

Name: Aziz Sayyad
Roll No: 381069
Batch: A3

Practical 3

Perform Parsing of Family Tree Using Knowledge Base

Problem Statement

The goal of this assignment is to parse a family tree using a knowledge base and infer relationships such as parent, sibling, or cousin. By applying logical reasoning, you will deduce various familial connections.

Objectives

- Understand knowledge representation and reasoning in artificial intelligence.
- Use inference rules to parse and deduce relationships within a family tree.

Theory

Knowledge Representation

Knowledge representation is a crucial aspect of artificial intelligence that involves defining entities (such as family members) and their relationships in a format that a computer can utilize to perform reasoning.

Inference

Inference is the process of deriving new information or relationships from existing facts using defined rules. In the context of a family tree, this involves applying logical rules to determine familial relationships.

Methodology

- 1. Represent Family Members and Relationships:**
 - Use facts to represent family members and their direct relationships. For example, you might define facts like:
 - `parent(John, Mary) .` (John is a parent of Mary)
 - `parent(John, David) .` (John is a parent of David)
 - `parent(Mary, Sara) .` (Mary is a parent of Sara)
- 2. Define Rules for Inferring Relationships:**

- Establish rules that define how to infer new relationships from existing ones.
For instance:
 - `sibling(X, Y) :- parent(Z, X), parent(Z, Y), X \= Y.` (X and Y are siblings if they share at least one parent and are not the same person)
 - `cousin(X, Y) :- parent(A, X), parent(B, Y), sibling(A, B).` (X and Y are cousins if their parents are siblings)
- 3. **Apply Rules to Infer New Relationships:**
 - Implement a reasoning engine that applies the defined rules to the facts in the knowledge base. This can be done using logic programming languages like Prolog or through custom implementations in Python.
 -

Working Principle / Algorithm

Here's a simple outline of the steps to parse the family tree:

1. **Input the Family Data:**
 - Populate the knowledge base with facts representing family members and their direct relationships.
2. **Define Inference Rules:**
 - Write rules that enable inference of new relationships (e.g., sibling, cousin).
3. **Query the Knowledge Base:**
 - Use queries to extract information about relationships. For example, asking for all siblings of a particular individual or identifying all cousins.
4. **Output Inferred Relationships:**
 - Display the relationships that have been inferred from the knowledge base.

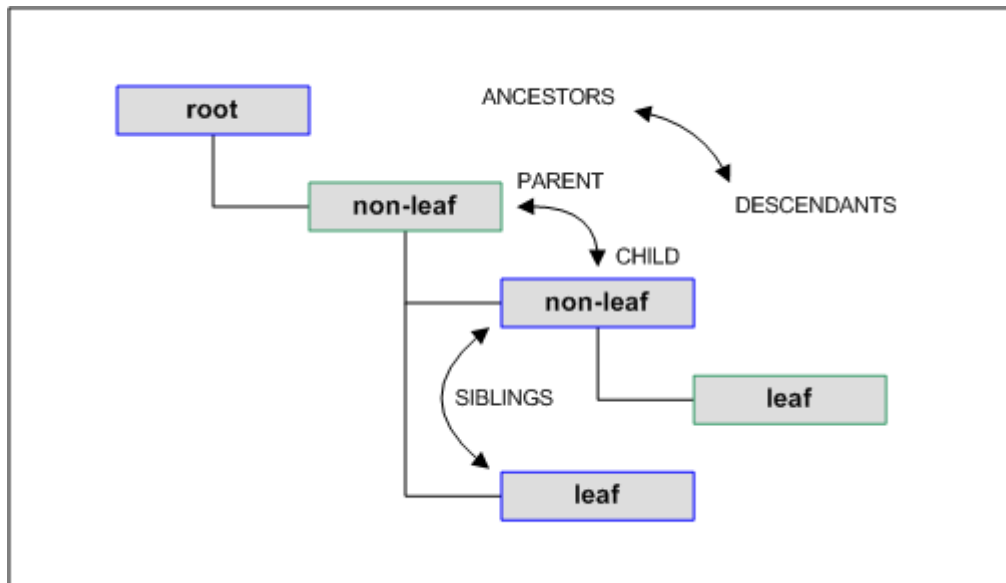
Advantages

- **Complex Reasoning:** This method allows for advanced reasoning capabilities and the ability to deduce intricate relationships that may not be immediately obvious.
- **Flexibility:** The knowledge base can be easily modified or expanded to include more facts or rules.

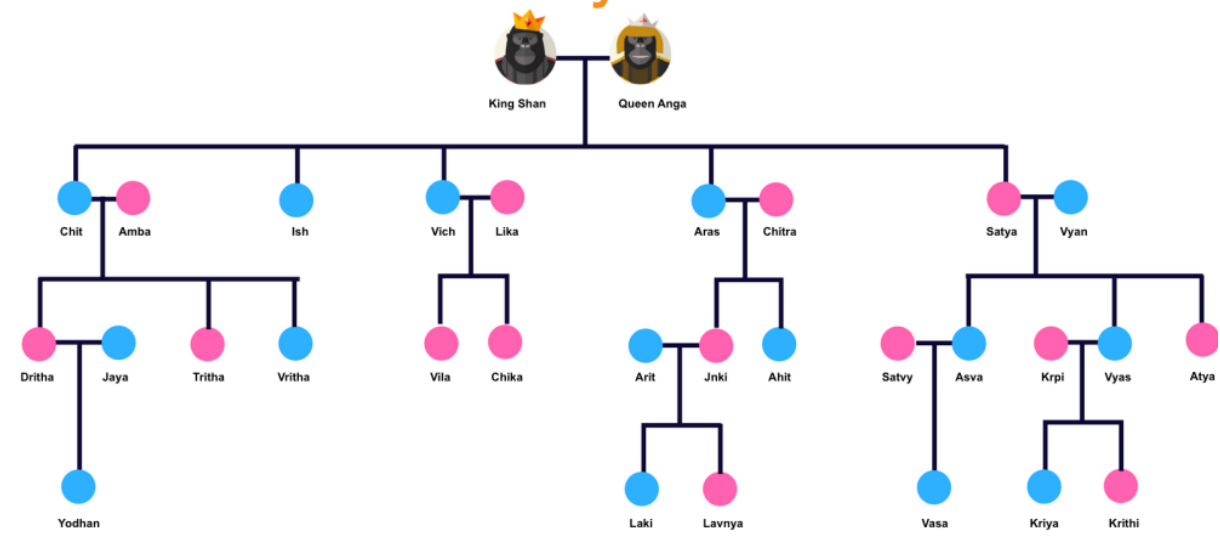
Disadvantages / Limitations

- **Complexity:** As the family tree grows in size and complexity, managing and querying the knowledge base may become increasingly difficult.
- **Performance:** Inference over a large set of rules and facts can lead to performance issues, especially if the rules are not optimized.

Diagram



Family Tree



Conclusion

Using a knowledge base combined with inference rules provides a structured and effective way to parse and deduce relationships within a family tree. This approach enhances our ability to reason about familial connections, enabling a clearer understanding of the family structure.