

# [The brazilian sign language english language essay](https://assignbuster.com/the-brazilian-sign-language-english-language-essay/)

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and is a language of signs, as used in different countries, presents rulesaccount for the formation of the signs and the organization of these structures and phrasalspeech. Unlike spoken languages, the primary organizers of sign languages ​​arehands that move in space in front of the body and articulate signs in certainlocations in space (SECRETARY OF EDUCATION, 2008). Research on sign languages ​​have shown that these languages ​​are comparablein complexity and expressiveness any oral languages​​. These languages ​​expressideas subtle, complex and abstract. Your users can discuss philosophy, literature or politics, and sports, work, fashion and use them with aesthetic functionto 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 muchdeaf community in learning Portuguese. This difficulty is due, among others, lack of sense of reasoning based on phonemes as we (listeners) do (associatingthe phoneme to grapheme; association is completely arbitrary to the deaf flag). This type of difficulty is the motivation for the creation of tools that assistdeaf 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 educationbilingual, in which the Brazilian Sign Language is the first and Portuguese, inwritten modality, the second. Chapter 1. INTRODUCTION 21. 1 PurposeThe primary objective of the project is to produce a translator able to analyze atext in Portuguese and generate a graphical output in an avatar that performs the corresponding signalsin LBS. A translator that we named " Translator Poli-Pounds." The translator must not only make a word for word translation, but do the considerationssyntax and context to the output approaches the maximum possiblenatural expression in LBS. Besides the basic function and more direct, which would support the deaf to understanda text in Portuguese, this translator can be used in some contexts or otherProducts 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 alsocan be stored in order to create a form of digital encoding of POUNDS

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1. 2 MotivationAs explained, the deaf in Brazil usually communicate by POUNDS, this being the language of these people, while Portuguese is like a secondlanguage. Given the significant proportion of this population that has difficulty reading and understandingtexts in Portuguese, it would be desirable to obtain them access content encodedin LBS. Thus, this project aims to provide an alternative to this problem. However, not only the instant translation is desired, but also expectstranslation result, coded in pounds, is a product that can be manipulatedChapter 1. INTRODUCTION 3by other tools aimed at deaf audience, in order to enable the creation of alegacy 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 publicationsacademic articles. Therefore, another goal of the project is the publicity of the results, including tools produced, so that they are public for use byall. The availability to the general public includes not only end users, but anydevelopers working on related projects, and to meetthis 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 systemsis also fundamental to our system of release on a free license so thatpermits. This is because the situation when something is available and anything that sets thecan be made, the rule of nothing is allowed until they receive specific permission. In this context arise licenses used in open source software, also calledopen source systems (open source), which ensures the user access to códigofontesystem, allowing them to make changes to adapt the software to theirneeds, helping with the development or even generate a new product withBased on the original. Thus, to encourage and facilitate the production of new tools that meetthe needs of the deaf community, our systems will be published on licensesfree. 1. 3 Related WorkIn this section talks about other jobs that have similarities with theproposed project, highlighting the differences, advantages and disadvantages of each. Dictionary Accesses BrazilA related work widely used in the deaf community is the dictionary POUNDSAccesses of Brazil (LIRA; SOUZA, 2008), which is an online toolquery signals from Portuguese words. The dictionary is in fact quite complete, But our proposal presents several differences. First, the fact translatecomplete sentences and not just words. Furthermore, our vocabulary is espansível andscalable for display output generated computationally, as opposed to video, andOur dictionary module also presents a formal model based on signalsin XML, so that it can be reused for other applications. FalibrasFalibras is a project done by the Institute of Computing at the Federal University ofAlagoas (CORADINE et al., 2007) whose purpose is very similar to ours: to make aPortuguese translator for LBS, with animated output. The project went through FalibrasVarious developments, starting with a purely lexical and translation of short phrases, after implementing parsing and ambiguity reduction, then modularizingcomponents. There is also an alternative approach to translationbased memory. The problem with Falibras is that despite being very easy to findseveral related articles, there is nothing available to the end user, neither the developers. There are tools that actually help to communitydeaf in general, and that is the difference with our project, provide toolsfor the open-source community. TLibrasAnother translator Portuguese-POUNDS we find is the TLibras (LIRA, 2003), projectOSCIP 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 LinguisticsComputational) and computer graphics, the very accessibility Brazil. This projecthas more than 20 people, which demonstrates the complexity of the present proposalwork. They planned three stages, beginning with texts in Portuguese, adding recognitionvoice 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 proposedintermediate language for translations, an interlanguage (top of the pyramid of Vauquois citedConceptual Aspects of the section) to which all languages ​​and can be translatedbe translated. That is, to use the UNL, the project team had to TLibrasbasically do a mapping of various texts POUNDS to UNL, includingmorphological information, syntactic and semantic, and then the bridge would be made because theUNL-Portuguese translation already exists. A module is quite interesting TLibras which proposes creating primarilya 3D avatar that speaks POUNDS, which could be used in various applications throughan 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 aimis to have a translator available via internet, using this avatar would be infeasible (alwayswould be generated videos, which consume a lot of resources). However, one difficulty we had was the fact finding nothing available topublic 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 transcribedUNL was for a small comic with 5 sentences. RybenáThe player Rybená (FERNEDA; COSTA; ALMEIDA, 2003) is a web tool thatpromises 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 sendtorpedo, although only 4 handset models are currently supported 1. This translator was the only one who could actually test, as there is a versionfunctional on your site. However, we found that its use is not very intuitive andtranslation was performed word for word, creating the so-called Portuguese signaled whatsyntactically 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 OrganizationThis 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? ckRybena = marked. Access on 05/12/2010Chapter 2 - Conceptual Aspects: the basics are set to be discussedthroughout the document, the characteristics of LIBRAS, conceptsof formal languages ​​and translation methods;? Chapter 3 - Technologies Assessed: studies on APIs and existing toolsthat have been evaluated and, among some of them, used in the project;? Chapter 4 - Project Specification: In this section you define the requirements ofdesign, use cases and explanation of some decisions. In particular definisethe architecture of the system with its divisions into modules, specifyingthe functions each including a template definition herein of dataencoding the signals;? Chapter 5 - Implementation: This chapter describes the methodology andtechnical details on the implementation of the modules specified in the architecture;? Chapter 6 - Testing and Evaluation: This chapter describes the main tests performedto validate the functionality of the translator;? Chapter 7 - Conclusions: This chapter assesses the project's results and highlightsfuture 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 2CONCEPTUAL ASPECTS2. 1 POUNDSThe Brazilian Sign Language is the language used by deaf people to communicate inBrazil. Sign languages ​​are not much different from spoken languages, being as complexand expressive as they are. The LBS is present at all levels of analysis ofother languages, but also have their own grammar, its own syntax and its ownvocabulary. The main difference compared to languages ​​spoken is the fact of being POUNDSa language visual-spatial, which is done through gestures and expressions with hands, headand body, perceived by sight. It is therefore different from Portuguese for example, which is aauditory-oral language uses sounds as perceived by hearing. 2. 1. 1 The morphology of the signalThe formation of a signal is defined basically by five parameters, which is fourrefer to the hands: configuration, location (or pivot point), motion and orientationpalms, and a fifth that refers to the use of non-manual features, whichinclude facial expressions, mouth movements, gaze direction, which allows the expressiona 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 signalis 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 movementsdirectional space, and the set of movements in the same sign. The orientation ofpalms 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 orright. Finally, traces involve non-manual facial expression, body movement andlook. Signs like CUTE, cute and handsome, for example, are representedthe same configuration, position, orientation and movement of the hand, however havedifferent facial expressions. 2. 1. 2 Conventions Written formThis section describes the conventions we adopt throughout the paper asthe 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 appearsseparate letter by letter. Exs.: M-A-R-C-E-L-O4th. Number agreement / staff or place is made with elements subscribed tosignals. 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 envelopesthe signal. Exs: ANDARrapidamente, S IMbalanca head ???? 6th. Why do not usually have an ending to differentiate between male and femaleand singular or plural signs, they will be represented with an @ in the end. So AMIG @ means " friend", " friend", " friends" or " friends." 2. 1. 3 SignWritingThe notation for writing in POUNDS described in section 2. 1. 2 is the alternative usuallyused by several articles and studies in this field, since there is noofficial form of graphic representation. However, as is evident, this brings notationlittle or no information about the morphology of the signals used, thisis from the lexeme CASA is impossible to imagine how it would be a corresponding signal, incontrast, the Portuguese words are formed by a sequence of syllablesrepresent sound units well known, allowing the reader to " synthesize" the soundthe word, even without ever having seen it before. But there is also a notation write enable signal language formclarify the morphological features of the signal, being named SignWriting, and that canbe used to write any signs of sign language, the example of our alphabetRoman also allows the writing of several different languages. This system was invented in 1974 by American Valerie Sutton, a dancer whotwo years earlier had developed DanceWriting. With a symbol SignWriting you can specify characteristics of the signal asposition, 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 afacial 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 notmeans that the most common order is SVO. There are many situations in which theOSV order is better (in which the phenomenon occurs topicalization, which consists inhighlight the issue first, contextualization) or SOV. Briefly, in POUNDS allowed to SVO, SOV and OSV (the latter two withrestrictions). These constraints are, in general, due to the requirement of concordancebetween verb and subject / object and the presence of non-manual markings. SOV is preferable figure in sentences where certain " iconic" as in PIE WOMANPUT-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 thensignal action, linking them. Eg JOAOa MARIAb aDARb BOOK. OSV is also widely used (many point to as the most common order, asBRITO (2006)), because it represents the topic-comment order, allowing first thatexplain the context for the caller then explain the action that occurred. It is quiteCommon since there are no restrictions on its use. 2. 1. 6 Degrees of Complexity POUNDSConsidering all these characteristics and difficulties, we set thethat would be a definition of LBS in different complexity levels, where each leveladds an extra layer of complexity to the language. This scale was divided into2: one only analyzes the signal and its internal aspects (lexical level) and other analyzessentence structure as a whole (syntactic level). The purpose of this scale is also servingguide to an iterative implementation of labor, increasing the complexity of eachlevel. 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 levelFigure 2. 3: Graduation POUNDS - sentence level2. 2 Linguistics2. 2. 1 Grammars for Natural LanguagesA formal language is a set of strings, where each string can be formedcombining the symbols of an alphabet?, then forming a subset of? \* (allpossible combinations of symbols). A grammar is a set of rules thatdefine the formation of these chains, so a grammar defines a language. Sobeing, there is an equivalence relation between grammars and languages, as onethere 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 nopresents no restriction and each subsequent type 1 (context sensitive languages), 2 (context-free languages) and 3 (regular languages) more restrictive than theabove. That is, both for grammars for languages ​​such as: Type3? type2? type1? tipo0. (Chomsky, 1959)Besides the correspondence between languages ​​and grammars, there is correspondencethose with recognizers which accept sentences belonging to the corresponding languageand not reject the sentences corresponding to the language; matchesare regular languages ​​$ finite automaton, context-free languages ​​$ automatonstack; $ recursively enumerable language Turing machine. A grammar must be able to produce all sentences syntactically possiblethe corresponding language and must be unable to generate sentences syntacticallyinvalid for the same language. However, because of the enormous complexity of languagesnatural, you can not find a perfect grammar that represents alanguage, and any grammar defined in the context of natural languages ​​approximationof reality, ie, generate and recognize some sentences invalid. Jobs linguists have sought to analyze the syntactic structure of sentences throughsyntactic tree (FIORIN, 2005), which leads us to the use of free grammarscontext because these correspond to stack automata, which are able to recognizestructures in trees. Chomsky himself has also developed the theory of grammarstransformative to perform analysis and natural language processing syntacticbased on context-free grammars (Friedman et al. 1971). CHAPTER 2. CONCEPTUAL ASPECTS 16Furthermore, 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 theuse of higher types imply a very high computational complexity forsentence recognition, making its use impractical in applications where theprocessing time is important, for most of them. In (LUFT, 2002) we have a job of a linguist who seeks to generate a descriptionthe Portuguese with the use of production rules of context-free grammars alsopresenting the syntactic structures analyzed in the form of trees. 2. 2. 2 Grammars transformationalThe theory of transformational grammar was created and described by Noam Chomsky inhis book Aspects of the Theory of Syntax (Chomsky, 1965) that seeks to create ageneral theory of linguistics showing the inherent substrate common to all languagesHuman (this set of standards is the very foundation " language", the innate abilityany human being to learn their mother tongue) (LYONS, 1970). Chomsky makes a significant step towards formalizing the theoretical arealanguage, however this still falls short of formalization necessary to useon computers. Thus, researchers sought to interpret the computingthe proposal of Chomsky, filling gaps and making changes when necessarysomething to make it computationally tractable. The first proposal of formalizingTransformational grammar was presented by the book (Friedman et al., 1971), writtenin 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 thatcontext-free grammars, but with some additional restrictions. The nodes of the trees, which describe the syntactic structures may be qualifiedfor 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 - ofmandatory absence (and presence of ausença featuure). 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, canobligation to determine the presence or absence of a particular element (qualifiedby feature class or inherently). The dictionary transformational grammar comprises a set of definitionsfeatures 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 thatso permits. The insertion must be done through the analysis of complex symbols (aword has a complex symbol, which must be compatible with the complex symbolnode 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 outinclusion complexes between symbols (from the description of the tree structure). For a lexical insertion occurs, a contextual feature must be determindapresent in the tree, and besides if one performs compatibility testing complex symbolsthe 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 transformationSC ERASE 2. / / Structural change appliedChanges can also be conditional change. Looks like this: IF restrictionTHEN ELSE shift change. Besides the transformations, the third component of transformational grammar canalso count on a control program, which is actually a program whose instructionsare as defined transformations, namely the control program is a form oforder 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/ / Condiza with the structure defined in the transformation. 2) CP PASSIVE, FLIP, regdel. / / Apply various transformations3) 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 changeAs a programming language, the driver also hascontrol 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 grammaris a powerful tool in the analysis of syntactic structures and already considersPredicted various aspects relevant to translation processes, an example isin fact the verb POUNDS have an agreement as to be subject THING, ANIMAL ORMAN. This is a case here to be treated with the features of inherence. CHAPTER 2. CONCEPTUAL ASPECTS 19It 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 withvarious solutions adopted by many pesquidores (Vauquois, 1976). One approachwas widely used for the translation rules, namely rules are defined morfogógicas, syntacticalor semantics to bridge the gap between the two languages. This method requires highknowledge of languages, and large participation of specialists in them to create therules. Currently, it is said that we are in the " era of statistical translation," which follows adifferent approach by the rules. This " new era" were a basis of statistical modelswhose parameters are derived from the analysis of a language corpus, consisting of severaltexts in the two languages ​​(Brown et al. 1990) and is widely used for solutions oftranslation today (LOPEZ, 2008). However, as further explained in section 4. 3the 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 leveland sophistication can be described by pyramid Vauquois (Vauquois, 1976)(Also called a triangle Vauquois) which has a slightly modified versionshown in Figure 2. 4. It has levels for the translation, and ashigher in the pyramid, the more " deep" is the analysis of language and therefore bettertranslation would be performed. In the case of this figure, the original pyramid was divided intofour levels. The first level, morphological, is only based on a translationwords, ie based on only one dictionary. This type of translation is poor becausedisregards any sentence structure or relationship between words. The second level isthe syntactic analysis that performs the syntax of the language, then considering these aspectsmentioned. The third level corresponds to a study of semantic featurestext, taking into account the meaning of words, enabling a reduction of ambiguitybelow present levels and identifying linguistic expressions. The toppyramid would be a perfect translation, using a single intermediate language in whichthe other languages ​​can be described completely. Figure 2. 4: Pyramid Vauquois - a modified versionChapter 3TECHNOLOGIES EVALUATEDIn various parts of the project we rely on existing technologies in orderfor more agility in development and greater quality in the final work obtained, striving to leverage the existing solutions to solve particular problemsmore peripheral our system, i. e. those which are not directly relatedtranslation algorithms. In this section we describe the technologies that were examined in this context, beingsome selected and used by us. 3. 1 Morphological AnalyzersWere raised possible morphological analyzers for Portuguese towhich to base the implementation of some morphological analyzer that satisfiedraised to the interface, which handles relations between syntactic analyzers andMorphological. Both analyzers were evaluated and the MXPOST JSpell. We studied the complitudethe information provided by each facility and the degree of integration planned forwith the other modules of the project. The conclusions were: MXPOSTThe good of truth, unless a morphological analyzer, a program is MXPOSTlabeler (tagger), ie, it applies labels to the words they are presented, sobased on a set of training data that it provided a learningsupervised. Using the work " Taggers NILC's" 1 in which researchers appliedMXPOST the training of morphological labels attached to texts in Portuguese, one mayuse 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(Ie 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 gráfiicasAPI). 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 startlearning through their tutorial on the wiki site 3. Furthermore the group heldpurchase book Mastering Blender (MULLEN, 2009), which discussed in depthissues related to the game engine, since the user community in general can findmore focused on how to use Blender 3D modeller. Following these sources we build an animation of a hand, being builtbased 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 manipulationArmour was generated video with animation. Figure 3. 1: Sample screen of BlenderOne disadvantage of using Blender is that there seems to be no way ofintegrating 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 featurefor which it is famous. Shows is that the community recognizes thatBlender is not designed to be easy or intuitive, but to be a toolhigh productivity as soon as you master it. However in our experience withenvironment, this difficulty ended up being much lower than expected due to thisoverall impression. ProcessingIt consists of an open source Java API for generating interactive applications3D simplest usage generally didactic, which allows direct manipulation of modelsOBJ 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 usedto 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 byexample. Another advantage is that the resulting application is actually an applet, or oneJava application integrated with web browsers. Panda3DLike Processing, Panda3D is also an open source API for manipulatingruntime of graphical models. Its advantage is that it is a professional tool, has been developed andused by Disney and Carnegie Mellon University's Entertainment Technology Center. One of the main advantages of Panda3D Processing is about the possibility ofdealing with the concept of bones at runtime. CHAPTER 3. TECHNOLOGIES EVALUATED 26Although it has a very small user base, its developer communityproved very open to newcomers, providing aid to those who really friendlywish to dominate technology, contrary to what typically happens in the communityBlender, which prefers appreciate the extensive documentation. It also presents an advantage over the game enngine Blender, which has nodocumentation as wide as compared with the total application documentation asa whole and also because of the Blender game engine is the most immature oftool. 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 Blenderas modeling tool. 3DStudioAs Blender is also a 3D modeling environment. The main differenceis that the 3DStudio be a proprietary tool and face, but at the same time, have a much greater market penetration. Both Blender when 3DStudio can generate models compatible with Processingand Panda3D. ComparisonIn the table below we summarize the main characteristics of the computing toolsGraphical considered. Note1: considering the language of the table, it would be more advantageous for usJava 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 advantageAdditional warmth of your community. With this analysis, we conclude that the principle would be the best combination usingBlender for modeling and the Panda3D for the API, however, for reasons that will beexplained in the section that deals with the implementation of the system, already anticipate that the combinationchosen was the 3DStudio for modeling and for the Processing APITable 3. 1: Comparison of computer graphics technologyFlash Processing Blender Panda3D 3DstudioModeling Yes (2D) Yes No No YesAPI Yes Yes Yes Yes (at best) notUser base Large Medium Small Small LargeDocumentation 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 NoWeb 3. 3 FrameworksFor the development of modules web technologies that could be studiedand used to provide a gain in productivity, preventing loss of time with thewriting code repetitive Chamdo the boilerplate code, whether the construction of interfaces andmanage navigation between pages, as in automating the mappingobject-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 languageJava. The basic technology for the processing of requests are the Java EE platformservlets, while the interface is mainly generated by JSP (Java Server Pages). Servlets are basically user-defined classes that performs processingthe web application and generates the HTML page response, or more properly, Arrow parameters and forwards the request to a JSP page that is more appropriatefor interface design. The part of the system that manages the lifecycle of servlets andthey forward the requests coming to the server is called container, and thebest known open source implementations Tomcat and Glassfish. In general, the most advanced frameworks for Java / web are based on technologyservlets. CHAPTER 3. TECHNOLOGIES EVALUATED 28In our work first extensively studied these technologies througha book (BATES; SIERRA; BATES, 2008) and initiated the implementation basedtherein. However, we find that your use codes demanded extensive and repeated fortreat navigation as well as making the mapping between request parameters andobjects. So we decided to verify the possibility of using more advanced frameworks. StrutsStruts was one of the first Java EE frameworks, implementing a layerparent, according to the model MVC web application, simplifying the use ofservlets, requiring only the creation of classes ActionThis framework was originally developed by Craig McClanahan and donated tothe Apache Software Foundation in 2002, which continues to be developed according tothis standard foundation. JBoss SeamIt is a more advanced framework developed by Red Hat, part of lotused JBoss application server, which consists of a platform that encompasses thecontainer and most other facilities for developers to create Java applicationsserver. The idea of ​​the framework is basically an easy way to create together (hence thename) technologies EJB components (business logic) and JSF interfaces (one" Evolution" of the JSP). It also provides components that greatly facilitate the creation ofCRUD's (forms for creating, editing, updating and removing entities from the databasedata). However, being very powerful, also has a considerable learning curve, In particular we must deal with several complex configuration files. CHAPTER 3. TECHNOLOGIES EVALUATED 29VRaptorIt is an MVC Framework for Java Web development focused on fast, promisingits users a high productivity with a low learning curve, savingtime in developing solutions. VRaptor is developed by Caelum, school that offers courses in Java arePaul. As in other frameworks, the idea is to release the developer of repetitive codetedious and connected to technology so you can focus on the development of logicbusiness. Some aspects is utilized to automate the conversion of request parametersHTTP objects expected by the controller and ease of navigation controlbetween pages. An interesting feature is that the need of writing configuration filesand generally supplanted by the use of conventions in programming parts ofapplication 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 sizeour web modules) that was our choice for web framework. HibernateWhen dealing with web applications is very common the need to storeinformation in the database, but since the application we deal with objects in generalyou must perform a complex process of converting data into objects that canbe registered in the database tables and vice versa. Hopefully this work can be automated with the use of frameworks that implementJPA (Java persitence API) that defines how Java EE applications should performthis conversion. The open source implementation of the most known and used Hibernate JPA is thatfeatures support for multiple databases available, including MySQL, database also open source used by us. CHAPTER 3. TECHNOLOGIES EVALUATED 30What's more, several frameworks, including Seam and VRaptor already have mechanismsintegration that facilitate the configuration and use of Hibernate. Chapter 4SPECIFICATION PROJECT4. 1 Requirementsfunctional Requirements? The system must perform the translation of a text to a text in PortuguesePOUNDS, considering the syntactic aspects of languages ​​involved.? The body of the dictionary should be expandable, allowing words to be cadastrasgradually.? The basis of syntactic rules of the Portuguese language should be easily modifiable, allowing iterative adjustments during project development and facilitatinglinguists interactions with the system.? The translation result must be viewed through an animation, sincefew deaf know a system of written notation of sign language, asoccurs with SignWriting.? The repository data dictionary should be available for other systemscan use it (via a service architecture)Non-functional requirements? Although the output occurs with computer graphics, it is expected that the animationexecutable on typical computers without special plates for graphics acceleration.? One feature desired for the system is the modularity, so that componentsSystem can be used in other projects involving languagessignals.? Waiting for the translator is also a system as transparent as possible withoutthere are difficulties user to operate it. CHAPTER 4. SPECIFICATION PROJECT 32? It is hoped that the system is implemented using platforms and technologiesopened. 4. 2 Use CasesThis section will describe the expected use cases of the system. Figure 4. 1 contains thediagram of use cases, which are detailed below. Figure 4. 1: Use casesUC1 - Title: Translate phraseActors: UserPreconditions: nonePrimary flow of events: One. User accesses the system by selecting option " translate" 2nd. User tells the system the desired text in Portuguese3rd. User calls the translation4th. 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 signalActors: expert PoundsPreconditions: noneFlow winds primer: One. User accesses the system by selecting option " Insert new signal" 2nd. User provides the signal parameters3rd. System responds as would be the signal described4th. User validates the output5th. User provides signal meaning in Portuguese6th. Signal system adds to your baseAlternative 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 signalActors: expert PoundsPreconditions: noneFlow winds primer: One. User accesses the system by selecting option " Edit existing signal" 2nd. System displays list of all available signals3rd. User chooses a signal to be editedCHAPTER 4. SPECIFICATION PROJECT 344th. System displays all current parameters of the signal5th. User modifies the parameters you want6th. System responds as would be the signal described7th. User validates the outputEight. User provides signal meaning in Portuguese9th. System saves signal modifications to their baseAlternative flow of events: 7, user can reject the response and return to step 5. Postconditions: modified signal in the system. UC4 - Insert / Change grammar ruleActors: expert PoundsPreconditions: noneFlow winds primer: One. User accesses the system by selecting option " Change grammar rule" 2nd. System displays list of all the grammar rules3rd. User edits or inserts new rules4th. System saves changes to the basePostconditions: modified rules in the system. 4. 3 Design Decisions on Machine TranslationAlthough for Machine Translation in the statistical models are the most commonlyused, 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 notCHAPTER 4. SPECIFICATION PROJECT 35having written form. Therefore, there are hardly any written texts in POUNDSto serve as a corpus and that there are at notations difficult to be processedor underused, as SignWriting. Given these facts, we chose to usemethod of translation rules for this work. Various levels of translation presented in Section 2. 3, this translator will act insecond, the syntactic level, ie, the bridge between languages ​​is the transformation of the structuresyntactic Portuguese into the syntactic structure of LBS. This level was chosen forrepresent a cost-effective, not showing the simplicity unwanteda translation morphological but not going further merit of semantic analysis forthat 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 structurephrasal LIBRAS, more specifically the structure of a sentence. She divided it into twocategories, for verbs plain and non-plain, ie defined syntax trees for the twoPOUNDS. Therefore these structures will be considered in this work to definerules. 4. 4 ArchitectureThe system architecture translation poly-pounds, i. e. the representation of the unitsSoftware constituting the system (also called modules) and the relationshipamong them can be described briefly in figure 4. 2. It is noteworthy since several of these blocks are independent units that can bedirectly reused in other applicationsThe following describes each of these system modules by specifying function, inputand expected outputs. 4. 4. 1 Data ModelA key issue of this work is how can digitally encodea sequence of signals (pounds or any other sign language) so thatthey can be processed by various applications. Figure 4. 2: System ArchitectureThis question corresponds approximately to the problem of how to register fortexts written in sign language, which as already described in section aspectsconceptual, still not well resolved within the deaf community. Initially, a chance for our translation system would provide the output nowthis notation SignWriting, which also contribute to building more easilya legacy written in LBS. However, as has also been exposed, now atBrazil SignWriting acceptance of the deaf community is low, so we choseBy using this model only encoding system as " internal" systems thatuse, ie so that the user need not know know POUNDS SignWritingto operate our system. Thus, our coding system has attributes corresponding directlyattributes expressed graphically in a symbol SignWriting. We did this based mainly on correspondence (SUTTON, 2003), workwhich describes extensively the attributes and possible values ​​in SignWriting; CHAPTER 4. SPECIFICATION PROJECT 37complementation of some aspects of the notation (possibilities of movinghands) were removed from the work of Tables (1999). Thus, we can define a data structure capable of encoding signals, represented by figure 4. 3Figure 4. 3: Data ModelThe figure shows that a signal is modeled as a sequence of symbols, anda symbol of what can be represented by a symbol SignWriting; createdthis distinction between sign and symbol due to certain " composite signals" as AA-BB inthat " 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 informationsyntactic 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 aPortuguese word; name: name of the signal, like a word; words of Portuguese words that can match thesign; literal: words that must occur in the context of the signal; CHAPTER 4. SPECIFICATION PROJECT 38inerências: classes of words that should appear incontext of the signal (eg, words that representanimals); Symbol: represents a combination of morphologicalthat can be expressed with a symbol, ora 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 topoint of lease or if the non-dominant handremains neutral space; Facial expression: defining characteristics of cheekeyes, eyebrows, forehead, eyes, mouth, nose, teeth, tongue, and others; Hand (dominant and nondominant): Setup: how the fingers are articulated; Guidance: If the palm is facing the emitteror against him, facing the floor orto heaven; Plane: the arm with the hand are verticallyor horizontally; Fingers: how fingers move. Based on this data structure defined primarily synthesized on a setclass, according to the paradigm of Object Orientation. These classes are then used to serve as input to processestables to define structures in a database capable of storing dataand structure (or schema) XML documents that can also represent thesedata. Morphological Analyzer 4. 4. 2Figure 4. 4 illustrates the specification of this module. For parsers have focused on parsing of sentences, andThis, as the name implies, your ultimate goal, it is certain independence necesseráriaFigure 4. 4: Specification of the morphological analyzerconcerning achievement of lexemes. Aiming to provide this decoupling the analyzersyntactic, arises the idea of ​​using a morphological analyzer. It is said that this structureto that underlies because a parser is used to obtain morphological analyzerstokens 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 thesesigns, he should notify them to the overlying layer through syntactic tokens agreed. Typically, a morphological analyzer uses morphological tokens until mostpossible amount of consunta is, it returns to some automaton overlyingcorresponding token. In the case of natural languages ​​it is common that the same sequence of tokens morphologicaljoin more than one syntactic sense. Is exemplified: The phrase " as awave 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 ifcorresponds to a combination of first-person singular present indicative of voiceAn active verb " eat". In fact, this decision will not fit. He should just tell the parserpossible 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 morphologicalWere planned for the tokens morphological characteristics of the classes listedThen, 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 isessential 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\_: Undefineds: 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 transformationstransformational grammar defined in order to obtain a sentence " Portuguese simCAPÍTULO4th. SPECIFICATION PROJECT 46plificado " which would be written in the form of words in Portuguese that is closestSyntax of LBS. This sequence also contains words in Portuguese, but organizedto represent a sentence in POUNDS, exactly the same waywe use to represent the Portuguese phrases in POUNDS in written form alongthis work, with the addition of syntactic and morphological information for each word. The transformer is based on syntactic grammar rules of LBS, but unknownhow 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 present4. 4. 5 contextualizingFigure 4. 7: Specification of contextualizingThis module acts after prayer has been simplified by transforming the syntactic andcorresponding 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 fromCHAPTER 4. SPECIFICATION PROJECT 47Purely context analysis or a combination thereof with desamgibuação. Changessource contextual typically occur in the presence of adverbs, contextsurrounding the main verb. As for disambiguation, this occurs when there is more than onesignal 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, butyes changing signal characteristics main verb. In this case, the information thatthe main verb is followed by the adverb " quickly" is added by the transformersyntactic information contained in the verbal token. Eventually, after the modulecontextualisador perform conversions basic tokens for signals which containdescription of how the signal should be held, it should modify the descriptive attributesappropriately, adding syntactic information provided by the processor. Continuing with the example, the attribute contextualisador increase the speed of the objectHandMovement 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 adverbintensity " quickly" modifies the. 2nd. the contextualisador relates the adverb " quickly" to speed completion ofsign " 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 ofcontext;? appearance time can determine frequency of motion;? the pivot point may be a mark verb agreement with the adverbof place;? hand configuration may change as subject, ranging up person, animalor 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 characteristicsSurrounding the inherence);? 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 tellcontextualising what to do. Therefore, although one can say that this componentis built based on knowledge of grammar POUNDS, not for nowOne can separate this knowledge, the typical expert linguist, the implementation oftool (made by the developer). In this module there special treatment for certain words, such as linking verbsand adverbs that alter the morphology of the signals (eg quickly), this treatment" Hard-coded" is not at all absurd, since these categories consist of listsclosed words. 4. 4. 6 Signal Synthesizer 3DThe output generated by the translator, a codification of the signs of the sentence in XML, canbe used for various kinds of tools, such as a synthesizer or SignWritingeven for a text plan describing the signs, but the solution adopted in this workis an output of computer graphics animation, in which a virtual avatarcarries the signals described in XML. Thus, the synthesizer consists of a module attachable to other applications it receivesthe XML description of a sentence in POUNDS, this description based on our moCAPÍTULO4th. SPECIFICATION PROJECT 49delo data, and summarizes the movements required in accordance with the attributes setadosthat description. Collaborative Tool 4. 4. 7A collaborative tool it is a web application dedicated to the creation and consultationof entries in the dictionary Portuguese - POUNDS collaboratively conceptuallysimilar 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