Lab02

October 30, 2023

0.1 Lab02: Logic

Create folder named `Student_ID` (for example, if your student id is 1234567, you will name the folder as `1234567`) with the following structure:

- Folder `Project02_logic` - `SRC`: Source code - `REPORT`: Report (file .pdf)

Compress `Student_ID` folder with **zip** format.

Please, follow exactly all the requirements and instructions above.

- If you have any questions, you can contact me via email:
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Design a KB system by your own python scripts.

Given a Knowledge Base **(KB)** and a statement α, both represented by prepositional logic and change to CNF. Determine if KB entails α (KB α) by resolution.

- Your report have at least 5 test cases for demo (test cases should not be too simple).
- Write short evaluations about the advantages and disadvantages of resolution method for prepositional logic, propose your own solution for specific problem. **a. Desribe the experiment data.**
- **Input data**: **KB** and α with CNF stored in **input.txt**. This file have the following structure:
  - The first line contains α statement
  - The second line has N – the number of clauses in the KB.
  - N following lines are clauses in KB, one line for each clause.

Positive literal is represented by an uppercase character (A-Z). Negative literal is positive literal with minus ('-') before the character.

Literals are linked by OR. Bettween literals and keywords there can be more than one space.

- **Output data**: The set of statements that are generated during the whole resolution process and the conclusion clause is stored in **output.txt**. This file must have the following structure:
  - The first line contains M1 – the number of generated clauses in first loop. M1 following lines describe those clauses (including empty clause), each line represents a clause. The empty clause is represented by "{}"
  - Next loops are also represented as (M_2, M_3,..., M_n clauses) the first loop.
  - The last line is the conclusion clause, which mean if "KB entails α?". Print YES if KB entails α. NO for the opposite.
  - Remove redundant clause (same clauses in same loop, or the loops before).

- main function must::
  - Read the input data and store it in a suitable data structure
  - Call PL-Resolution function for execute resolution algorithm
  - Export the output data with the required format
- Store the semantic information of true and false value in PL-RESOLUTION. Do not forget that we need to negate α.
- Literals in a clause is sorted by alphabetical ordering
- Infered condition is checked in each loop as when all the new clauses are generated from the current KB.
- Clauses that have $A \vee B \vee -B$ format and $True$ value are similar to $A \vee True$ can be removed.

Example: A KB and α clause in **input.txt**

Input.txt	Output.txt	Ghi chú
-A	3	
4	-A	(-A OR B) hợp giải với (-B)
-A OR B	B	(-A OR B) hợp giải với (negative of -A)
B OR -C	-C	(-C OR B) hợp giải với (-B)
A OR -B OR C	4	
-B	-B OR C	(A OR C OR -B) hợp giải với (-A)
	A OR C	(A OR C OR -B) hợp giải với (B)
	A OR -B	(A OR C OR -B) hợp giải với (-C)
	{}	(-B) hợp giải với (B)
	YES	KB entails α vì tồn tại mệnh đề rỗng trong KB

Another example KB with a different α

Input.txt	Output.txt	Ghi chú
A	2	KB KHÔNG entail α vì không phát sinh được mệnh đề mới và không tìm thấy mệnh đề rỗng
4	-C	
-A OR B	-B OR C	
-C OR B	2	
A OR C OR -B	A OR -B	
-B	-A OR C	
	1	
	A OR -C	
	0	
	NO	

b. Evaluations

STT	Description	Ratio
1	Read input data and store in suitable data structure	0.5
2	Implementation of resolution method	1.0
3	Inference process and results	2.5
5	Testcases, report, evaluations,	1.0