5.2   Example of Monotonic Rules: Family Relationships

Imagine a database of facts about some family relationships. Suppose that the database contains facts about the following *base predicates*:

$mother(X, Y)$ X is the mother of Y

$father(X, Y)$ X is the father of Y

$male(X)$ X is male

$female(X)$ X is female

Then we can infer further relationships using appropriate rules. First, we can define a predicate $parent$: a parent is either a father or a mother.

$$mother(X, Y) \rightarrow parent(X, Y)$$

$$father(X, Y) \rightarrow parent(X, Y)$$

Then we can define a brother to be a male person sharing a parent:

$$male(X), parent(P, X), parent(P, Y), notSame(X, Y) \rightarrow$$
$$brother(X, Y)$$

The predicate $notSame$ denotes inequality; we assume that such facts are kept in a database. Of course, every practical logical system offers convenient ways of expressing equality and inequality, but we chose the abstract solution to keep the discussion general.

Similarly, $sister$ is defined as follows:

$$female(X), parent(P, X), parent(P, Y), notSame(X, Y) \rightarrow$$
$$sister(X, Y)$$