

实践5 基于SUMA的OWL推理

课程名称: 知识工程 实验日期: 2023/6/22
班级: 人工智能 x 班 姓名: 学号:

一、实践要求

1、根据实验演示视频跑通 SUMA 的 OWL 推理代码，并解释输出内容。

二、实践内容

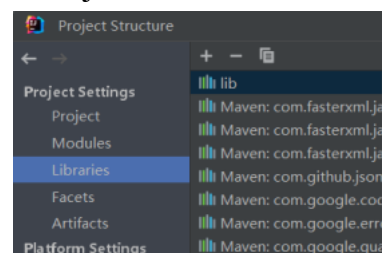
- 1、SUMA 系统代码调试
- 2、SUMA 系统输出内容解释

三、实践步骤（包括源码与过程截图）

git clone SUMA 源码 到本地；

```
PS D:\1-School\知识工程\知识工程实验及报告模板\实验五> git clone https://github.com/SUMA-2019/SUMA-resource
Cloning into 'SUMA-resource'...
fatal: unable to access 'https://github.com/SUMA-2019/SUMA-resource/': Failed to connect to github.com port 443 after 2
884 ms: Timed out
PS D:\1-School\知识工程\知识工程实验及报告模板\实验五> git clone https://github.com/SUMA-2019/SUMA-resource
Cloning into 'SUMA-resource'...
remote: Enumerating objects: 169, done.
remote: Counting objects: 100% (169/169), done.
remote: Compressing objects: 100% (149/149), done.
remote: Total 169 (delta 26), reused 139 (delta 14), pack-reused 0
Receiving objects: 100% (169/169), 22.74 MiB | 1.84 MiB/s, done.
Resolving deltas: 100% (26/26), done.
PS D:\1-School\知识工程\知识工程实验及报告模板\实验五>
```

导入 jar 包



运行参数

pathTBox:本体路径(*.owl)

pathABox:数据路径(*.nt/ttl)

n: 物化步长，默认为 7

pathExtendedABox:物化后的数据路径 (*.nt)

isQueryByJena:是否进行 Jena 查询

initIsRoleWriting(true):是否进行角色改写，默认为 true

queryPath: SPARQL 查询路径(.sparql)

answerPath: 查询答案的路径

```

public static void main(String[] args) throws Exception {
    String pathTBox = "data/univ-bench-dl.owl";
    String pathABox = "data/uobm1.nt";
    String pathExtendedABox = "data/new_uobm1_no.nt";
    String pathDataThing = "data/newThing_oubm1_test.nt";
    boolean isQueryByJena = true;
    initIsRoleWriting(true);
    String queryPath = "data/standard.sparql";
    String answerPath = "data/result_new_no_rewrite.nt";
    int n_step = 7;
}

```

四、实践结果

```

list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Man>
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Woman>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isTaryAbout> <http://semantics.cri.ihe.com/univ-bench-dl.owl#TennisClass>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#teachingAssistantOf> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Course>)
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isTaryAbout> <http://semantics.cri.ihe.com/univ-bench-dl.owl#TeachingClass>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isHeadOf> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Program>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#like> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Sports>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectMinCardinality(1 <http://semantics.cri.ihe.com/univ-bench-dl.owl#like> owl:Thing)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Student>
list: ObjectComplementOf(ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#hasMajor> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Science>))
list: ObjectMinCardinality(1 <http://semantics.cri.ihe.com/univ-bench-dl.owl#takesCourse> owl:Thing)
list: ObjectAllValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#takesCourse> <http://semantics.cri.ihe.com/univ-bench-dl.owl#GraduateCourse>)
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isTaryAbout> <http://semantics.cri.ihe.com/univ-bench-dl.owl#BasketBallClass>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#hasMajor> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Science>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Student>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isHeadOf> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Department>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#like> <http://semantics.cri.ihe.com/univ-bench-dl.owl#SwimmingClass>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isHeadOf> <http://semantics.cri.ihe.com/univ-bench-dl.owl#College>)
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isStudentOf> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Organization>)
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: <http://semantics.cri.ihe.com/univ-bench-dl.owl#Person>
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isTaryAbout> <http://semantics.cri.ihe.com/univ-bench-dl.owl#Sports>)
list: ObjectSomeValuesFrom(<http://semantics.cri.ihe.com/univ-bench-dl.owl#isTaryAbout> <http://semantics.cri.ihe.com/univ-bench-dl.owl#BasketBallClass>)

```

加载公理与数据日志输出，显示加载了 502 条公理以及 247601 数据。

```

19:29:31,430 INFO DictionaryInput:292 - axioms count 502
19:29:32,414 INFO DictionaryInput:79 - -----
19:29:32,415 INFO DictionaryInput:80 - Number of initial data: 247601
19:29:32,415 INFO DictionaryInput:81 - Number of facts with equivalent role substitution: 3506
19:29:32,415 INFO DictionaryInput:82 - Number of facts with inverse role substitution: 2528
19:29:32,415 INFO DictionaryInput:83 - Number of equivalent roles: 2
19:29:32,415 INFO DictionaryInput:84 - Number of inverse roles: 8
19:29:32,415 INFO DictionaryInput:156 - Number of facts after adding ClassAssertion: 247601
19:29:32,415 INFO SUMARunTest:62 - reading data time: 915 ms
19:29:32,715 INFO DicSerialReason:33 -

```

物化，一共进行了 6 轮物化操作，耗时 810 毫秒。

```

19:29:32,715 INFO DicSerialReason:33 - 
-----Start Materialization-----
19:29:32,715 INFO DicSerialReason:35 - loopCount 1 dataCount 257766
19:29:33,138 INFO DicSerialReason:35 - loopCount 2 dataCount 387984
19:29:33,404 INFO DicSerialReason:35 - loopCount 3 dataCount 422930
19:29:33,456 INFO DicSerialReason:35 - loopCount 4 dataCount 430501
19:29:33,466 INFO DicSerialReason:35 - loopCount 5 dataCount 431079
19:29:33,470 INFO DicSerialReason:35 - loopCount 6 dataCount 431127
19:29:33,472 INFO DicSerialReason:78 - No new data was generated!
19:29:33,473 INFO SUMARunTest:73 - reason time: 810 ms

```

Jena 查询输出

```

19:29:33,473 INFO SUMARunTest:73 - reason time: 810
18:53:37,916 INFO JenaTest:72 - q 1
18:53:37,916 INFO JenaTest:73 - resultsCount: 21
18:53:37,942 INFO JenaTest:72 - q 2
18:53:37,942 INFO JenaTest:73 - resultsCount: 2465

```

五、实践心得

通过课堂，我了解到 SUMA 是一个高效、可扩展的查询回答系统，支持 OWL 2 DL 本体。它有这样的特点，现有的本体答题推理器不能解决无限化的问题和处理一些数据时存在的高开销问题，而 SUMA 通过为事实和规则建立高效的索引来降低离线物化的成本。同时，低复杂度的物化算法允许 SUMA 可以支持大规模数据集的实时推理。在这个实验中，我们只对 SUMA 系统做了一个简单的 TEST 测试。SUMA 有大量的代码行，而且还很难理解。