3D Processing is about the possibility of dealing with the concept of bones at runtime. CHAPTER 3. TECHNOLOGIES

EVALUATED 26 Although it has a very small user base, its developer community proved very open to newcomers, providing aid to those who really friendly wish to dominate technology, contrary to what typically happens in the community Blender, which prefers appreciate the extensive documentation. It also presents an advantage over the game engine Blender, which has no documentation as wide as compared with the total application documentation as a whole and also because of the Blender game engine is the most immature of tool. But as Processing is only API would still need a modeling tool, so that a good combination of Panda3D as would be the API and Blender as modeling tool. 3D Studio As Blender is also a 3D modeling environment. The main difference is that the 3D Studio be a proprietary tool and face, but at the same time, have a much greater market penetration. Both Blender when 3D Studio can generate models compatible

with Processing and Panda3D. Comparison In the table below we summarize the main characteristics of the computing tools Graphical considered. Note1: considering the language of the table, it would be more advantageous for us Java would, by now possess a larger domain and the rest of the project is in Java; Note2: not listed in the table, but remembering that Panda3D still has the advantage Additional warmth of your community. With this analysis, we conclude that the principle would be the best combination using Blender for modeling and the Panda3D for the API, however, for reasons that will be explained in the section that deals with the implementation of the system, already anticipate that the combination chosen was the 3D Studio for modeling and for the Processing API

Table 3. 1: Comparison of computer graphics technology

	Flash	Processing	Blender	Panda3D	3D Studio
Modeling	Yes	Yes	Yes	Yes	Yes
(2D)	Yes	No	No	Yes	Yes
API	Yes	Yes	Yes	Yes	Yes (at best)
User base	Large	Medium	Small	Small	Large
Documentation	Small	Medium	Large	Wide	?
language	Action Script	Python	Java	C + + / Python	-Integrating web
Yes	No	Yes	Yes	-	
Learning curve	Medium	Large	Small	Medium	?
Open source	No	Yes	Yes	Yes	Yes

Web 3. 3 Frameworks For the development of modules web technologies that could be studied and used to provide a gain in productivity, preventing loss of time with the writing code repetitive Chamdo the boilerplate code, whether the construction of interfaces and manage navigation between pages, as in automating the mapping object-relational to store information in databases. Java EE - Servlets (Java EE or J2EE or Java 2 Enterprise Edition, or Java Enterprise Edition in Portuguese) is a platform for server programming in the programming language Java. The basic technology for the processing of requests are the Java EE platform servlets, while the interface is mainly

generated by JSP (Java Server Pages). Servlets are basically user-defined classes that performs processing the web application and generates the HTML page response, or more properly, Arrow parameters and forwards the request to a JSP page that is more appropriate for interface design. The part of the system that manages the lifecycle of servlets and they forward the requests coming to the server is called container, and the best known open source implementations Tomcat and Glassfish. In general, the most advanced frameworks for Java / web are based on technology servlets.

CHAPTER 3. TECHNOLOGIES EVALUATED 28 In our work first extensively studied these technologies through a book (BATES; SIERRA; BATES, 2008) and initiated the implementation based therein. However, we find that your use codes demanded extensive and repeated for treat navigation as well as making the mapping between request parameters and objects. So we decided to verify the possibility of using more advanced frameworks. Struts Struts was one of the first Java EE frameworks, implementing a layer parent, according to the model MVC web application, simplifying the use of servlets, requiring only the creation of classes Action This framework was originally developed by Craig McClanahan and donated to the Apache Software Foundation in 2002, which continues to be developed according to this standard foundation. JBoss Seam It is a more advanced framework developed by Red Hat, part of the JBoss application server, which consists of a platform that encompasses the container and most other facilities for developers to create Java applications server. The idea of the framework is basically an easy way to create together (hence the name) technologies EJB components (business logic) and JSF interfaces (one"

Evolution" of the JSP). It also provides components that greatly facilitate the creation of CRUD's (forms for creating, editing, updating and removing entities from the database data). However, being very powerful, also has a considerable learning curve, In particular we must deal with several complex configuration files. CHAPTER 3. TECHNOLOGIES EVALUATED 29 VRaptor It is an MVC Framework for Java Web development focused on fast, promising its users a high productivity with a low learning curve, saving time in developing solutions. VRaptor is developed by Caelum, school that offers courses in Java are Paul. As in other frameworks, the idea is to release the developer of repetitive code tedious and connected to technology so you can focus on the development of logic business. Some aspects is utilized to automate the conversion of request parameters HTTP objects expected by the controller and ease of navigation control between pages. An interesting feature is that the need of writing configuration files and generally supplanted by the use of conventions in programming parts of application that interacts with the framework. By having a simpler structure, with a direct documentation and easy to understand, and be sufficient for our needs (given the relatively small size of our web modules) that was our choice for web framework.

Hibernate When dealing with web applications is very common the need to store information in the database, but since the application we deal with objects in general you must perform a complex process of converting data into objects that can be registered in the database tables and vice versa. Hopefully this work can be automated with the use of frameworks that implement JPA (Java persistence API) that defines how Java EE applications should perform this conversion. The open source implementation of the most

known and used Hibernate JPA is that features support for multiple databases available, including MySQL, database also open source used by us. CHAPTER 3. TECHNOLOGIES EVALUATED 30 What's more, several frameworks, including Seam and VRaptor already have mechanisms integration that facilitate the configuration and use of Hibernate. Chapter 4 SPECIFICATION PROJECT 4. 1 Requirements functional Requirements? The system must perform the translation of a text to a text in Portuguese POUNDS, considering the syntactic aspects of languages involved.? The body of the dictionary should be expandable, allowing words to be cadastras gradually.? The basis of syntactic rules of the Portuguese language should be easily modifiable, allowing iterative adjustments during project development and facilitating linguists interactions with the system.? The translation result must be viewed through an animation, since few deaf know a system of written notation of sign language, as occurs with SignWriting.? The repository data dictionary should be available for other systems can use it (via a service architecture) Non-functional requirements? Although the output occurs with computer graphics, it is expected that the animation executable on typical computers without special plates for graphics acceleration.? One feature desired for the system is the modularity, so that components System can be used in other projects involving languages signals.? Waiting for the translator is also a system as transparent as possible without there are difficulties user to operate it. CHAPTER 4. SPECIFICATION PROJECT 32? It is hoped that the system is implemented using platforms and technologies opened. 4. 2 Use Cases This section will describe the expected use cases of the system. Figure 4. 1 contains the diagram of use cases, which are detailed below. Figure 4. 1:

Use cases UC1 - Title: Translate phrase Actors: User Preconditions:

none Primary flow of events: One. User accesses the system by selecting option " translate" 2nd. User tells the system the desired text in

Portuguese 3rd. User calls the translation 4th. System responds with the same text, but in Pounds. Alternative Flows: CHAPTER 4. SPECIFICATION PROJECT

332, if the user enters a text in another language or unfamiliar words, the system responds with words by spelling the same manual, ie, the word is

spelled signals through the loan of Pounds. UC2-Insert new signal Actors:

expert Pounds Preconditions: none Flow winds primer: One. User accesses the system by selecting option " Insert new signal" 2nd. User provides the signal parameters 3rd. System responds as would be the signal described 4th. User validates the output 5th. User provides signal meaning in Portuguese 6th.

Signal system adds to your base Alternative flow of events: In 4, you can reject the response and return to step 2. Postconditions: new sign added to the system. UC3 - Edit existing signal Actors: expert Pounds Preconditions:

none Flow winds primer: One. User accesses the system by selecting option " Edit existing signal" 2nd. System displays list of all available signals 3rd. User chooses a signal to be edited CHAPTER 4. SPECIFICATION PROJECT 344th.

System displays all current parameters of the signal 5th. User modifies the parameters you want 6th. System responds as would be the signal

described 7th. User validates the output Eight. User provides signal meaning

in Portuguese 9th. System saves signal modifications to their base Alternative flow of events: 7, user can reject the response and return to step 5.

Postconditions: modified signal in the system. UC4 - Insert / Change

grammar rule Actors: expert Pounds Preconditions: none Flow winds primer:

One. User accesses the system by selecting option " Change grammar rule"

2nd. System displays list of all the grammar rules

3rd. User edits or inserts new rules

4th. System saves changes to the base

Postconditions: modified rules in the system.

4. 3 Design Decisions on Machine Translation

Although for Machine Translation in the statistical models are the most

commonly used, this work has a great restriction on the use of this method:

the language is the object pounds, which is constituted by signs and visual

space is not

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having written form.

Therefore, there are hardly any written texts in POUNDS to serve as a corpus

and that there are at notations difficult to be processed or underused, as

SignWriting. Given these facts, we chose to use method of translation rules

for this work. Various levels of translation presented in Section 2. 3, this

translator will act in second, the syntactic level, ie, the bridge between

languages is the transformation of the structure syntactic Portuguese into the

syntactic structure of LBS. This level was chosen for represent a cost-

effective, not showing the simplicity unwanted a translation morphological

but not going further merit of semantic analysis for that present very high

complexity that would flee the scope of this work. The thesis defended by

Quadros (1999) presents a proposal of what would be the structure phrasal

LIBRAS, more specifically the structure of a sentence. She divided it into

two categories, for verbs plain and non-plain, ie defined syntax trees for the

two POUNDS. Therefore these structures will be considered in this work to

define rules.

4. 4 Architecture

The system architecture translation poly-pounds, i. e. the representation of the units Software constituting the system (also called modules) and the relationship among them can be described

briefly in figure 4. 2. It is noteworthy since several of these blocks are independent units that can be directly reused in other applications. The following describes each of these system modules by specifying function, input and expected outputs.

4. 4. 1 Data Model

A key issue of this work is how can we digitally encode a sequence of signals (pounds or any other sign language) so that they can be processed by various applications. Figure 4. 2: System Architecture

This question corresponds approximately to the problem of how to register for texts written in sign language, which as already described in section aspects conceptual, still not well resolved within the deaf community. Initially, a chance for our translation system would provide the output now this notation SignWriting, which also contribute to building more easily a legacy written in LBS. However, as has also been exposed, now at Brazil SignWriting acceptance of the deaf community is low, so we chose by using this model only encoding system as "internal" systems that use, ie so that the user need not know know POUNDS SignWriting to operate our system. Thus, our coding system has attributes corresponding directly attributes expressed graphically in a symbol SignWriting. We did this based mainly on correspondence (SUTTON, 2003), work which describes extensively the attributes and possible values in SignWriting; CHAPTER 4. SPECIFICATION PROJECT 37

complementation of some aspects of the notation (possibilities of moving hands) were removed from the work of Tables (1999). Thus, we can define a data structure capable of encoding signals, represented by figure 4. 3

Figure 4. 3: Data Model

The figure shows that a signal is modeled as a sequence of symbols, and a symbol of what can be represented by a symbol SignWriting; created this distinction between sign

and symbol due to certain " composite signals" as AA-BB in that " AA" has a form of writing in SignWriting and " BB" another, and thereby " AA-BB" is being the signal, while " AA" and " BB" are symbols. Besides the symbol sequence, the aggregate signal also stamp information syntactic translator that can assist in your task. Thus, we have the following hierarchy of attributes to describe the signal: Signal: expresses an idea, which usually corresponds to a Portuguese word; name: name of the signal, like a word; words of Portuguese words that can match the sign; literal: words that must occur in the context of the signal; CHAPTER 4. SPECIFICATION PROJECT

38 inências: classes of words that should appear in context of the signal (eg, words that represent animals); Symbol: represents a combination of morphological that can be expressed with a symbol, or a figure of SignWrite; Location: where in the body the hands are positioned; Contact: form of interaction of the hand with the lease; Hands on unit: indicates that the two go hand to point of lease or if the non-dominant hand remains neutral space; Facial expression: defining characteristics of cheek, eyes, eyebrows, forehead, eyes, mouth, nose, teeth, tongue, and others; Hand (dominant and non-dominant): Setup: how the fingers are articulated; Guidance: If the palm is facing the emitter or against him, facing the floor or to heaven; Plane: the arm with the hand are vertically or horizontally; Fingers: how fingers move. Based on this data structure defined primarily synthesized on a set class, according to the paradigm of Object Orientation. These classes are then used to serve as input to processes tables to define structures in a database capable of storing data and structure (or schema) XML documents that can also represent these data. Morphological Analyzer 4. 4. 2 Figure 4. 4 illustrates

the specification of this module. For parsers have focused on parsing of sentences, and this, as the name implies, your ultimate goal, it is certain independence necessary. Figure 4. 4: Specification of the morphological analyzer concerning achievement of lexemes. Aiming to provide this decoupling the analyzer syntactic, arises the idea of using a morphological analyzer. It is said that this structure to that underlies because a parser is used to obtain morphological analyzer tokens as syntactic analysis, syntactic, continues. It should be noted that the verification scores and, logically, diacritics, this structure, it is the morphological analyzer. But why not treat function of these signs, he should notify them to the overlying layer through syntactic tokens agreed. Typically, a morphological analyzer uses morphological tokens until most possible amount of consumed is, it returns to some automaton overlying corresponding token. In the case of natural languages it is common that the same sequence of tokens morphological join more than one syntactic sense. Is exemplified: The phrase "as awake in the sea," the morphological analyzer would be dubious about deciding whether the sequence of letters (And hence morphological tokens) "as" is an adverb, a conjunction, or even if corresponds to a combination of first-person singular present indicative of voice. An active verb "eat". In fact, this decision will not fit. He should just tell the parser possible meanings of morphological token in question. That is, to the previous example, the three possible meanings for the lexeme "how" should be returned.

4. 4. 2. 1 Tokens morphological

Were planned for the tokens morphological characteristics of the classes listed. Then, being a token that does not necessarily have all these classes defined (However, there classes of features that can not coexist

grammatically). These classes are very much inspired by the default dictionary provided by the project JSpell. CHAPTER 4. SPECIFICATION

PROJECT 40It is worth noting also that only the characteristic " category" is Mandatory, it is essential for analysis superjacent. CAT, " category". Possible values and meanings: adj: adjectiveadv: adverbArticle: Articlea_nc: adejetivo / common nouncard: cardinal numbercon: conjunctioncp: contractionIn: interjectionnc: common nounnord: ordinalnp: namepass: particle

passivatingpunct: scorePPOs: possessive pronounpind: indefinite pronounpdem: demonstrative pronounPINT: interrogative pronounPEPs: personal pronounPrel: relative pronounprep: prepositionv: verbFeatures for adjectives and nouns (adj, a_nc, nc, np)name: Description: " lead article," Common toponyms. Possible value and meaning: 1: yesname: , " genre"

CHAPTER 4. SPECIFICATION PROJECT 41Possible values and meanings: _: undefinedf: femalem: malen: neutral2: both male and femíneoname: , " number" Possible values and meanings: n: neutralp: plural_: Undefined: singularname: , " degree" Possible values and meanings: sup:

superlativedim: diminutiveConjugation, vVerbs must also be labeled, and with the number, and with peopletransitivity and with time. Thus, specific category are: name:

, " person" Possible values and meanings: 1: first3: third2: second1_3: first / thirdname: , " time" Possible values and meanings: ip: personal infinitiveinf:

infinitiveCHAPTER 4. SPECIFICATION PROJECT 42pp: preteriteppa: past participlepc: present conditionalpic: the imperfect subjunctivec:

Conditionalp: presentfc: future of conjunctiveg: gerundpmp: pluperfect

tensepi: imperfectf: futurei: imperativename: , " transitivity" Possible values and meanings: _: Transitive / intransitivei: intransitivet: transitiveOf Adverbs, advFor this part of speech, marking also be returned to its subcategory, in the following mold: name: , " subcategory adverbial" Possible values and meanings: place: adverb of placemode: mode adverbneg: adverb of negationquant: adverb of quantitytime: time adverbContractions, cpCHAPTER 4. SPECIFICATION PROJECT 43In the case of contractions involving adverbs, articles, prepositions and pronouns, thefollowing tags are used when appropriate: Notation: tag: ability, possibility, (...). List: Adv: the where, there, somewhere, here, once. Art: As, a, a, o. Prep: by, for, from, in, with. Prep2: between. Pdem: this, this, this, that, this, this. Pdem2: other. Pind: something, another, another, some, someone,. PPES: follow it, te, Article, Nosco, me, vosco, you, migo. The markings Prep2 Pdem2 and should be used when the contraction occurs betweentwo elements of the same class, and these markings for identification ofsecond element of the contraction. Semantics or Inherent FeaturesThe inherent characteristics required for a conversion of written PortuguesePOUNDS more correct to be marked with the label SEM, which is already the mode usedby morphological analyzer Jspell to inform the researcher about featuressemantics of the word. Thus, Feature: Proposed values and meanings: River: Rivermonth: monthbook: literarypo: peoplehave: locationcountry: countryn: Roman numeralCHAPTER 4. SPECIFICATION PROJECT 44sea: Concerning the markp: Portuguese namep1: foreign namepl: planetAcronym: Acronymmitol: mythological beingscont: Mainlandcid: citylanguage: languageinstitution: institutionservice: serviceproj: Project4. 4. 3 ParserFigure 4. 5: Specifying the

parserThe parser takes a sequence of tokens and says if this firstFollowing is grammatically correct, ie, if it belongs to the Portuguese language.

thisoperation models the Portuguese language as a context-free language

and is basedin a context-free grammar formulated based on the work

Modern GrammarBrazilian (LUFT, 2002). As the sentence grammatically

accepted, the parser mustreturn a parse tree of the sentence so that it can

be operated in the next phase. This is thebehavior described in Figure 4. 5.

CHAPTER 4. SPECIFICATION PROJECT 45Here is a point of major limitation of

the work, to want to treat the Portuguese languageas a context-free

language. For that defines a scope of phrasesformal and " well-behaved". At

this stage already eliminates some ambiguities of the morphological

analyzer (eg " home" can be either a noun or verb (married)), since not all

combinations linearclasses of grammatical trees can generate valid, but we

still have morea valid tree, a situation that could be resolved with semantic

analysis. For the performance of this component can be improved, the rules

of grammarcontext-free should be subject to editing by expert linguists. 4. 4.

4 Transformer SyntacticFigure 4. 6: Specification of transformer syntacticThe

transformer is the first syntactic element that makes the bridge between the

twoin our language translator. As the translation we propose is the level of

syntax, itthe syntactic processor, through rules that map syntax to

Portuguesesyntax POUNDS, modify the structure of the sentence in

Portuguese for a structurePOUNDS, so that it is syntactically correct in the

target language and its semanticsis maintained. As seen in Figure 4. 6, the

goal of transforming the syntactic module is receivinga syntax tree in a

language (Portuguese) and return the sequence of tokens (words)resultant.

Opera, so on the parse tree obtained by performing transformational grammar defined in order to obtain a sentence " Portuguese simplified " which would be written in the form of words in Portuguese that is closest Syntax of LBS. This sequence also contains words in Portuguese, but organized to represent a sentence in POUNDS, exactly the same way we use to represent the Portuguese phrases in POUNDS in written form along this work, with the addition of syntactic and morphological information for each word. The transformer is based on syntactic grammar rules of LBS, but unknown how words can be represented by signs (morphology POUNDS). This step involves the following problems: removal of unnecessary articles and prepositions? placement of adverbs of time at the beginning of sentences? placing the adjective after the noun qualified? detect comparison (equality or inequality), and make the appropriate changes? positioning of pronouns WHO, WHERE, WHAT? positioning WHAT, HOW and WHAT-TO (top) and BY-YOU (end)? Changing the order of the sentence (SVO, SOV, OSV) as this verb present.

4. 5 contextualizing

Figure 4. 7: Specification of contextualizing

This module acts after prayer has been simplified by transforming the syntactic and corresponding signals obtained by the dictionary Portuguese-POUNDS, as shown in Figure 4. 7. It will be seen that there may be changes on the performance foreseen for the signals originating from CHAPTER 4.

SPECIFICATION PROJECT 47 Purely context analysis or a combination thereof with desambiguação. Change source contextual typically occur in the presence of adverbs, context surrounding the main verb. As for disambiguation, this occurs when there is more than one signal for the

English word to be translated. Its performance is particularly notable in cases such as the adverb " quickly". This adverb is not transmitted by the speaker of LBS through a new sign, but by changing signal characteristics main verb. In this case, the information that the main verb is followed by the adverb " quickly" is added by the transformer syntactic information contained in the verbal token. Eventually, after the module contextualisador perform conversions basic tokens for signals which contain description of how the signal should be held, it should modify the descriptive attributes appropriately, adding syntactic information provided by the processor. Continuing with the example, the attribute contextualisador increase the speed of the object Hand Movement hands used by the signal corresponding to the modified verb. For the phrase " to eat quickly chocolate", the information flow takes place as described: One. the syntactic processor includes the token " eat" the information that the adverb intensity " quickly" modifies the. 2nd. the contextualisador relates the adverb " quickly" to speed completion of sign " eat" 3rd. returns the list of objects signs. As the characteristics described in section 2. 1, other changes may be: demand signal most suitable for an ambiguous position based on the analysis of context; appearance time can determine frequency of motion; the pivot point may be a mark verb agreement with the adverb of place; hand configuration may change as subject, ranging up person, animal or thing; CHAPTER 4. SPECIFICATION PROJECT 48 orientation can be a number-agreement personnel; some words change according to the context of signal analysis (literal or characteristics Surrounding the inference); denial formed by counter movement or head movement; detect variations

(number) of personal pronouns;? variation of the pronoun WHO as the context requires;? add expression interrogative / exclamatory punctuation as found;? WHEN disambiguation (three possible signals);? DAY disambiguation (two possible signals);? disambiguation of numerals. For now there is no formal definition of a data structure that is able to tell contextualising what to do. Therefore, although one can say that this component is built based on knowledge of grammar POUNDS, not for now One can separate this knowledge, the typical expert linguist, the implementation of tool (made by the developer). In this module there special treatment for certain words, such as linking verbs and adverbs that alter the morphology of the signals (eg quickly), this treatment "Hard-coded" is not at all absurd, since these categories consist of lists of closed words.

4. 4. 6 Signal Synthesizer 3D

The output generated by the translator, a codification of the signs of the sentence in XML, can be used for various kinds of tools, such as a synthesizer or SignWriting even for a text plan describing the signs, but the solution adopted in this work is an output of computer graphics animation, in which a virtual avatar carries the signals described in XML. Thus, the synthesizer consists of a module attachable to other applications it receives the XML description of a sentence in POUNDS, this description based on our moCAPÍ

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delo data, and summarizes the movements required in accordance with the attributes set adosthat description. Collaborative Tool

4. 4. 7A collaborative tool

it is a web application dedicated to the creation and consultation of entries in the dictionary Portuguese - POUNDS collaboratively conceptually similar to Wikipedia, which allows access via software such entries, in the form

ofWebServices. This tool was named " WikiLibras." This tool is very important for the design as it allows for collaboration