

(a) Translate the following sentences into predicate calculus:

- (i) Some men are fat.
- (ii) All sincere men are honest.
- (iii) Some men are either jolly and honest or fat.
- (iv) All fat men are jolly and sincere.

(b) Give a context-free grammar for sentences such as those in (a).

(c) For each production in your answer to (b), give a rule for computing the meaning so that the translations you gave in (a) are produced as the meanings of those sentences.

(d) Translate the sentence

Some men are jolly and honest.

and show how it can be proved true from the sentences in (a) using a goal-directed proof.

AI2 -- Natural language tutorial exercise 2 (SOLUTION)

Note: This was a question on last year's degree exam.

(a)

- (i) exists X (man(X) & fat(X))
- (ii) forall X ((sincere(X) & man(X)) -> honest(X))
- (iii) exists X (man(X) & (jolly(X) & honest(X)) or fat(X))
- (iv) forall X ((fat(X) & man(X)) -> (jolly(X) & sincere(X)))

(b)

Assertion --> All NG are Desc
Assertion --> Some NG are Desc
NG --> N
NG --> Adj NG
Desc --> Adj
Desc --> either Desc or Desc
Desc --> Desc and Desc
N --> men
Adj --> fat
Adj --> sincere
Adj --> honest
Adj --> jolly

(c)

Assertion --> All NG are Desc	forall X (NG -> Desc)
Assertion --> Some NG are Desc	exists X (NG & Desc)
NG --> N	N(X)
NG --> Adj NG	Adj(X) & NG
Desc --> Adj	Adj(X)
Desc --> either Desc or Desc	Desc1 or Desc2
Desc --> Desc and Desc	Desc1 & Desc2
N --> men	man
Adj --> fat	fat
Adj --> sincere	sincere
Adj --> honest	honest
Adj --> jolly	jolly

(d)

Translation: exists X (man(X) & (jolly(X) & honest(X)))

exists X (man(X) & (jolly(X) & honest(X)))

<=== by (a)(ii)

[reducing the proof of honest(X) to sincere(X) & man(X)]

exists X (man(X) & (jolly(X) & sincere(X) & man(X)))

<=== by (a)(iv)

[reducing the proof of jolly(X) & sincere(X) to fat(X) & man(X)]

exists X (man(X) & (fat(X) & man(X) & man(X)))

<=== by laws about &

exists X (man(X) & fat(X))

which is true by (a)(i)