



US005966686A

United States Patent [19]

[11] Patent Number: **5,966,686**

Heidorn et al.

[45] Date of Patent: ***Oct. 12, 1999**

[54] **METHOD AND SYSTEM FOR COMPUTING SEMANTIC LOGICAL FORMS FROM SYNTAX TREES**

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[73] Assignee: **Microsoft Corporation**, Redmond, Wash.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/674,610**

[22] Filed: **Jun. 28, 1996**

[51] Int. Cl.⁶ **G06F 17/27**

[52] U.S. Cl. **704/9; 707/104**

[58] Field of Search 704/9, 8, 1, 10; 395/12; 707/100, 101, 102, 104

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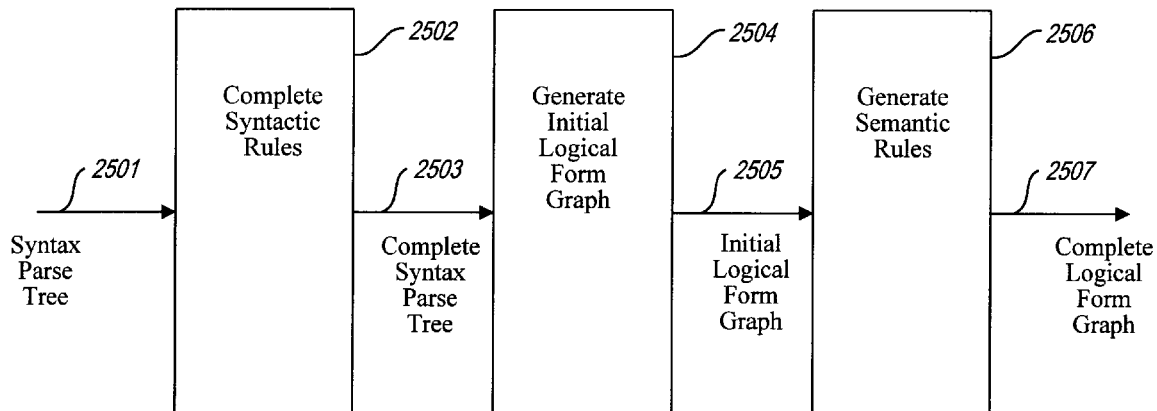
Primary Examiner—Joseph Thomas
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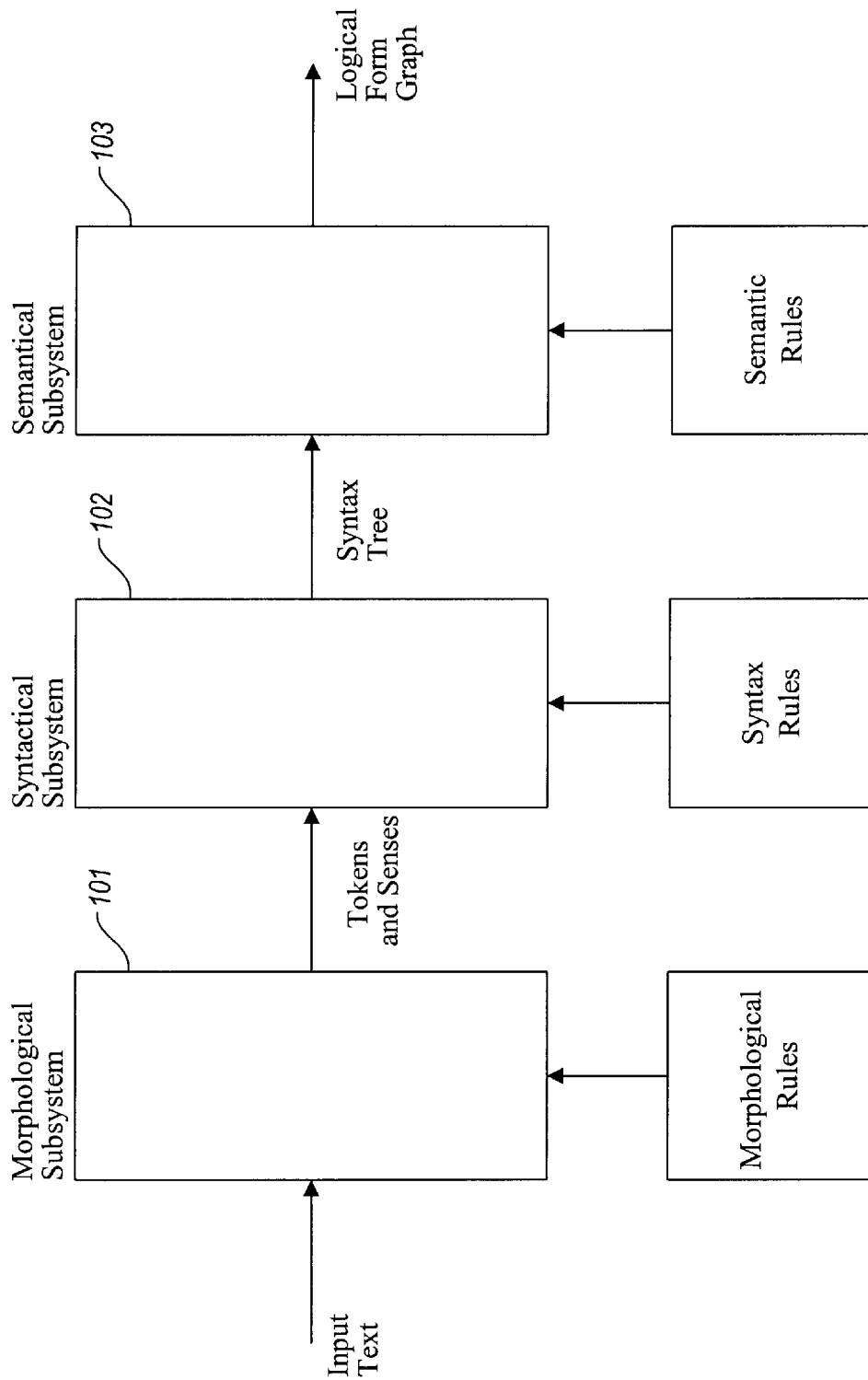
[57] ABSTRACT

Methods and computer systems for semantically analyzing natural language sentences. The natural language processing subsystems for morphological and syntactic analysis transform an input sentence into a syntax parse tree. Semantic analysis applies three sets of semantic rules to create a skeletal logical form graph from a syntax parse tree. Semantic analysis then applies two additional sets of semantic rules to provide semantically meaningful labels for the links of the logical form graph, to create additional logical form graph nodes for missing elements, and to unify redundant elements. The final logical form graph represents the complete semantic analysis of an input sentence.

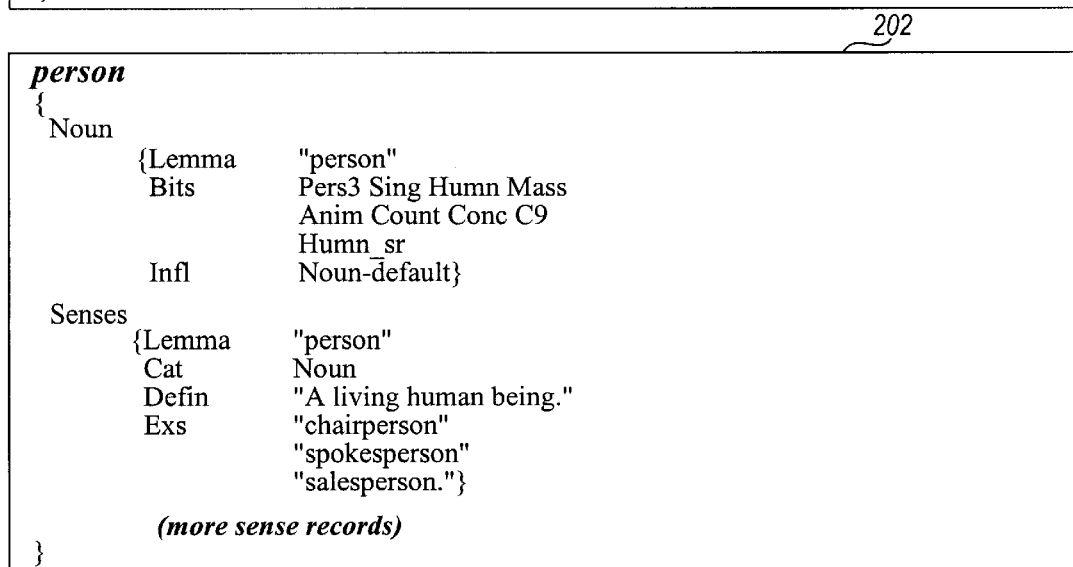
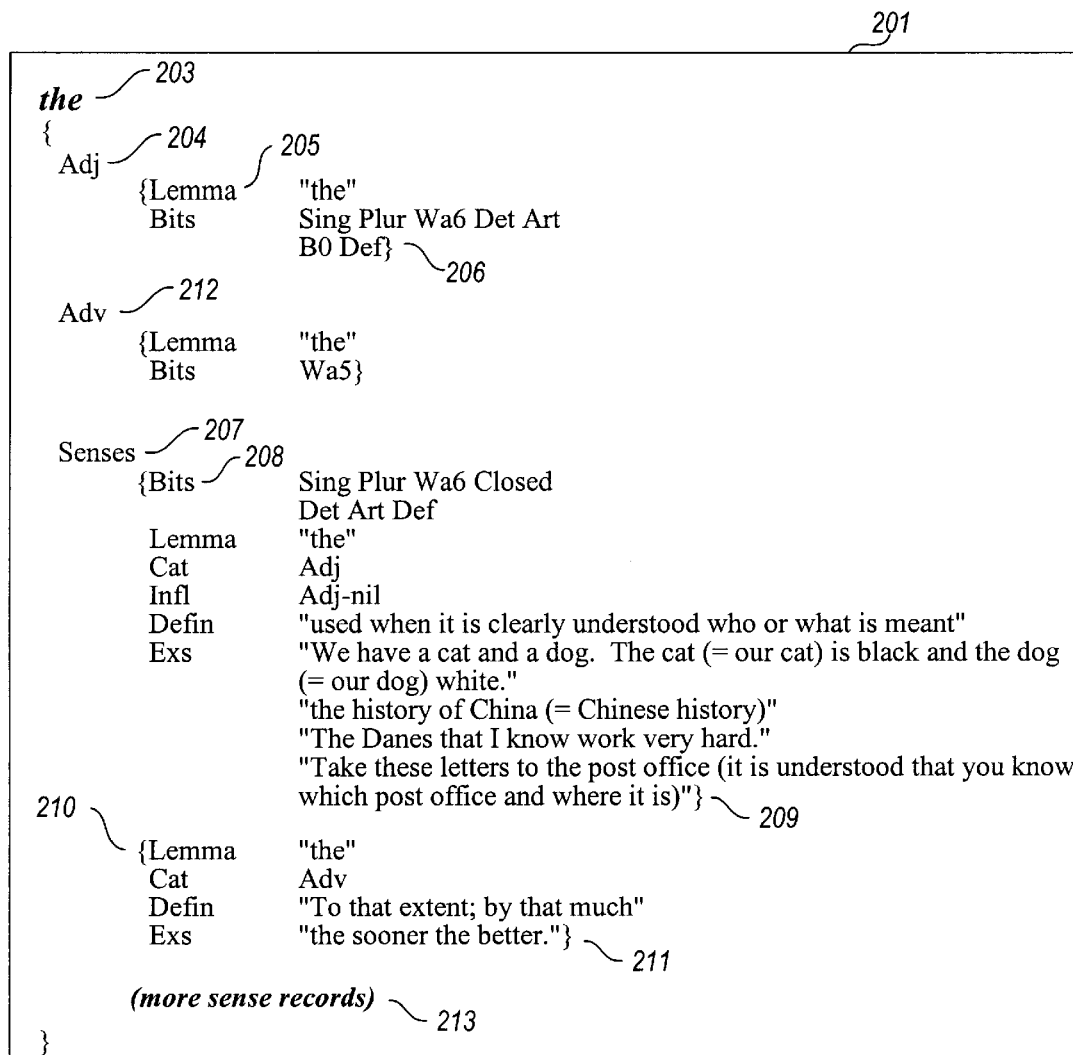
9 Claims, 69 Drawing Sheets

The New Semantic Subsystem





(PRIOR ART)
Fig. 1



(PRIOR ART) Fig. 2

whom	
{	
Pron	
	{Lemma "who"
	Bits Pers3 Sing Plur Rel Wh
	Humn Obj Anim}
Senses	
	{Lemma "who"
	Bits Pers3 Sing Plur Rel Wh
	Closed Humn Obj Anim
	Cat Pron
	Defin "(the object form of who, used esp. in writing and careful speech)"
	Exs "With whom?"
	"The man with whom he talked."
	"You saw whom?"
	"Whom did they see?"
	"the man (whom) they saw arriving"
	"a man (whom) you may know of"} (more sense records)
}	

i	
{	
Noun	
	{Lemma "i"
	Bits Pers3 Sing TakesAn
	Infl Noun-irreg}
Pron	
	{Lemma "I"
	Bits Sing Nom TakesAn Persl
	Humn Anim LexCap}
Senses	
	{Lemma "i"
	Cat Noun
	Infl Noun-irreg
	Defin "The ninth letter of the modern English alphabet."}
	{Lemma "I"
	Cat Pron
	Defin "Used to refer to oneself as speaker or writer."}
	(more sense records)
}	

met	
{	
Verb	
	{Lemma "meet"
	Bits Sing Plur Past
	Pastpart
	Infl Verb-meet}
Senses	
	{Lemma "meet"
	Bits Past Pastpart
	Cat Verb}
}	

(PRIOR ART) Fig. 3

```

was
{
  Verb
    {Lemma    "be"
     Bits     Pers3 Sing Past Pers1
     Infl     Verb-be } }

  Senses
    {Lemma    "be"
     Bits     Past Pastpart
     Cat      Verb}

    (more sense records)
}

```

```

my
{
  Adj
    {Lemma    "I"
     Bits     Wa5 Det Poss Pers1 Def
             Gen A0
     Infl     Adj-none }

  Ij
    {Lemma    "my } }

  Senses
    {Lemma    "I"
     Bits     Wa5 Closed Det Poss
             Pers1 Def Gen A0
     Cat      Adj
     Infl     Adj-none
     Defin    "belonging to me"
     Exs      "my car"
             "my mother"}

    {Cat      Ij
     Defin    "Used as an exclamation of surprise, pleasure, or dismay"
     Exs      "Oh, my! What a tiring day!"}

    (more sense records)
}

```

(PRIOR ART)
Fig. 4

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