Exploring the BIA model

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Abstract

Word recognition is a central component of human language cognition, and more specifically of cognitive activity during the fundamental human task of reading. We implement here two spreading activation models of word recognition, the Bilingual Interactive Activation (BIA) model and the Interactive Activation (IA) model on which it is based. We test them extensively on both isolated word cases and sequential sets of input, using a combined lexicon of Dutch and English words. In a comparison of the two models and a human study of word recognition response time in bilingual Dutch-English speakers (?, ?), we find that the models do return moderately accurate results in the isolated word cases, but do not necessarily produce useful data in the sequential case.

Keywords: Word recognition; Bilingual Interactive Activation

Introduction

Introduction should summarize the following: word recognition as a part of human language cognition, the role of models in increasing understanding of human word recognition, acknowledging the progress in more recent word recognition models while simultaneously discussing the maintained relevance of the older BIA model, our model/differences between our model and others, the experiments we performed with our model, and our results.

Overview

Word recognition is so fundamental a part of our internal language processing that we almost never stop to recognize it, despite its incredible functionality. We process texts accessed visually at an average rate of 300 words per minute (?, ?) or 5 words per second, and the central function in that process is visual word recognition. During the process of reading we perform not only the visual processing of line segments to letters and letters to words, but also the grammatical and phonological processes necessary to contrive sense from the passage (?, ?) .

Bilingual word processing and recognition is interesting in particular due to some of the questions it raises. The primary two are as follows: first, when word candidates similar to the input string are activated, are candidates from both languages considered, or from only one? Secondly, is the internal lexical "database" stored as one single integrated lexicon or in two distinctly separate ones? These two possibilities, that of distinctly separate linguistic processing and competition and that of more or less integrated competition, are generally referred to as language selective and language non-selective access hypotheses respectively (?, ?). All models and data referred to in this work operate under the assumption of language non-selective access.

In this work, we utilize an implementation of the Bilingual Interactive Activation (BIA) model as well as the more monolingual Interactive Activation (IA) model with varying sets of bilingual input words. The input words were chosen based on a reference set of human data in which subjects were presented with those same words. Our languages of choice are Dutch and English, as they align with the human data. In a final test, we present words to the model sequentially without resetting activation values, in order to assess the model's viability as a representation of word recognition in context. In terms of the isolated tests, the model performed well: the BIA model functioned as a more accurate representation of the natively Dutch bilingual subjects of the human study than the IA model, both becoming certain more quickly in the case of the native language and slightly more slowly in the case of the non-native language. On the other hand, the sequential test revealed little useful data, though that in itself lends us insight on the nature and usefulness of the BIA model.

Background

Introduction to categories of background information, primarily: Human data and studies, BIA and IA model development, specific implementation information (PDP handbook), any other miscellaneous bits. Discuss how they came together for the implementation of our model and construction of our experiments.

BIA and IA model development

Specifically acknowledging the work of (?, ?) (BIA) and (?, ?) (IA) in development of their models, results/uses of their models, etc.

Human data

Work done by Van Heuven in acquiring the relevant human data for this paper. Methods, results etc might be valuable to mention.

PDP handbook implementation

Acknowledge PDP handbook role in specific implementation decisions, such as choice of parameters and as a reference for general structuring decisions, although most of the general structure goes back to the original (?, ?) model.

Model

A discussion of the model as a representation of human cognition. Cite the opinions of modern vs older sources on the model, and discuss assumed corresponding features between actual human cognition and the model. Discuss how/why differences between the two exist.

Implementation

A discussion of specific implementation decisions, such as method of representation for individual units, data structures used etc.

Experiments

Introduction to experiments.

Test 1

Discuss specific test (parameters inputs etc) and then results (tables graphs figures basic discussion etc)

Test 2

repeat as needed

General Discussion

Wrap it up, then list all references.
Below I have included all the formatting examples included in the template, use as needed.

Formalities, Footnotes, and Floats

Use standard APA citation format. Citations within the text should include the author's last name and year. If the authors' names are included in the sentence, place only the year in parentheses, as in ? (?), but otherwise place the entire reference in parentheses with the authors and year separated by a comma (?, ?). List multiple references alphabetically and separate them by semicolons (?, ?, ?). Use the "et al." construction only after listing all the authors to a publication in an earlier reference and for citations with four or more authors.

Footnotes

Indicate footnotes with a number[1] in the text. Place the footnotes in 9 point type at the bottom of the column on which they appear. Precede the footnote block with a horizontal rule.[2]

Tables

Number tables consecutively. Place the table number and title (in 10 point) above the table with one line space above the caption and one line space below it, as in Table 1. You may float tables to the top or bottom of a column, or set wide tables across both columns.

Table 1: Sample table title.

Error type	Example
Take smaller	63 - 44 = 21
Always borrow	96 - 42 = 34
0 - N = N	70 - 47 = 37
0 - N = 0	70 - 47 = 30

Figures

All artwork must be very dark for purposes of reproduction and should not be hand drawn. Number figures sequentially, placing the figure number and caption, in 10 point, after the figure with one line space above the caption and one line space below it, as in Figure 1. If necessary, leave extra white space at the bottom of the page to avoid splitting the figure and figure caption. You may float figures to the top or bottom of a column, or set wide figures across both columns.

Figure 1: This is a figure.

Acknowledgments

Place acknowledgments (including funding information) in a section at the end of the paper.

[1] Sample of the first footnote.
[2] Sample of the second footnote.

References Instructions

Follow the APA Publication Manual for citation format, both within the text and in the reference list, with the following exceptions: (a) do not cite the page numbers of any book, including chapters in edited volumes; (b) use the same format for unpublished references as for published ones. Alphabetize references by the surnames of the authors, with single author entries preceding multiple author entries. Order references by the same authors by the year of publication, with the earliest first.

Use a first level section heading, "**References**", as shown below. Use a hanging indent style, with the first line of the reference flush against the left margin and subsequent lines indented by 1/8 inch. Below are example references for a conference paper, book chapter, journal article, dissertation, book, technical report, and edited volume, respectively.