Linguística Computacional Interativa

Planejamento e realização de texto

Aula de 28 de agosto de 2012

Tópicos da Aula

- Introdução
  - A intuição gramatical
  - Gramáticas e Gramaticalização

- Tema da Aula
  - Modelos Clássicos de Geração de Representações "Textuais"
    - Planejamento
    - Realização
  - Modelos Sequenciais
  - Modelos Integrados
  - Modelos Intercalados

  - Geração de Textos Baseada em Esquemas (McKeown, 1985)

Introdução

Sobre Gramáticas e Gramaticalização

A *intuição* gramatical

Linguagem é uma capacidade cognitiva inata?

- A "hipótese inatista" e a "gramática universal" de Chomsky
  - O ser humano nasce com a capacidade de desenvolver a linguagem. Quando uma criança é exposta à experiência linguística, mesmo que em reduzida escala ou com limitações pessoais (e.g. surdez), o mecanismo linguístico que faz parte do seu aparato cognitivo entra em ação e ela adquire uma linguagem (qualquer que seja).

    A este mecanismo linguístico inato Chomsky chamou, **em 1981**, de Gramática Universal: "a number of fundamental principles that sharply restrict the class of attainable grammars and narrowly constrain their form, but with parameters that have to be fixed by experience." (*Lectures on Government and Binding*)

Mas … por que me importar com isto?

Observação Cultural: Em anos recentes, a chamada *Optimality Theory* apresentou uma alternativa para os princípios e parâmetros da gramática universal de Chomsky, sugerindo – *grosso modo* – que a linguagem humana (i.e. toda a variedade que há entre as línguas) pode ser formalmente definida por um conjunto de restrições que se aplicam de forma estritamente ordenada a um componente gerativo de base que produz todas as formas linguísticas candidatas. O que leva uma variedade a diferir da outra é justamente a ordem que comanda o conjunto de restrições aplicáveis.

Computação, Representações, Sistemas Simbólicos

- A “Hierarquia de Chomsky”
  - Expressividade e Complexidade de diferentes tipos de gramáticas
- Raciocínio Visual e Raciocínio Linguístico: Sistemas de Representação e Limites de Abstração
  - Oberlander & Stenning, 1997
  - http://csjarchive.cogsci.rpi.edu/1995v19/i01/p0097p0140/MAIN.PDF
- “Cognitive Dimensions of Notations” (CDN)
  - Blackwell & Green, 2003
  - http://www.cl.cam.ac.uk/~afb21/publications/BlackwellGreen-CDsChapter.pdf

SECTION 1

A language is a collection of sentences of finite length all constructed from a finite alphabet (or, where our concern is limited to syntax, a finite vocabulary) of symbols. Since any language L in which we are likely to be interested is an infinite set, we can investigate the structure of L only through the study of the finite devices (grammars) which are capable of enumerating its sentences. A grammar of L can be regarded as a function whose range is exactly L. Such devices have been called "sentence-generating grammars."[1] A theory of language will contain, then, a specifica-

tion of the class F of functions from which grammars for particular languages may be drawn.

The weakest condition that can significantly be placed on grammars is that F be included in the class of general, unrestricted Turing machines. The strongest, most limiting condition that has been suggested is that each grammar be a finite Markovian source (finite automaton).[2]

The latter condition is known to be too strong; if F is limited in this way it will not contain a grammar for English (Chomsky, 1956). The former condition, on the other hand, has no interest. We learn nothing about a natural language from the fact that its sentences can be effectively displayed, i.e., that they constitute a recursively enumerable set.

Chomsky, 1959

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138 CHOMSKY

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SECTION 2

A phrase structure grammar consists of a finite set of "rewriting rules" of the form $\varphi \rightarrow \psi$, where φ and ψ are strings of symbols. It contains a special "initial" symbol S (standing for "sentence") and a boundary symbol $\#$ indicating the beginning and end of sentences. Some of the symbols of the grammar stand for words and morphemes (grammatically significant parts of words). These constitute the "terminal vocabulary." Other symbols stand for phrases, and constitute the "nonterminal vocabulary" (S is one of these, standing for the "longest" phrase). Given such a grammar, we generate a sentence by writing down the initial string $\#S\#$, applying one of the rewriting rules to form a new string $\#\varphi_1\#$ (that is, we might have applied the rule $\#S\# \rightarrow \#\varphi_1\#$ or the rule $S \rightarrow \varphi_1$), applying another rule to form a new string $\#\varphi_2\#$, and so on, until we reach a string $\#\varphi_n\#$ which consists solely of terminal symbols and cannot be further rewritten. The sequence of strings constructed in this way will be called a "derivation" of $\#\varphi_n\#$.

Chomsky, 1959

A Cognitive Theory of Graphical and Linguistic Reasoning: Logic and Implementation

KEITH STENNING
JON OBERLANDER
University of Edinburgh

We discuss external and internal graphical and linguistic representational systems. We argue that a cognitive theory of peoples' reasoning performance must account for (a) the logical *equivalence* of inferences expressed in graphical and linguistic form, and (b) the implementational *differences* that affect facility of inference. Our theory proposes that graphical representation limit abstraction and thereby aid "processibility." We discuss the ideas of *specificity* and *abstraction*, and their cognitive relevance. Empirical support both comes from tasks which involve the manipulation of external graphics and tasks that do not. For the former, we take Euler's (1772) circles, provide a novel computational reconstruction, show how it captures abstractions, and contrast it with earlier con-

Notational Systems – the Cognitive Dimensions of Notations framework

Alan F. Blackwell and Thomas R.G. Green

Final version of manuscript as included in
John M. Carroll (Ed.)
HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science
San Francisco: Morgan Kaufmann (2003), pp. 103-134.

Although common in software engineering, few other design disciplines proceed according to checklists or predefined sequences of tasks. Software design educators increasingly suggest that such design tools are not sufficient for the design of novel user interfaces either (Winograd 1996). The highly structured (but largely a-theoretical) checklist methods have worked reasonably well in the development of user interfaces built from a small set of standard elements, such as Motif widgets, the Macintosh toolbox, or Windows foundation classes. This is because the design choices in arranging menus, buttons and dialog boxes are relatively few, and the results can sometimes be assessed using checklists such as those presented in “style guides” for the relevant system (Apple 1992, Microsoft 1995). Simple checklists are not so successful when the user interface is composed of completely novel graphical elements, composed according to completely novel visual grammars. These notational systems range from complex products such as visual programming languages, to embedded functionality such as central heating controls and the ubiquitous computing platforms of the future that move beyond the windows, icon and menu paradigm.

We do not believe that it will be possible to deal with these new notational systems by creating new checklists. Instead, we emulate other design disciplines by aiming to support the activity of the designers, based on some understanding of the process of design. User interface design is currently far more of a craft than an engineering discipline. It is subject to elements of affect, of fashion and social acceptance, in addition to technical considerations. For these reasons, we can learn from studies of other design disciplines where the same craft elements apply. For example, a study comparing knitwear designers and helicopter designers (Eckert & Stacey 2000) observes that a community of designers develops their own vocabulary for design criteria that is created through practice and tradition, rather than being easily accessible outside the community. In the Cognitive Dimensions of Notations framework, we aim to provide the same kind of vocabulary for use by user interface designers.

D. Schön Representational Backtalk

Appeared in Knowledge-Based Systems Journal, Special Issue on Semiotic Approaches to Human-Computer Interaction, Elsevior Science, Vol.14., No.8, pp.449-453, 2001.

What does the Representation Talk Back to You?

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Abstract

Our research goal is to support designers with interactive systems by exploring the relationship among representations, their meanings, and their effects. This paper first outlines ART (Amplifying Representational Talkback), a prototype system which we have developed to instantiate our research framework. We then reinterpret the essence of the ART system by illustrating the ART approach with other people's work in Semiotic Approaches to User Interface Design presented at the ACM CHI 2000 workshop. We identify critical aspects of the system from four points: (1) interactions with representations "I" produced; (2) representations as indices for thoughts; (3) hands-on representations; and (4) limiting the automation. By having the ART system as an

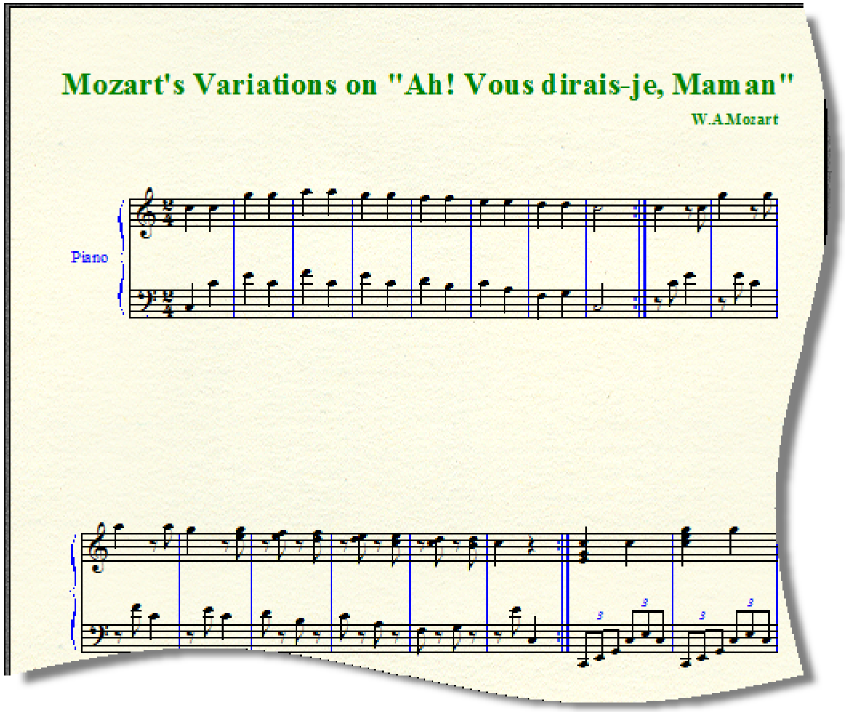
...ated the process of design as a cycle of ...action through a conversation with the ...e theoretical ground has been provided for ...y happening during the reflection-in-action ...research goal is to support designers with ...stems by exploring the relationship among ...ntation that a designer produces (such as ... its meaning that the designer "sees" in the ..., and (3) its effects onto the designer's ... of the design task. This nicely fits the ...f Semiotic Approaches to User Interface ...ere *Semiotics is devoted to studying* ...*n: representations, their interpretation and* ...2000].

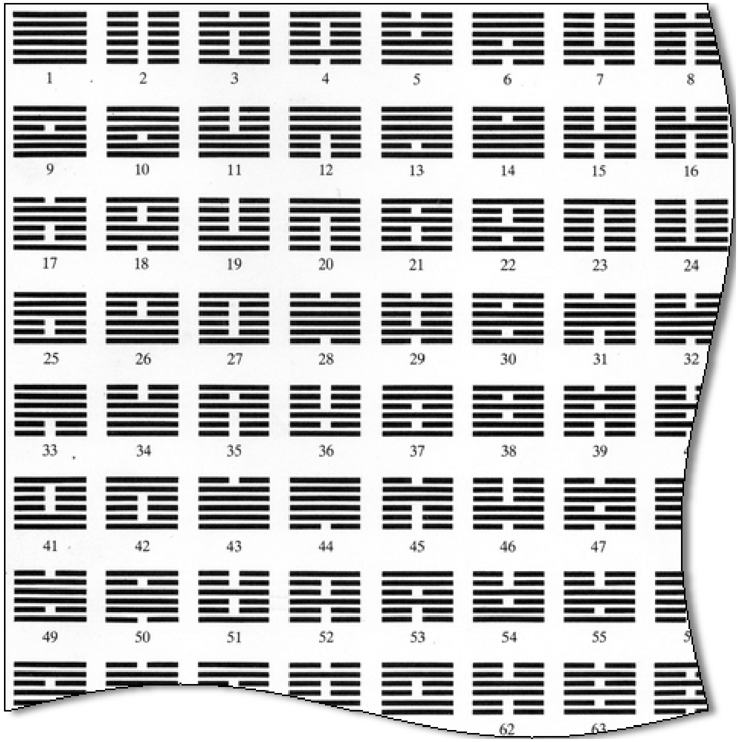
interactive computational tools had better been regarded

...onsists of two parts. In the first part, we ...RT (Amplifying Representational Talkback) system, a prototype system we have developed to support early phases of a design task, in this particular case

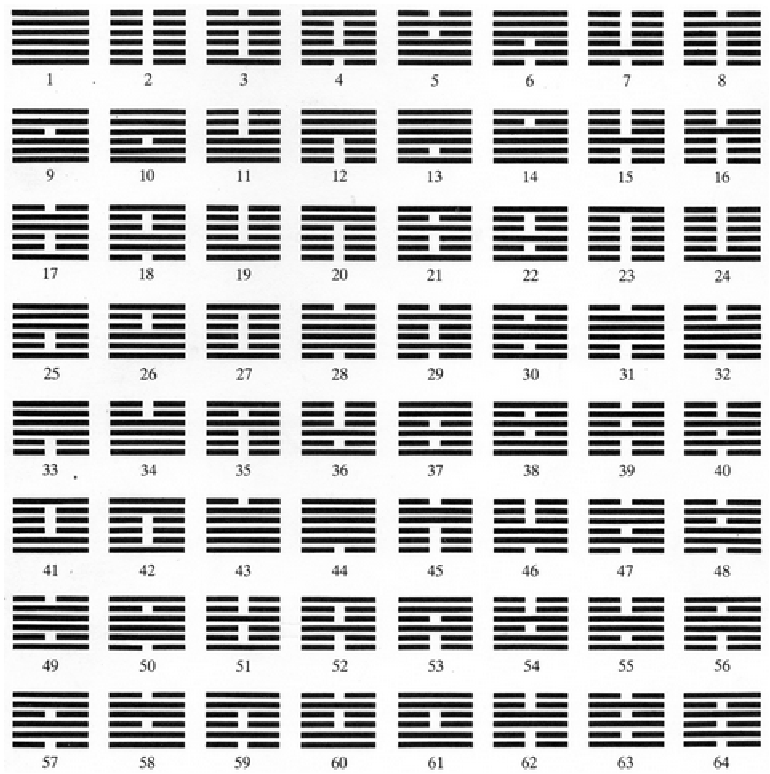
Gramáticas e Gramaticalização

- Exemplos de como funciona e como podemos usar a 'intuição gramatical' : Domínios não-linguísticos





Ordem e estrutura dos hexagramas do I Ching



Gramáticas, Cargas Cognitivas e Alternativas Semióticas

- "Ouviram do Ipiranga as margens plácidas
  de um povo heróico o brado retumbante."

- ***Custo Cognitivo***
  - Quanto 'custa', ao nosso aparato cognitivo, entender uma notação?
    - Ao gerar representações destinadas ***ao usuário***, nosso objetivo normalmente é que elas que elas não custem caro para o aparato cognitivo do usuário.

- ***Custo Semiótico***
  - Quanto custam ao aparato cognitivo de quem as utiliza para se ***comunicar*** com o usuário?
  - Quanto custam ao ***processo computacional que faz a mediação*** da comunicação entre o produtor (designer / desenvolvedor) e o consumidor (usuário) da representação?
  - Quanto custa um ***erro de interpretação ou uso*** destas representações para o ***meio físico-social*** em que está o usuário?
  - Qual a ***tolerância (faixa de aceitabilidade) dos usuários a variações representacionais*** na comunicação mediada por sistemas computacionais?
  - Uma ***composição de representações variadas*** melhora a comunicação? Quando, como e por quê?

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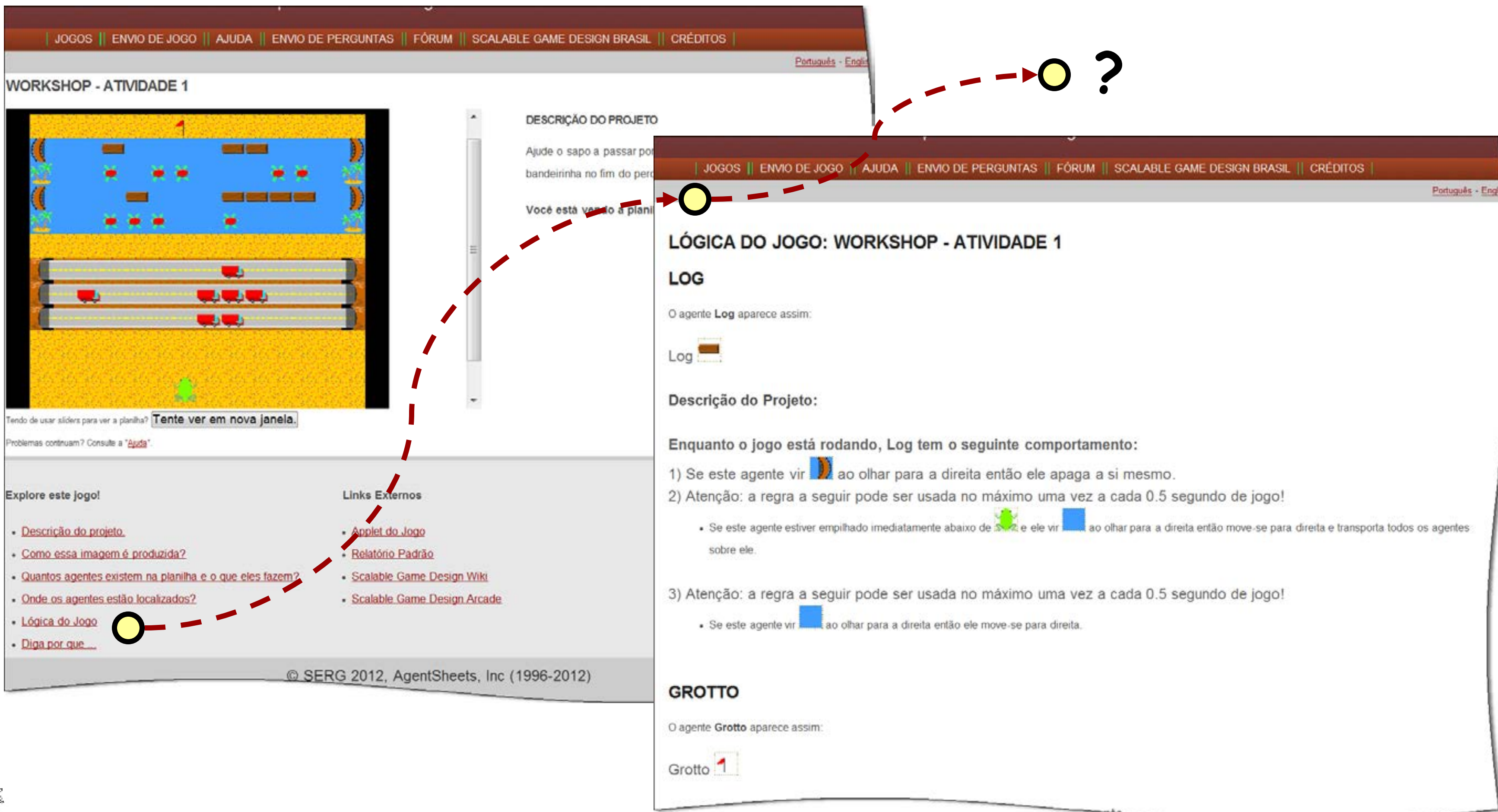
Um “tour gramaticalizante” pelo PoliFacets



Tema da Aula

Modelos Clássicos de Geração de Representações "Textuais"

(não necessariamente LN, ainda)

Representando informação como TEXTO

- Geração Automática de Representações “Textuais” (para usuários finais)
  - Funções (Componentes) de Base
    - Planejamento:
      - O que dizer?
        - » Seleção do conteúdo a ser comunicado
      - Como dizer?
        - » Segmentação e estruturação da comunicação
    - Realização:
      - Dizer!
        - » Expressão da comunicação final

Modelos Clássicos de Geração de Textos

- Planejamento & Realização Sequenciais
  - Planejamento e Realização são 2 Blocos Separados
    - Primeiro se seleciona e organiza o conteúdo
    - Depois se expressa o conteúdo
    - Há vantagens e desvantagens
- Planejamento & Realização Integrados
  - Planejamento e Realização são uma coisa só
    - Seleção, organização e expressão de conteúdo são feitos juntos
      - Casos triviais / Geradores Ad Hoc
    - Há vantagens e desvantagens
- Planejamento & Realização Intercalados
  - Planejamento e Realização são subdivididos em blocos de sub-funções de planejamento e realização que se alternam
    - A ordem de aplicação das subfunções de planejamento e realização importa
    - Há vantagens e desvantagens

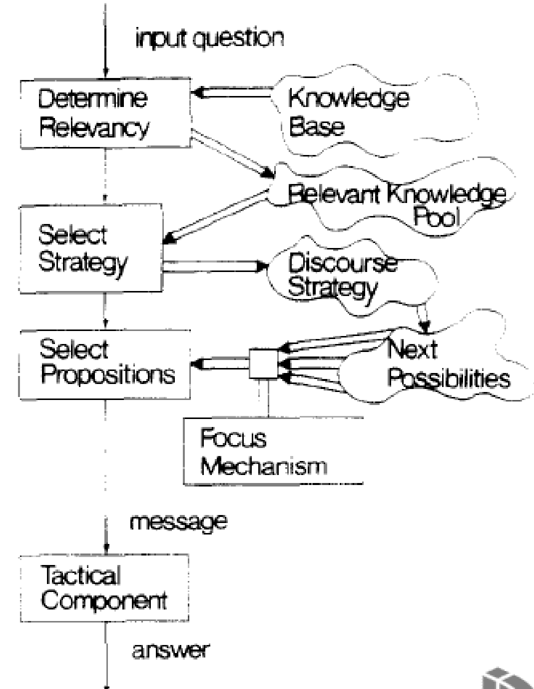
Geração de Textos Baseada em Esquemas

- Kathy McKeown, 1985
  Discourse Strategies for Generating Natural Language Text
  http://homepages.inf.ed.ac.uk/jmoore/course-reads/nlg/McKeown85.pdf

3. The TEXT Generation Model

Our approach relies on a model of language production which divides processing into two stages. The first stage determines the content and structure of the discourse and is termed the 'strategic' component, following Thompson [38]. The second stage, the 'tactical' component, uses a grammar and dictionary to realize in English the message produced by the strategic component. This division allows for focus on the problems of determining content and structure as part of the strategic component.[5]

[5] A control structure which allows for backtracking between the tactical and strategic components (e.g. Appelt [2]) would also be possible. The approach we have taken clearly specifies how the planning of the text influences the realization of a message in natural language. Backtracking would allow for processes that produce the surface expression to influence the planning of the discourse. Our division of the processes, however, does allow us to focus on textual organization, an issue which Appelt has not addressed.



McKeown, 1985: pp. 5-6

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Leituras para a próxima aula

- K. Nakakoji, Y. Yamamoto (2001) What does the representation talk back to you? *Knowledge-Based Systems*, Volume 14, Issue 8, 1 December 2001, pp. 449-453
  http://www.sciencedirect.com/science/article/pii/S0950705101001393
- Slides de Robert Dale – Overview de NLG
  http://web.science.mq.edu.au/~rdale/teaching/esslli/part01.pdf
- Artigo de Ed Hovy (Two Types of Planning in Language Generation)
  http://acl.ldc.upenn.edu/P/P88/P88-1022.pdf