Intelligent Retrieval from a Database, Part 1

We would like to create a knowledge-based system that will answer queries about a group of family members.

The first step is to design the knowledge base. We will try to represent knowledge by first-order sentences of the signature that consists of

- object constants S, W, A, M,
- unary predicate constants *Male*, *Female*, and
- binary predicate constants *Parent*, *Brother*.

We expect that our knowledge base KB will consist of two parts: *general*, describing the relationships between the predicates *Male*, *Female*, *Parent*, *Brother*, and *specific*—facts about the individuals S, W, A, M.

The intended interpretation I of this signature is defined as follows:

$$
\begin{array}{l}
|I| = \{S, W, A, M\}, \\
S^I = S,\ W^I = W,\ A^I = A,\ M^I = M, \\
\mathit{Male}^I = \{A, M\}, \\
\mathit{Female}^I = \{S, W\}, \\
\mathit{Parent}^I = \{\langle S, W\rangle, \langle S, A\rangle, \langle W, M\rangle\}, \\
\mathit{Brother}^I = \{\langle A, W\rangle\}.
\end{array}
$$

We would like KB to be *correct* in the sense that I should be a model of KB.

We would like KB to be *complete on the level of ground atoms*: for every ground atom (that is, atomic formula without variables) F, KB should entail either F or $\neg F$.