COMPUTER SCIENCE

Assignment 1 Report

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OOP Design:

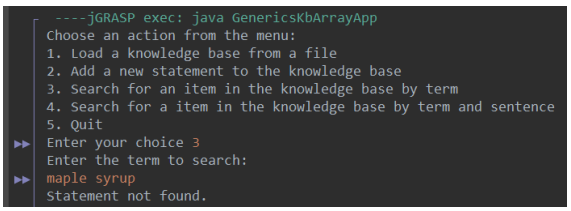
- In this assignment 5 classes were created:
    1. Statement class
    2. GenericsKbArrayApp class
    3. GenericsKbBSTApp class
    4. BinaryTree class
    5. BinaryTreeNode class

- The first class created was the statement class in which each statement object represents an entry in the knowledge base and consists of a term, sentence, and confidence score. It also implements the Comparable interface. There are also two compareTo() methods which are used later on in the BinaryTree class.
- The GenericsKbArrayApp class is a program which creates an array of a pre-set length and is populated by a text file. Each line of the text file is read and split to create a Statement object which is then stored in the array. If the term is already in the array knowledge base it will test whether the new sentence has a higher confidence score and append the current object stored in that position with the new information. The user can then choose other options to update objects stored in the array or find specific terms.
- The next class created was the BinaryTreeNode class in which each Node object represents an entry in the BinaryTree knowledge base and stores a Statement object as data. This is a class of generic type which extends the Comparable interface.
- The BinaryTree class is a program has an attribute called root which is of type BinaryTreeNode and is used to reference the start of knowledge base. In this class there are many function such as find() and postOrder() which can be used to traverse the knowledge base and find specific entries. This is a generic class which extends the Comparable interface.

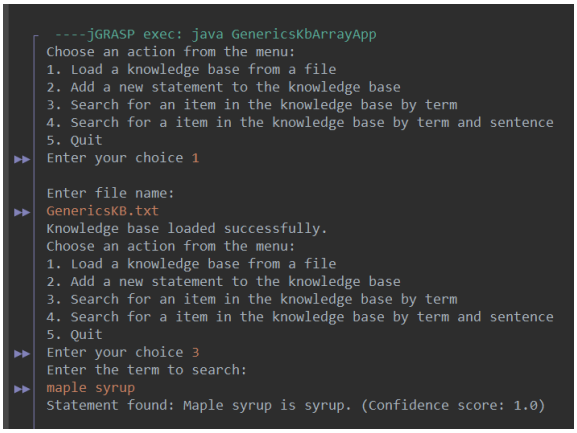
Experimental Testing:

- Description of testing protocol: The first test implemented was checking whether the knowledge bases were being populated. This was tested by searching for a statement before and after loading a knowledge base. Next was to test whether the updating function was working. Firstly, by testing if the knowledge base would update if another knowledge base was added, secondly by adding a new statement and thirdly by trying to add a statement with a lower confidence score. The final test was to see if the search function was operational by searching for two random statements in the knowledge base and then one statement which was not in the knowledge base. The enhanced functionality search was tested in the creativity section of the report.

- Testing the population of the knowledge base of GenericsKbArrayApp:

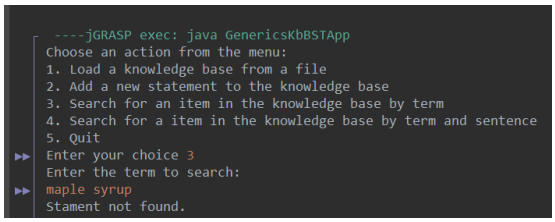


Without populating the knowledge base.



With populating the knowledge base.

- Testing the population of the knowledge base of GenericsKbBSTApp:



Without populating the knowledge base.

```
----jGRASP exec: java GenericsKbBSTApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 3
Enter the term to search:
maple syrup
Statement found: Maple syrup is syrup. (Confidence score: 1.0)
```

With populating the knowledge base.

- Test updating the GenericsKbArrayApp:

```
----jGRASP exec: java GenericsKbArrayApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
motility
Enter the statement to search for:
Motility is an action
Statement not found.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB-additional.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
motility
Enter the statement to search for:
Motility is an action
The statement was found and has a confidence of: 1.0
```

Updating the knowledge base with a new knowledge base.

```
----jGRASP exec: java GenericsKbArrayApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 3
Enter the term to search:
maple syrup
Statement found: Maple syrup is syrup. (Confidence score: 1.0)

Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 2
Enter the term:
maple syrup
Enter the statement:
Maple syrup is sweet.
Enter the confidence score:
1
Statement for term maple syrup has been updated
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 3
Enter the term to search:
maple syrup
Statement found: Maple syrup is sweet. (Confidence score: 1.0)
```

Updating the knowledge base with a new statement.

```
----jGRASP exec: java GenericsKbArrayApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 2
Enter the term:
maple syrup
Enter the statement:
Maple syrup is sweet.
Enter the confidience score:
0.5
Statement for term maple syrup has not been found or confidence level is too low.
```

Trying to update the knowledge base with a new statement which has a lower confidence score.

- Test updating GenericsKbBSTApp:

```
----jGRASP exec: java GenericsKbBSTApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
motility
Enter the statement to search for:
Motility is an action
Statement not found for term: motility
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB-additional.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
motility
Enter the statement to search for:
Motility is an action
Statement found: Motility is an action (Confidence score: 1.0)
```

Updating the knowledge base with a new knowledge base.

```
----jGRASP exec: java GenericsKbBSTApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
maple syrup
Enter the statement to search for:
Maple syrup is syrup.
Statement found: Maple syrup is syrup. (Confidence score: 1.0)
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 2
Enter the term:
maple syrup
Enter the statement:
Maple syrup is sweet.
Enter the confidience score:
1
Statement found: Maple syrup is sweet. (Confidence score: 1.0)
```

Updating the knowledge base with a new statement.

```
----jGRASP exec: java GenericsKbBSTApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 2
Enter the term:
maple syrup
Enter the statement:
Maple syrup is sweet.
Enter the confidience score:
0.5
Statement for term maple syrup has not been found or confidence level is too low.
```

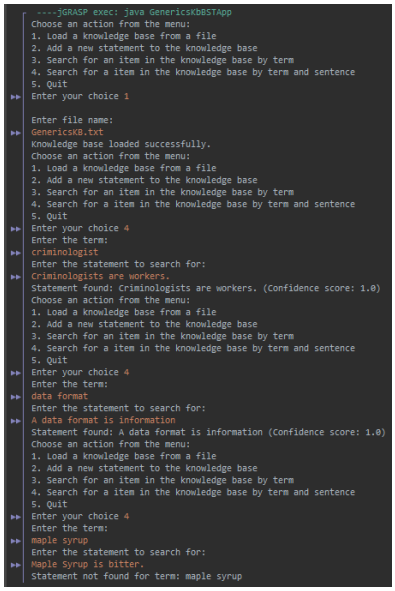
Trying to update the knowledge base with a new statement which has a lower confidence score.

- Test searching GenericsKbBSTApp:

```
----jGRASP exec: java GenericskbArrayApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
criminologist
Enter the statement to search for:
Criminologists are workers.
The statement was found and has a confidence of: 1.0
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
data format
Enter the statement to search for:
A data format is information
The statement was found and has a confidence of: 1.0
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 4
Enter the term:
maple syrup
Enter the statement to search for:
Maple syrup is bitter.
Statement not found.
```

Testing the search of the first line of the text file entered and one in the middle as well and a statement which does not exist.



Testing the search of the first line of the text file entered and one in the middle as well and a statement which does not exist.

Creativity:

- For creativity both programs have enhanced search functionality. If the user enters option 3 and chooses a term that appears in the knowledge base, the program will display all the statements that contain that specific term in the sentence of the statement.

1. Example from GenericsKbArrayApp:

```
----jGRASP exec: java GenericsKbArrayApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 3
Enter the term to search:
pilot
Statement found: An automatic pilot is a device (Confidence score: 1.0)

Statement found: Pilot projects are tests. (Confidence score: 1.0)

Statement found: Barnstormers are pilots. (Confidence score: 1.0)

Statement found: Commercial pilots have irregular schedules. (Confidence score: 1.0)

Statement found: A pilot boat is a boat (Confidence score: 1.0)

Statement found: Pilot fish are small fish that swim alongside a shark. (Confidence score: 0.711968839168548 6)

Statement found: A pilothouse is a compartment (Confidence score: 1.0)

Statement found: A fighter pilot is a pilot (Confidence score: 1.0)

Statement found: A pilot experiment is an experiment (Confidence score: 1.0)

Statement found: Pilot isa worker. (Confidence score: 1.0)

Statement found: An autopilot is a device (Confidence score: 1.0)

Statement found: Pilot trials publish in journals. (Confidence score: 1.0)

Statement found: An airplane pilot is a flyer (Confidence score: 1.0)

Statement found: Veteran pilots have experience. (Confidence score: 1.0)

Statement found: A wingman is a pilot (Confidence score: 1.0)

Statement found: Human pilot trials publish in journals. (Confidence score: 1.0)

Statement found: A pilot program is a trial (Confidence score: 1.0)

Statement found: Helicopter pilots involve in rescue operations. (Confidence score: 1.0)

Statement found: Test pilots are pilots. (Confidence score: 1.0)
```

For example, where the program prints all statements that contain the word “pilot” that the user entered.

- Example from GenericsKbBSTApp:

```
----jGRASP exec: java GenericsKbBSTApp
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 1

Enter file name:
GenericsKB.txt
Knowledge base loaded successfully.
Choose an action from the menu:
1. Load a knowledge base from a file
2. Add a new statement to the knowledge base
3. Search for an item in the knowledge base by term
4. Search for a item in the knowledge base by term and sentence
5. Quit
Enter your choice 3
Enter the term to search:
pilot
Statement found: An airplane pilot is a flyer (Confidence score: 1.0)

Statement found: An automatic pilot is a device (Confidence score: 1.0)

Statement found: An autopilot is a device (Confidence score: 1.0)

Statement found: Barnstormers are pilots. (Confidence score: 1.0)

Statement found: Commercial pilots have irregular schedules. (Confidence score: 1.0)

Statement found: A fighter pilot is a pilot (Confidence score: 1.0)

Statement found: Helicopter pilots involve in rescue operations. (Confidence score: 1.0)

Statement found: Human pilot trials publish in journals. (Confidence score: 1.0)

Statement found: Pilot projects are tests. (Confidence score: 1.0)

Statement found: A pilot boat is a boat (Confidence score: 1.0)

Statement found: Pilot isa worker. (Confidence score: 1.0)

Statement found: Pilot fish are small fish that swim alongside a shark. (Confidence score: 0.711968839168548 6)

Statement found: A pilot experiment is an experiment (Confidence score: 1.0)

Statement found: A pilot program is a trial (Confidence score: 1.0)

Statement found: A pilothouse is a compartment (Confidence score: 1.0)

Statement found: Pilot trials publish in journals. (Confidence score: 1.0)

Statement found: Test pilots are pilots. (Confidence score: 1.0)

Statement found: Veteran pilots have experience. (Confidence score: 1.0)

Statement found: A wingman is a pilot (Confidence score: 1.0)
```

The same example where the program prints all statements that contain the word “pilot” that the user entered.

Git Log:

```
0: commit bf6471858d06a8282fae6830de14f9b9afdd63eb
1: Author: Miguel Lavarinhas <lvrmig001@myuct.ac.za>
2: Date: Sat Mar 2 16:05:52 2024 +0200
3:
4: Added javadoc to all classes.
5:
6: commit 224b205bea991fa427b419fc10c726902c0270b4
7: Author: Miguel Lavarinhas <lvrmig001@myuct.ac.za>
8: Date: Fri Mar 1 10:42:45 2024 +0200
9:
...
19: Author: Miguel Lavarinhas <lvrmig001@myuct.ac.za>
20: Date: Thu Feb 29 18:44:10 2024 +0200
21:
22: Assignment 1: Finished GenericsKbArray and BinaryTree and
modified BinaryTreeNode and GenericsKBSTApp.
23:
24: commit 9ad1f452482eb37d5f4709aa68f2ffeb894f1d0f
25: Author: Miguel Lavarinhas <lvrmig001@myuct.ac.za>
26: Date: Wed Feb 28 18:44:59 2024 +0200
27:
28: Assignment 1: This is my first commit.
```