Logical Language Lojban
A Hackers’ Spoken Language

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What Is Lojban?

- constructed *spoken* (human-human) language
- based on predicate logic
- relatively young (1950’s – 1990’s)
Outline

1. Introduction
2. Language Basics
   - Alphabet And Pronunciation
   - Basic Sentences
   - Obtaining Your Objects
3. Expressive Features
   - Tenses
   - Questions
   - Compound Words
4. Lojban And Computers
5. Conclusion
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Logical Language Lojban
What Is Lojban?

- conlang
- predicate logic
  - person is-going to-dest from-source
- developed since 1955
- current state finalized in 1997
  - grammar and base vocabulary frozen
What Is Lojban?

Features

- unambiguous grammar
- phonetic spelling
- structurally simple
  - easy to learn
- 1350 root words
  - combinable to millions
- regular – no exceptions
Why Was Lojban Created?

- research into Sapir-Whorf hypothesis
  - “The structure of one’s language constrains one’s thinking.”
  - Null hypothesis: It doesn’t.
  - Will native Lojbanists exhibit “new” thought patterns?
Aims of the Talk

My Aims With This Talk

• show that . . .
  • Lojban is of more than scientific interest
  • shows typical “hacker values”

• give a fun talk

• motivate actual use of Lojban
  • not a mobilization speech though
Design Goals wrt. Sapir-Whorf

- same expressive power of natural languages
- *but* significantly different structure
- remove restrictions on creative and clear thought/communication
Aims of the Talk

Why Else Is Lojban Interesting?

• human-computer interaction
• more precise/powerful expression
  • full set of logical connectives
  • mathematical expressions properly expressible
• robust over noisy channels
• candidate for an international language
The Lojban Alphabet

', . a b c d e f g i j k l m n o p r s t u v x y z

- basic latin alphabet
- ‘h’, ‘q’, and ‘w’ are not Lojban letters
- punctuation characters “‘’, .” represent sounds
- no question/exclamation mark, etc.
Pronunciation of the Vowels

- a [a] father
- e [ɛ] bet, lens
- i [i] green
- o [o] joke, note
- u [u] boot
- y [ə] above

・ vowel length doesn’t matter
Pronunciation of the Consonants (excerpt)

- c [ʃ]  shirt
- j [ʒ]  measure
- s [s]  soldier
- v [v]  voice
- x [x]  loch, Ach
- z [z]  magazine

- variations permitted, as long as sounds are distinguishable
- In particular, ‘r’ can be any rhotic sound.
Pronunciation of Punctuation

- [h]  ahead
- [?]  pause/stop
- ,  non-standard syllable break

• examples later...
Basic Sentence Structure

*person* comes-to *to-dest* from-source

- predicate ("bridi")
- arguments ("sumti")
- syntax: $x_1 \ R \ x_2 \ x_3 \ldots$
  - asserts that $x_1 \ldots x_n$ are in relation $R$
  - often matches subject-verb-object form of natlangs
Basic Sentences

The Cast

- Starring Pesco and Maya.
- Names will be “lojbanized”.
  - transcribe phonetically
  - must end in a consonant
  - terminate with a pause (‘.’)
- original name spelling could be used
  - but requires an “escape”
# The Cast – Lojbanized

<table>
<thead>
<tr>
<th>Lojban name</th>
<th>sumti form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maya</td>
<td>ma,iar.</td>
</tr>
<tr>
<td>Pesco</td>
<td>peskos.</td>
</tr>
</tbody>
</table>

- la = flag word: “name follows”
An Example Relation

klama – to come/go to

- max. 5 (direct) arguments
- argument order is significant
- **place structure** defines argument meanings

klama – $x_1$ comes to $x_2$ from $x_3$ via $x_4$ using $x_5$
Our First Sentence

- R = klama
  - $x_1 = \text{la peskos}$. 
  - $x_2 = \text{la ma,iar}$. 

  \[ \text{la peskos.} \ [\text{cu}] \ klama \ \text{la ma,iar}. \]

- cu = flag word: “bridi follows”
  - usually elidable
  - obvious/unimportant trailing arguments elidable

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Logical Language Lojban
Pro-Sumti

- analogous to pronouns
- use in any sumti place

  mi  me
  do  you
  ti  this here
  ta  that there
Obtaining Your Objects

Articles

le bredi [ku]

- le turns bredi relationships into sumti
- very close in meaning to “the”
- terminator ku usually elidable
Article Example

\[ \text{gunka} - x_1 \text{ works on } x_2 \text{ [activity] with goal } x_3 \]

- “\(\text{le } \text{bridi}\)” means some thing(s) that would fit the \(x_1\) place of \(\text{bridi}\).
- \(\text{le gunka} – \) “the worker(s)”
- Note: neither singular nor plural implied!
Tenses

- temporal
- spatial
- realized by attaching modifier words to the bridi
Tenses

Temporal Modifiers

pu in the past
ca in the present
ba in the future

la peskos. ba klama la ma,iar.

- Pesco will go to Maya at some time in the future.
- relative to the time of speaking

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Logical Language Lojban
Questions

- “Is it true that . . . ?”
- fill-in-the-blank(s)
  - “What is in relation . . . ?”
  - “In which relation(s) are . . . ?”
Truth-Value Questions

- prefix entire statement with xu
  
xu la ma,iar. klama la peskos.

- “Does Maya come to Pesco?”
Fill-In-The-Blank for Relations

- put mo in the bridi place

  la lojban. mo

- “What is Lojban?”

- (“In which relationships . . . ?”)
Fill-In-The-Blank for Arguments

- put ma in one or more sumti places
  ma klama ma

- “Who goes where?”
Thoughts About Lojban Applied to Computers

- using lojban for human-computer interaction
- need to assume some level of proficiency in Lojban
- no deep investigation, just ideas for research
Talk To Your Computer In Lojban!

- authoritative unambiguous grammar specified in YACC
  - EBNF version available
- therefore, easy and complete parsing
- recognize questions and imperatives
- maybe implement natural language interface with pattern matching?
- specialized subsets of Lojban maybe
Lojban As I18n Base Language?

- Lojban is easy to produce.
- I18n translates messages from some *base language*.
- problems with incorporating dynamic data
- structure of *neither* base nor target lang. understood
- Lojban beneficial if used as the base language?
  - Autoranslation to (pseudo-) English is already available.
Lojban For Programming

- use Lojban for naming identifiers
- no spaces needed between words
- questions/imperatives again
- relations?
- functions?
How To Learn Lojban

- basic grammar: only a few days
- you need vocabulary
  - practice!
  - flash-card programs available
  - #lojban (Freenode)
  - build a personal word list

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Summary

- Lojban is general, clean, simple, and precise
  $\Rightarrow$ powerful!
- Lojban can help us make clearer HCI’s
  (Return of the Command Line!)

Outlook
- We need Lojban speakers.
- How can we employ Lojban in programming/machine interfaces?
Further Reading

  - answering ;)
  - narrowing meaning and compound words
  - logic
- **See** www.lojban.org
  - “Level-0 Book”
  - Beginner’s Lessons
  - “Reference Grammar”