The Predicate Calculus in AI

The Predicate Calculus (or simply, LOGIC) is

a NOTATION for internal representations

useful for the DATABASE of a Production System

- -Allows DEDUCTION of new facts

  (based solely on the FORM of the facts)

- -Supports question answering

- -Supports Planning

Logic is NOT:

- -A REPRESENTATION

It is a LANGUAGE:

We still have to pick WHAT we will represent

and HOW we will state it in this language

The Predicate Calculus in AI

Logic IS:

A formalism in which we can express

what is TRUE and FALSE,

we can INFER new facts.

This gives the impression of understanding

Propositional Logic

The simplest form of logic is Propositional Logic

PROPOSITIONS: Statements that are TRUE or FALSE

Predicate	English meaning
RAIN	"It is raining"
SUNNY	"It is sunny"
MANSOCRATES	"Socrates is a man"
MANTURING	"Turing is a man"
ANHJKFG	"I like to go to the movies"

NOTE:

1. Predicates mean what I want them to mean

2. Propositional logic is a very weak language!

    There is no relation between

    MANSOCRATES and MANTURING

Propositional Logic

Propositions may be COMBINED with CONNECTIVES

to form SENTENCES in propositional logic

AND

A AND B is true if both A and B are true

OR

A OR B is true if at least one of A and B is true

IMPLIES

A IMPLIES B is true if when A is true, then B is true

> [NOTE: That’s ALL it means: if A is false, the "truth value" of this sentence is still TRUE]

NOT

NOT A is true if A is false, and vice-versa

EQUIV

A EQUIV B is true if A and B are both true or both false

Propositional Logic

Truth Tables

How to tell if a statement is true or false?

Use a truth table:

X	Y	X AND Y	X OR Y	X IMPLIES Y	NOT X	EQUIV X Y
T	T	T	T	T	F	T
T	F	F	T	F	F	F
F	T	F	T	T	T	F
F	F	F	F	T	T	T

For longer sentences, apply these rules recursively

Examples

(Using lisp-like form):

TAUTOLOGY: (A.K.A VALID)

(1) (EQUIV (IMPLIES SD (AND SUNNY WARM))
(AND (IMPLIES SD SUNNY) (IMPLIES SD WARM)))

FALLACY: (A.K.A. UNSATISFIABLE)

(2) (EQUIV
(NOT (OR SUNNY WARM))
(NOT (NOT (AND SUNNY (NOT WARM)))))

SATISFIABLE: (neither of the above):

(3) (OR (AND SD SUNNY) (AND (NOT SUNNY) WARM))