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A PRIORITY QUEUE FOR A SIMPLIFIED AGENDA MANAGER IN A RULE-BASED EXPERT SYSTEM SHELL

Objective: The objective of this assignment is to implement a simplified agenda manager. In each cycle, the agenda manager first deletes from the agenda the activated rule that was executed in a previous cycle. A list of new activated rules is given to the agenda manager to add to the agenda. Once a rule is added to the agenda, it remains there until it is executed. An agenda manager then determines the rule with highest priority for the inference engine to execute in this cycle. Only one rule can be executed in each cycle. A rule that has been executed and removed from the agenda may be put on the agenda again in the next cycle. The system halts when the agenda is empty or after it runs 30 cycles.

I. Setting up the environment

In this assignment, I used Python for programming. It is recommended that the grader should install *Jupyter Notebook* to run the experiment and test the code with other testing files.

First, we need to import two libraries to our environment.

```
import math
import re
import time
```

AGENDA MANAGER WITH THE FOLLOWING FUNCTIONS

1. HEAPIFY FUNCTION

```
def MAXHEAPIFY(A,i,heap_size):
    left = 2*i+1
    right = 2*i +2
    if left <=heap_size and int(A[left].split(',')[1])>int(A[i].split(',')[1]):
        largest = left
    else:
        largest =i
    if right <=heap_size and int(A[right].split(',')[1]) > int(A[largest].split(',')[1]):
        largest = right

    if largest != i:
        A[i], A[largest] = A[largest], A[i]
        MAXHEAPIFY(A,largest,heap_size)
```

2. BUILD QUEUE

```
def BuildQueue(A):
    heap_size = len(A)-1
    start_point = int(math.floor(len(A)/2)-1)
    for i in range(start_point,-1,-1):
        MAXHEAPIFY(A,i,heap_size)
```

3. INSERT VALUE TO HEAP

```
def Insert(A,value):
    A.append(value)
    i=len(A)-1
    while i>0 and int(A[int(i/2)].split(',')[1]) < int(value.split(',')[1]):
        A[i], A[int(i/2)] = A[int(i/2)],A[i]
        i = int(i/2)
```

4. DELETE VALUE FROM HEAP

```
def Delete(A,index):
    if index>len(A)-1:
        print("Please select proper element")
    else:
        if index==len(A)-1:
            del A[-1]
        else:
            # swap current index to the last
            A[index], A[len(A)-1] =A[len(A)-1],A[index]
            del A[-1]
            MAXHEAPIFY(A,index,len(A)-1)
```

5. EXTRACT MAX

```
def ExtractMax(A):
    if len(A)<1:
        print("Heap underflow")
    else:
        max = A[0]
        last = len(A)-1
        A[0], A[last] = A[last],A[0]
        del A[-1]
        MAXHEAPIFY(A,0,len(A)-1)
    return max
```

6. GET NUMBER OF RULES IN DATA FILE

```
def STATS(A):
    aggre_data = re.findall("\\((.*?)\\)", A)
    return len(aggre_data)
```

RUN THE EXPERIMENT BY PROVIDING PATH TO TEST FILE

filepath = 'test3.txt'

II. Results

a. Experiment result with test1.txt

Reading input...test1.txt

Basic statistics

Total rules: 33

There are 13 line(s) in our text file

Initialize simplified agenda manager...

.....Processing CYCLE 1/30.....

Build Priority Queue (Heap):

Reading 12 rule(s) at line 1:

['R10, 10', 'R20, 20', 'R90, 90', 'R75, 75', 'R35, 35', 'R60, 60', 'R260, 60', 'R360, 60', 'R210, 10', 'R5, 5', 'R76, 76', 'R80, 80']

Activated rules in the Agenda Manager

['R90, 90', 'R76, 76', 'R80, 80', 'R75, 75', 'R35, 35', 'R60, 60', 'R260, 60', 'R360, 60', 'R210, 10', 'R5, 5', 'R20, 20', 'R10, 10']

Extract rule (R90, 90) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['R80, 80', 'R76, 76', 'R60, 60', 'R75, 75', 'R35, 35', 'R10, 10', 'R260, 60', 'R360, 60', 'R210, 10', 'R5, 5', 'R20, 20']

.....Processing CYCLE 2/30.....

Reading 1 rule(s) at line 2:

['R15, 15']

Build Priority Queue (Heap):

Adding rule (R15, 15) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['R80, 80', 'R76, 76', 'R60, 60', 'R75, 75', 'R35, 35', 'R15, 15', 'R260, 60', 'R360, 60', 'R210, 10', 'R5, 5', 'R20, 20', 'R10, 10']

Extract rule (R80, 80) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['R76, 76', 'R75, 75', 'R60, 60', 'R360, 60', 'R35, 35', 'R15, 15', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20']

.....Processing CYCLE 3/30.....

Reading 1 rule(s) at line 3:

['R50, 50']

Build Priority Queue (Heap):

Adding rule (R50, 50) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['R76, 76', 'R75, 75', 'R60, 60', 'R360, 60', 'R35, 35', 'R50, 50', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20', 'R15, 15']

Extract rule (R76, 76) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['R75, 75', 'R360, 60', 'R60, 60', 'R15, 15', 'R35, 35', 'R50, 50', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20']

.....Processing CYCLE 4/30.....

Reading 1 rule(s) at line 4:

['R275, 75']

Build Priority Queue (Heap):

Adding rule (R275, 75) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R75, 75', 'R275, 75', 'R360, 60', 'R15, 15', 'R35, 35', 'R60, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20', 'R50, 50']

Extract rule (R75, 75) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['R275, 75', 'R50, 50', 'R360, 60', 'R15, 15', 'R35, 35', 'R60, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20']

.....Processing CYCLE 5/30.....

Reading 2 rule(s) at line 5:

['R80, 80', 'R55, 55']

Build Priority Queue (Heap):

Adding rule (R80, 80) to the queue. Maintaining heap.....Done!

Adding rule (R55, 55) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R80, 80', 'R275, 75', 'R50, 50', 'R15, 15', 'R35, 35', 'R360, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20', 'R60, 60', 'R55, 55']

Extract rule (R80, 80) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['R275, 75', 'R55, 55', 'R50, 50', 'R15, 15', 'R35, 35', 'R360, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20', 'R60, 60']

.....Processing CYCLE 6/30.....

Reading 1 rule(s) at line 6:

['R3, 3']

Build Priority Queue (Heap):

Adding rule (R3, 3) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R275, 75', 'R55, 55', 'R50, 50', 'R15, 15', 'R35, 35', 'R360, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R20, 20', 'R60, 60', 'R3, 3']

Extract rule (R275, 75) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['R55, 55', 'R35, 35', 'R50, 50', 'R15, 15', 'R20, 20', 'R360, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R3, 3', 'R60, 60']

.....Processing CYCLE 7/30.....

Reading 1 rule(s) at line 7:

['R310, 10']

Build Priority Queue (Heap):

Adding rule (R310, 10) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R55, 55', 'R35, 35', 'R50, 50', 'R15, 15', 'R20, 20', 'R360, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R3, 3', 'R60, 60', 'R310, 10']

Extract rule (R55, 55) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['R50, 50', 'R35, 35', 'R360, 60', 'R15, 15', 'R20, 20', 'R60, 60', 'R260, 60', 'R10, 10', 'R210, 10', 'R5, 5', 'R3, 3', 'R310, 10']

.....Processing CYCLE 8/30.....

Reading 1 rule(s) at line 8:

['R95, 95']

Build Priority Queue (Heap):

Adding rule (R95, 95) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R95, 95', 'R50, 50', 'R360, 60', 'R35, 35', 'R20, 20', 'R60, 60', 'R15, 15', 'R10, 10', 'R210, 10', 'R5, 5', 'R3, 3', 'R310, 10', 'R260, 60']

Extract rule (R95, 95) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['R260, 60', 'R50, 50', 'R360, 60', 'R35, 35', 'R20, 20', 'R60, 60', 'R15, 15', 'R10, 10', 'R210, 10', 'R5, 5', 'R3, 3', 'R310, 10']

.....Processing CYCLE 9/30.....

Reading 7 rule(s) at line 9:

['R59, 59', 'R58, 58', 'R57, 57', 'R56, 56', 'R255, 55', 'R54, 54', 'R53, 53']

Build Priority Queue (Heap):

Adding rule (R59, 59) to the queue. Maintaining heap.....Done!

Adding rule (R58, 58) to the queue. Maintaining heap.....Done!

Adding rule (R57, 57) to the queue. Maintaining heap.....Done!

Adding rule (R56, 56) to the queue. Maintaining heap.....Done!

Adding rule (R255, 55) to the queue. Maintaining heap.....Done!

Adding rule (R54, 54) to the queue. Maintaining heap.....Done!

Adding rule (R53, 53) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R260, 60', 'R59, 59', 'R360, 60', 'R58, 58', 'R255, 55', 'R60, 60', 'R50, 50', 'R57, 57', 'R54, 54', 'R53, 53', 'R3, 3', 'R310, 10', 'R15, 15', 'R35, 35', 'R10, 10', 'R56, 56', 'R210, 10', 'R20, 20', 'R5, 5']

Extract rule (R260, 60) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['R360, 60', 'R59, 59', 'R60, 60', 'R58, 58', 'R255, 55', 'R15, 15', 'R50, 50', 'R57, 57', 'R54, 54', 'R53, 53', 'R3, 3', 'R310, 10', 'R5, 5', 'R35, 35', 'R10, 10', 'R56, 56', 'R210, 10', 'R20, 20']

.....Processing CYCLE 10/30.....

Reading 1 rule(s) at line 10:

['R220, 20']

Build Priority Queue (Heap):

Adding rule (R220, 20) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R360, 60', 'R59, 59', 'R60, 60', 'R58, 58', 'R255, 55', 'R15, 15', 'R50, 50', 'R57, 57', 'R54, 54', 'R53, 53', 'R3, 3', 'R310, 10', 'R5, 5', 'R35, 35', 'R10, 10', 'R56, 56', 'R210, 10', 'R20, 20', 'R220, 20']

Extract rule (R360, 60) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['R60, 60', 'R59, 59', 'R50, 50', 'R58, 58', 'R255, 55', 'R15, 15', 'R35, 35', 'R57, 57', 'R54, 54', 'R53, 53', 'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R56, 56', 'R210, 10', 'R20, 20']

.....Processing CYCLE 11/30.....

Reading 1 rule(s) at line 11:

['R60, 60']

Build Priority Queue (Heap):

Adding rule (R60, 60) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R60, 60', 'R60, 60', 'R59, 59', 'R58, 58', 'R50, 50', 'R15, 15', 'R35, 35', 'R57, 57', 'R54, 54', 'R255, 55', 'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R56, 56', 'R210, 10', 'R20, 20', 'R53, 53']

Extract rule (R60, 60) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['R60, 60', 'R58, 58', 'R59, 59', 'R57, 57', 'R50, 50', 'R15, 15', 'R35, 35', 'R56, 56', 'R54, 54', 'R255, 55', 'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R53, 53', 'R210, 10', 'R20, 20']

.....Processing CYCLE 12/30.....

Reading 1 rule(s) at line 12:

['R90, 90']

Build Priority Queue (Heap):

Adding rule (R90, 90) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['R90, 90', 'R60, 60', 'R58, 58', 'R57, 57', 'R59, 59', 'R15, 15', 'R35, 35', 'R56, 56', 'R54, 54', 'R50, 50', 'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R53, 53', 'R210, 10', 'R20, 20', 'R255, 55']

Extract rule (R90, 90) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['R60, 60', 'R59, 59', 'R58, 58', 'R57, 57', 'R255, 55', 'R15, 15', 'R35, 35', 'R56, 56', 'R54, 54', 'R50, 50',
'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R53, 53', 'R210, 10', 'R20, 20']

.....Processing CYCLE 13/30.....

Reading 3 rule(s) at line 13:

['R1, 1', 'R2, 1', 'R1, 1']

Build Priority Queue (Heap):

Adding rule (R1, 1) to the queue. Maintaining heap.....Done!

Adding rule (R2, 1) to the queue. Maintaining heap.....Done!

Adding rule (R1, 1) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['R60, 60', 'R59, 59', 'R58, 58', 'R57, 57', 'R255, 55', 'R15, 15', 'R35, 35', 'R56, 56', 'R54, 54', 'R50, 50',
'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R53, 53', 'R210, 10', 'R20, 20', 'R1, 1', 'R2, 1', 'R1, 1']

Extract rule (R60, 60) from Agenda Manager

Rebuild the priority queue....Done! 20 rule(s) are in the Agenda Manager

['R59, 59', 'R57, 57', 'R58, 58', 'R56, 56', 'R255, 55', 'R15, 15', 'R35, 35', 'R53, 53', 'R54, 54', 'R50, 50',
'R3, 3', 'R310, 10', 'R5, 5', 'R220, 20', 'R10, 10', 'R1, 1', 'R210, 10', 'R20, 20', 'R1, 1', 'R2, 1']

.....Processing CYCLE 14/30.....

Extract rule (R59, 59) from Agenda Manager

Rebuild the priority queue....Done! 19 rule(s) are in the Agenda Manager

['R58, 58', 'R57, 57', 'R35, 35', 'R56, 56', 'R255, 55', 'R15, 15', 'R220, 20', 'R53, 53', 'R54, 54', 'R50, 50',
'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1', 'R10, 10', 'R1, 1', 'R210, 10', 'R20, 20', 'R1, 1']

.....Processing CYCLE 15/30.....

Extract rule (R58, 58) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['R57, 57', 'R56, 56', 'R35, 35', 'R54, 54', 'R255, 55', 'R15, 15', 'R220, 20', 'R53, 53', 'R20, 20', 'R50, 50',
'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1', 'R10, 10', 'R1, 1', 'R210, 10', 'R1, 1']

.....Processing CYCLE 16/30.....

Extract rule (R57, 57) from Agenda Manager

Rebuild the priority queue....Done! 17 rule(s) are in the Agenda Manager

['R56, 56', 'R255, 55', 'R35, 35', 'R54, 54', 'R50, 50', 'R15, 15', 'R220, 20', 'R53, 53', 'R20, 20', 'R1, 1', 'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1', 'R10, 10', 'R1, 1', 'R210, 10']

.....Processing CYCLE 17/30.....

Extract rule (R56, 56) from Agenda Manager

Rebuild the priority queue....Done! 16 rule(s) are in the Agenda Manager

['R255, 55', 'R54, 54', 'R35, 35', 'R53, 53', 'R50, 50', 'R15, 15', 'R220, 20', 'R210, 10', 'R20, 20', 'R1, 1', 'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1', 'R10, 10', 'R1, 1']

.....Processing CYCLE 18/30.....

Extract rule (R255, 55) from Agenda Manager

Rebuild the priority queue....Done! 15 rule(s) are in the Agenda Manager

['R54, 54', 'R53, 53', 'R35, 35', 'R20, 20', 'R50, 50', 'R15, 15', 'R220, 20', 'R210, 10', 'R1, 1', 'R1, 1', 'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1', 'R10, 10']

.....Processing CYCLE 19/30.....

Extract rule (R54, 54) from Agenda Manager

Rebuild the priority queue....Done! 14 rule(s) are in the Agenda Manager

['R53, 53', 'R50, 50', 'R35, 35', 'R20, 20', 'R10, 10', 'R15, 15', 'R220, 20', 'R210, 10', 'R1, 1', 'R1, 1', 'R3, 3', 'R310, 10', 'R5, 5', 'R2, 1']

.....Processing CYCLE 20/30.....

Extract rule (R53, 53) from Agenda Manager

Rebuild the priority queue....Done! 13 rule(s) are in the Agenda Manager

['R50, 50', 'R20, 20', 'R35, 35', 'R210, 10', 'R10, 10', 'R15, 15', 'R220, 20', 'R2, 1', 'R1, 1', 'R1, 1', 'R3, 3', 'R310, 10', 'R5, 5']

.....Processing CYCLE 21/30.....

Extract rule (R50, 50) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['R35, 35', 'R20, 20', 'R220, 20', 'R210, 10', 'R10, 10', 'R15, 15', 'R5, 5', 'R2, 1', 'R1, 1', 'R1, 1', 'R3, 3', 'R310, 10']

.....Processing CYCLE 22/30.....

Extract rule (R35, 35) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['R20, 20', 'R310, 10', 'R220, 20', 'R210, 10', 'R10, 10', 'R15, 15', 'R5, 5', 'R2, 1', 'R1, 1', 'R1, 1', 'R3, 3']

.....Processing CYCLE 23/30.....

Extract rule (R20, 20) from Agenda Manager

Rebuild the priority queue....Done! 10 rule(s) are in the Agenda Manager

['R220, 20', 'R310, 10', 'R15, 15', 'R210, 10', 'R10, 10', 'R3, 3', 'R5, 5', 'R2, 1', 'R1, 1', 'R1, 1']

.....Processing CYCLE 24/30.....

Extract rule (R220, 20) from Agenda Manager

Rebuild the priority queue....Done! 9 rule(s) are in the Agenda Manager

['R15, 15', 'R310, 10', 'R5, 5', 'R210, 10', 'R10, 10', 'R3, 3', 'R1, 1', 'R2, 1', 'R1, 1']

.....Processing CYCLE 25/30.....

Extract rule (R15, 15) from Agenda Manager

Rebuild the priority queue....Done! 8 rule(s) are in the Agenda Manager

['R310, 10', 'R210, 10', 'R5, 5', 'R1, 1', 'R10, 10', 'R3, 3', 'R1, 1', 'R2, 1']

.....Processing CYCLE 26/30.....

Extract rule (R310, 10) from Agenda Manager

Rebuild the priority queue....Done! 7 rule(s) are in the Agenda Manager

['R210, 10', 'R10, 10', 'R5, 5', 'R1, 1', 'R2, 1', 'R3, 3', 'R1, 1']

.....Processing CYCLE 27/30.....

Extract rule (R210, 10) from Agenda Manager

Rebuild the priority queue....Done! 6 rule(s) are in the Agenda Manager

['R10, 10', 'R1, 1', 'R5, 5', 'R1, 1', 'R2, 1', 'R3, 3']

.....Processing CYCLE 28/30.....

Extract rule (R10, 10) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['R5, 5', 'R1, 1', 'R3, 3', 'R1, 1', 'R2, 1']

.....Processing CYCLE 29/30.....

Extract rule (R5, 5) from Agenda Manager

Rebuild the priority queue....Done! 4 rule(s) are in the Agenda Manager

['R3, 3', 'R1, 1', 'R2, 1', 'R1, 1']

.....Processing CYCLE 30/30.....

Extract rule (R3, 3) from Agenda Manager

Rebuild the priority queue....Done! 3 rule(s) are in the Agenda Manager

['R1, 1', 'R1, 1', 'R2, 1']

THE SYSTEM HALTS BECAUSE IT RUNS 30 CYCLES

Running time: 0.029702

b. Experiment result with test2.txt

Reading input...test2.txt

Basic statistics

Total rules: 44

There are 34 line(s) in our text file

Initialize simplified agenda manager...

.....Processing CYCLE 1/30.....

Build Priority Queue (Heap):

Reading 2 rule(s) at line 1:

['r2, 2', 'r15, 15']

Activated rules in the Agenda Manager

['r15, 15', 'r2, 2']

Extract rule (r15, 15) from Agenda Manager

Rebuild the priority queue....Done! 1 rule(s) are in the Agenda Manager

['r2, 2']

.....Processing CYCLE 2/30.....

Reading 1 rule(s) at line 2:

['r20, 20']

Build Priority Queue (Heap):

Adding rule (r20, 20) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r20, 20', 'r2, 2']

Extract rule (r20, 20) from Agenda Manager

Rebuild the priority queue....Done! 1 rule(s) are in the Agenda Manager

['r2, 2']

.....Processing CYCLE 3/30.....

Reading 1 rule(s) at line 3:

['r100, 100']

Build Priority Queue (Heap):

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r100, 100', 'r2, 2']

Extract rule (r100, 100) from Agenda Manager

Rebuild the priority queue....Done! 1 rule(s) are in the Agenda Manager

['r2, 2']

.....Processing CYCLE 4/30.....

Reading 1 rule(s) at line 4:

['r0, 0']

Build Priority Queue (Heap):

Adding rule (r0, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r2, 2', 'r0, 0']

Extract rule (r2, 2) from Agenda Manager

Rebuild the priority queue.....Done! 1 rule(s) are in the Agenda Manager

['r0, 0']

.....Processing CYCLE 5/30.....

Reading 3 rule(s) at line 5:

['r100, 100', 'r102, 100', 'r103, 100']

Build Priority Queue (Heap):

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!

Adding rule (r102, 100) to the queue. Maintaining heap.....Done!

Adding rule (r103, 100) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r100, 100', 'r102, 100', 'r0, 0', 'r103, 100']

Extract rule (r100, 100) from Agenda Manager

Rebuild the priority queue.....Done! 3 rule(s) are in the Agenda Manager

['r103, 100', 'r102, 100', 'r0, 0']

.....Processing CYCLE 6/30.....

Reading 1 rule(s) at line 6:

['r104, 100']

Build Priority Queue (Heap):

Adding rule (r104, 100) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r103, 100', 'r102, 100', 'r0, 0', 'r104, 100']

Extract rule (r103, 100) from Agenda Manager

Rebuild the priority queue.....Done! 3 rule(s) are in the Agenda Manager

['r104, 100', 'r102, 100', 'r0, 0']

.....Processing CYCLE 7/30.....

Reading 1 rule(s) at line 7:

['r105, 100']

Build Priority Queue (Heap):

Adding rule (r105, 100) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r104, 100', 'r102, 100', 'r0, 0', 'r105, 100']

Extract rule (r104, 100) from Agenda Manager

Rebuild the priority queue....Done! 3 rule(s) are in the Agenda Manager

['r105, 100', 'r102, 100', 'r0, 0']

.....Processing CYCLE 8/30.....

Reading 3 rule(s) at line 8:

['r28, 28', 'r19, 19', 'r02, 0']

Build Priority Queue (Heap):

Adding rule (r28, 28) to the queue. Maintaining heap.....Done!

Adding rule (r19, 19) to the queue. Maintaining heap.....Done!

Adding rule (r02, 0) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r105, 100', 'r102, 100', 'r19, 19', 'r28, 28', 'r0, 0', 'r02, 0']

Extract rule (r105, 100) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['r102, 100', 'r28, 28', 'r19, 19', 'r02, 0', 'r0, 0']

.....Processing CYCLE 9/30.....

Reading 1 rule(s) at line 9:

['r35, 35']

Build Priority Queue (Heap):

Adding rule (r35, 35) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r102, 100', 'r35, 35', 'r28, 28', 'r02, 0', 'r0, 0', 'r19, 19']

Extract rule (r102, 100) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['r35, 35', 'r19, 19', 'r28, 28', 'r02, 0', 'r0, 0']

.....Processing CYCLE 10/30.....

Reading 1 rule(s) at line 10:

['r20, 20']

Build Priority Queue (Heap):

Adding rule (r20, 20) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r35, 35', 'r19, 19', 'r28, 28', 'r02, 0', 'r0, 0', 'r20, 20']

Extract rule (r35, 35) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['r28, 28', 'r19, 19', 'r20, 20', 'r02, 0', 'r0, 0']

.....Processing CYCLE 11/30.....

Reading 1 rule(s) at line 11:

['rule2, 2']

Build Priority Queue (Heap):

Adding rule (rule2, 2) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r28, 28', 'r19, 19', 'r20, 20', 'r02, 0', 'r0, 0', 'rule2, 2']

Extract rule (r28, 28) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['r20, 20', 'r19, 19', 'rule2, 2', 'r02, 0', 'r0, 0']

.....Processing CYCLE 12/30.....

Reading 3 rule(s) at line 12:

['r15, 15', 'r80, 80', 'r16, 16']

Build Priority Queue (Heap):

Adding rule (r15, 15) to the queue. Maintaining heap.....Done!

Adding rule (r80, 80) to the queue. Maintaining heap.....Done!

Adding rule (r16, 16) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r80, 80', 'r20, 20', 'r15, 15', 'r19, 19', 'r0, 0', 'rule2, 2', 'r02, 0', 'r16, 16']

Extract rule (r80, 80) from Agenda Manager

Rebuild the priority queue....Done! 7 rule(s) are in the Agenda Manager

['r20, 20', 'r19, 19', 'r15, 15', 'r16, 16', 'r0, 0', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 13/30.....

Reading 1 rule(s) at line 13:

['r13, 13']

Build Priority Queue (Heap):

Adding rule (r13, 13) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r20, 20', 'r19, 19', 'r15, 15', 'r16, 16', 'r0, 0', 'rule2, 2', 'r02, 0', 'r13, 13']

Extract rule (r20, 20) from Agenda Manager

Rebuild the priority queue....Done! 7 rule(s) are in the Agenda Manager

['r19, 19', 'r16, 16', 'r15, 15', 'r13, 13', 'r0, 0', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 14/30.....

Reading 1 rule(s) at line 14:

['r100, 100']

Build Priority Queue (Heap):

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!
New Agenda Manager after adding new rule(s)
['r100, 100', 'r19, 19', 'r15, 15', 'r16, 16', 'r0, 0', 'rule2, 2', 'r02, 0', 'r13, 13']

Extract rule (r100, 100) from Agenda Manager
Rebuild the priority queue....Done! 7 rule(s) are in the Agenda Manager
['r19, 19', 'r16, 16', 'r15, 15', 'r13, 13', 'r0, 0', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 15/30.....

Reading 3 rule(s) at line 15:

['r99, 99', 'r100, 100', 'r30, 30']

Build Priority Queue (Heap):

Adding rule (r99, 99) to the queue. Maintaining heap.....Done!

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!

Adding rule (r30, 30) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r100, 100', 'r99, 99', 'r30, 30', 'r16, 16', 'r19, 19', 'rule2, 2', 'r02, 0', 'r13, 13', 'r0, 0', 'r15, 15']

Extract rule (r100, 100) from Agenda Manager

Rebuild the priority queue....Done! 9 rule(s) are in the Agenda Manager

['r99, 99', 'r19, 19', 'r30, 30', 'r16, 16', 'r15, 15', 'rule2, 2', 'r02, 0', 'r13, 13', 'r0, 0']

.....Processing CYCLE 16/30.....

Reading 3 rule(s) at line 16:

['r5, 5', 'r88, 88', 'r99, 99']

Build Priority Queue (Heap):

Adding rule (r5, 5) to the queue. Maintaining heap.....Done!

Adding rule (r88, 88) to the queue. Maintaining heap.....Done!

Adding rule (r99, 99) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r99, 99', 'r99, 99', 'r88, 88', 'r16, 16', 'r15, 15', 'r19, 19', 'r02, 0', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r30, 30']

Extract rule (r99, 99) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['r99, 99', 'r30, 30', 'r88, 88', 'r16, 16', 'r15, 15', 'r19, 19', 'r02, 0', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2']

.....Processing CYCLE 17/30.....

Reading 2 rule(s) at line 17:

['r55, 55', 'r70, 70']

Build Priority Queue (Heap):

Adding rule (r55, 55) to the queue. Maintaining heap.....Done!

Adding rule (r70, 70) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r99, 99', 'r70, 70', 'r88, 88', 'r30, 30', 'r15, 15', 'r55, 55', 'r16, 16', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r19, 19', 'r02, 0']

Extract rule (r99, 99) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r88, 88', 'r70, 70', 'r55, 55', 'r30, 30', 'r15, 15', 'r19, 19', 'r16, 16', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 18/30.....

Reading 1 rule(s) at line 18:

['r45, 45']

Build Priority Queue (Heap):

Adding rule (r45, 45) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r88, 88', 'r70, 70', 'r55, 55', 'r45, 45', 'r15, 15', 'r19, 19', 'r30, 30', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'r16, 16']

Extract rule (r88, 88) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r70, 70', 'r45, 45', 'r55, 55', 'r16, 16', 'r15, 15', 'r19, 19', 'r30, 30', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 19/30.....

Reading 1 rule(s) at line 19:

['rr1, 0']

Build Priority Queue (Heap):

Adding rule (rr1, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r70, 70', 'r45, 45', 'r55, 55', 'r16, 16', 'r15, 15', 'r19, 19', 'r30, 30', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'rr1, 0']

Extract rule (r70, 70) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r55, 55', 'r45, 45', 'r30, 30', 'r16, 16', 'r15, 15', 'r19, 19', 'rr1, 0', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 20/30.....

Reading 1 rule(s) at line 20:

['rr2, 0']

Build Priority Queue (Heap):

Adding rule (rr2, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r55, 55', 'r45, 45', 'r30, 30', 'r16, 16', 'r15, 15', 'r19, 19', 'rr1, 0', 'r13, 13', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'rr2, 0']

Extract rule (r55, 55) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r45, 45', 'r16, 16', 'r30, 30', 'r13, 13', 'r15, 15', 'r19, 19', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 21/30.....

Reading 1 rule(s) at line 21:

['rr3, 0']

Build Priority Queue (Heap):

Adding rule (rr3, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r45, 45', 'r16, 16', 'r30, 30', 'r13, 13', 'r15, 15', 'r19, 19', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'rr3, 0']

Extract rule (r45, 45) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r30, 30', 'r16, 16', 'r19, 19', 'r13, 13', 'r15, 15', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 22/30.....

Reading 1 rule(s) at line 22:

['rr4, 0']

Build Priority Queue (Heap):

Adding rule (rr4, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r30, 30', 'r16, 16', 'r19, 19', 'r13, 13', 'r15, 15', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'rr4, 0']

Extract rule (r30, 30) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r19, 19', 'r16, 16', 'rr4, 0', 'r13, 13', 'r15, 15', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 23/30.....

Reading 1 rule(s) at line 23:

['rr5, 0']

Build Priority Queue (Heap):

Adding rule (rr5, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r19, 19', 'r16, 16', 'rr4, 0', 'r13, 13', 'r15, 15', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'r5, 5', 'rule2, 2', 'r02, 0', 'rr5, 0']

Extract rule (r19, 19) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r16, 16', 'r15, 15', 'rr4, 0', 'r13, 13', 'r5, 5', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 24/30.....

Reading 1 rule(s) at line 24:

['rr6, 0']

Build Priority Queue (Heap):

Adding rule (rr6, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r16, 16', 'r15, 15', 'rr4, 0', 'r13, 13', 'r5, 5', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rule2, 2', 'r02, 0', 'rr6, 0']

Extract rule (r16, 16) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r15, 15', 'r13, 13', 'rr4, 0', 'rr6, 0', 'r5, 5', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rule2, 2', 'r02, 0']

.....Processing CYCLE 25/30.....

Reading 1 rule(s) at line 25:

['rr7, 0']

Build Priority Queue (Heap):

Adding rule (rr7, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r15, 15', 'r13, 13', 'rr4, 0', 'rr6, 0', 'r5, 5', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rule2, 2', 'r02, 0', 'rr7, 0']

Extract rule (r15, 15) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r13, 13', 'r5, 5', 'rr4, 0', 'rr6, 0', 'rule2, 2', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

.....Processing CYCLE 26/30.....

Reading 1 rule(s) at line 26:

['rr8, 0']

Build Priority Queue (Heap):

Adding rule (rr8, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r13, 13', 'r5, 5', 'rr4, 0', 'rr6, 0', 'rule2, 2', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0', 'rr8, 0']

Extract rule (r13, 13) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r5, 5', 'rule2, 2', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

.....Processing CYCLE 27/30.....

Reading 1 rule(s) at line 27:

['rr9, 0']

Build Priority Queue (Heap):

Adding rule (rr9, 0) to the queue. Maintaining heap.....Done!

New Agenda Manger after adding new rule(s)

['r5, 5', 'rule2, 2', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0', 'rr9, 0']

Extract rule (r5, 5) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['rule2, 2', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

.....Processing CYCLE 28/30.....

Reading 1 rule(s) at line 28:

['rr10, 0']

Build Priority Queue (Heap):

Adding rule (rr10, 0) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['rule2, 2', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0', 'rr10, 0']

Extract rule (rule2, 2) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['rr10, 0', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

.....Processing CYCLE 29/30.....

Reading 1 rule(s) at line 29:

['rr11, 0']

Build Priority Queue (Heap):

Adding rule (rr11, 0) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['rr10, 0', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0', 'rr11, 0']

Extract rule (rr10, 0) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['rr11, 0', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

.....Processing CYCLE 30/30.....

Reading 1 rule(s) at line 30:

['rr12, 0']

Build Priority Queue (Heap):

Adding rule (rr12, 0) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['rr11, 0', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0', 'rr12, 0']

Extract rule (rr11, 0) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['rr12, 0', 'rr9, 0', 'rr4, 0', 'rr6, 0', 'rr8, 0', 'rr3, 0', 'rr1, 0', 'rr2, 0', 'r0, 0', 'rr5, 0', 'rr7, 0', 'r02, 0']

THE SYSTEM HALTS BECAUSE IT RUNS 30 CYCLES

Running time: 0.037396

c. Experiment result with test3.txt

Reading input...test3.txt

Basic statistics

Total rules: 33

There are 7 line(s) in our text file

Initialize simplified agenda manager...

.....Processing CYCLE 1/30.....

Build Priority Queue (Heap):

Reading 30 rule(s) at line 1:

['r15, 15', 'r16, 16', 'r30, 30', 'r4, 4', 'r6, 6', 'r17, 17', 'r19, 19', 'r26, 26', 'r20, 20', 'r1, 1', 'r29, 29', 'r23, 23', 'r14, 14', 'r13, 13', 'r12, 12', 'r11, 11', 'r28, 28', 'r7, 7', 'r8, 8', 'r9, 9', 'r27, 27', 'r25, 25', 'r24, 24', 'r18, 18', 'r10, 10', 'r3, 3', 'r2, 2', 'r22, 22', 'r5, 5', 'r21, 21']

Activated rules in the Agenda Manager

['r30, 30', 'r29, 29', 'r23, 23', 'r28, 28', 'r27, 27', 'r18, 18', 'r22, 22', 'r26, 26', 'r20, 20', 'r16, 16', 'r25, 25', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r24, 24', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13', 'r5, 5', 'r12, 12']

Extract rule (r30, 30) from Agenda Manager

Rebuild the priority queue....Done! 29 rule(s) are in the Agenda Manager

['r29, 29', 'r28, 28', 'r23, 23', 'r26, 26', 'r27, 27', 'r18, 18', 'r22, 22', 'r12, 12', 'r20, 20', 'r16, 16', 'r25, 25', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r24, 24', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13', 'r5, 5']

.....Processing CYCLE 2/30.....

Reading 0 rule(s) at line 2:

[]

No rule added to Agenda Manager

Extract rule (r29, 29) from Agenda Manager

Rebuild the priority queue....Done! 28 rule(s) are in the Agenda Manager

['r28, 28', 'r27, 27', 'r23, 23', 'r26, 26', 'r25, 25', 'r18, 18', 'r22, 22', 'r12, 12', 'r20, 20', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13']

.....Processing CYCLE 3/30.....

Reading 1 rule(s) at line 3:

['r100, 100']

Build Priority Queue (Heap):

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r100, 100', 'r28, 28', 'r23, 23', 'r27, 27', 'r25, 25', 'r18, 18', 'r22, 22', 'r26, 26', 'r20, 20', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r12, 12', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13', 'r21, 21']

Extract rule (r100, 100) from Agenda Manager

Rebuild the priority queue....Done! 28 rule(s) are in the Agenda Manager

['r28, 28', 'r27, 27', 'r23, 23', 'r26, 26', 'r25, 25', 'r18, 18', 'r22, 22', 'r21, 21', 'r20, 20', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r12, 12', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13']

.....Processing CYCLE 4/30.....

Reading 1 rule(s) at line 4:

['r35, 35']

Build Priority Queue (Heap):

Adding rule (r35, 35) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r35, 35', 'r28, 28', 'r23, 23', 'r27, 27', 'r25, 25', 'r18, 18', 'r22, 22', 'r26, 26', 'r20, 20', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13', 'r12, 12']

Extract rule (r35, 35) from Agenda Manager

Rebuild the priority queue....Done! 28 rule(s) are in the Agenda Manager

['r28, 28', 'r27, 27', 'r23, 23', 'r26, 26', 'r25, 25', 'r18, 18', 'r22, 22', 'r12, 12', 'r20, 20', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2', 'r13, 13']

.....Processing CYCLE 5/30.....

Reading 0 rule(s) at line 5:

[]

No rule added to Agenda Manager

Extract rule (r28, 28) from Agenda Manager

Rebuild the priority queue....Done! 27 rule(s) are in the Agenda Manager

['r27, 27', 'r26, 26', 'r23, 23', 'r20, 20', 'r25, 25', 'r18, 18', 'r22, 22', 'r12, 12', 'r13, 13', 'r16, 16', 'r24, 24', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r6, 6', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r2, 2']

.....Processing CYCLE 6/30.....

Reading 0 rule(s) at line 6:

[]

No rule added to Agenda Manager

Extract rule (r27, 27) from Agenda Manager

Rebuild the priority queue....Done! 26 rule(s) are in the Agenda Manager

['r26, 26', 'r25, 25', 'r23, 23', 'r20, 20', 'r24, 24', 'r18, 18', 'r22, 22', 'r12, 12', 'r13, 13', 'r16, 16', 'r6, 6', 'r17, 17', 'r14, 14', 'r19, 19', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r2, 2', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3']

.....Processing CYCLE 7/30.....

Reading 1 rule(s) at line 7:

['r100, 100']

Build Priority Queue (Heap):

Adding rule (r100, 100) to the queue. Maintaining heap.....Done!

New Agenda Manager after adding new rule(s)

['r100, 100', 'r26, 26', 'r23, 23', 'r25, 25', 'r24, 24', 'r18, 18', 'r20, 20', 'r12, 12', 'r13, 13', 'r16, 16', 'r6, 6', 'r17, 17', 'r14, 14', 'r22, 22', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r2, 2', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3', 'r19, 19']

Extract rule (r100, 100) from Agenda Manager

Rebuild the priority queue....Done! 26 rule(s) are in the Agenda Manager

['r26, 26', 'r25, 25', 'r23, 23', 'r19, 19', 'r24, 24', 'r18, 18', 'r20, 20', 'r12, 12', 'r13, 13', 'r16, 16', 'r6, 6', 'r17, 17', 'r14, 14', 'r22, 22', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r9, 9', 'r1, 1', 'r2, 2', 'r5, 5', 'r15, 15', 'r10, 10', 'r3, 3']

.....Processing CYCLE 8/30.....

Extract rule (r26, 26) from Agenda Manager

Rebuild the priority queue....Done! 25 rule(s) are in the Agenda Manager

['r25, 25', 'r24, 24', 'r23, 23', 'r19, 19', 'r16, 16', 'r18, 18', 'r20, 20', 'r12, 12', 'r13, 13', 'r9, 9', 'r6, 6', 'r17, 17', 'r14, 14', 'r22, 22', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3', 'r1, 1', 'r2, 2', 'r5, 5', 'r15, 15', 'r10, 10']

.....Processing CYCLE 9/30.....

Extract rule (r25, 25) from Agenda Manager

Rebuild the priority queue....Done! 24 rule(s) are in the Agenda Manager

['r24, 24', 'r19, 19', 'r23, 23', 'r13, 13', 'r16, 16', 'r18, 18', 'r20, 20', 'r12, 12', 'r10, 10', 'r9, 9', 'r6, 6', 'r17, 17', 'r14, 14', 'r22, 22', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3', 'r1, 1', 'r2, 2', 'r5, 5', 'r15, 15']

.....Processing CYCLE 10/30.....

Extract rule (r24, 24) from Agenda Manager

Rebuild the priority queue....Done! 23 rule(s) are in the Agenda Manager

['r23, 23', 'r19, 19', 'r20, 20', 'r13, 13', 'r16, 16', 'r18, 18', 'r22, 22', 'r12, 12', 'r10, 10', 'r9, 9', 'r6, 6', 'r17, 17', 'r14, 14', 'r15, 15', 'r21, 21', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3', 'r1, 1', 'r2, 2', 'r5, 5']

.....Processing CYCLE 11/30.....

Extract rule (r23, 23) from Agenda Manager

Rebuild the priority queue....Done! 22 rule(s) are in the Agenda Manager

['r20, 20', 'r19, 19', 'r22, 22', 'r13, 13', 'r16, 16', 'r18, 18', 'r21, 21', 'r12, 12', 'r10, 10', 'r9, 9', 'r6, 6', 'r17, 17', 'r14, 14', 'r15, 15', 'r5, 5', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3', 'r1, 1', 'r2, 2']

.....Processing CYCLE 12/30.....

Extract rule (r20, 20) from Agenda Manager

Rebuild the priority queue....Done! 21 rule(s) are in the Agenda Manager

['r22, 22', 'r19, 19', 'r21, 21', 'r13, 13', 'r16, 16', 'r18, 18', 'r15, 15', 'r12, 12', 'r10, 10', 'r9, 9', 'r6, 6', 'r17, 17', 'r14, 14', 'r2, 2', 'r5, 5', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3', 'r1, 1']

.....Processing CYCLE 13/30.....

Extract rule (r22, 22) from Agenda Manager

Rebuild the priority queue....Done! 20 rule(s) are in the Agenda Manager

['r21, 21', 'r19, 19', 'r18, 18', 'r13, 13', 'r16, 16', 'r17, 17', 'r15, 15', 'r12, 12', 'r10, 10', 'r9, 9', 'r6, 6', 'r1, 1', 'r14, 14', 'r2, 2', 'r5, 5', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8', 'r3, 3']

.....Processing CYCLE 14/30.....

Extract rule (r21, 21) from Agenda Manager

Rebuild the priority queue....Done! 19 rule(s) are in the Agenda Manager

['r19, 19', 'r16, 16', 'r18, 18', 'r13, 13', 'r9, 9', 'r17, 17', 'r15, 15', 'r12, 12', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r14, 14', 'r2, 2', 'r5, 5', 'r11, 11', 'r4, 4', 'r7, 7', 'r8, 8']

.....Processing CYCLE 15/30.....

Extract rule (r19, 19) from Agenda Manager

Rebuild the priority queue....Done! 18 rule(s) are in the Agenda Manager

['r18, 18', 'r16, 16', 'r17, 17', 'r13, 13', 'r9, 9', 'r14, 14', 'r15, 15', 'r12, 12', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r8, 8', 'r2, 2', 'r5, 5', 'r11, 11', 'r4, 4', 'r7, 7']

.....Processing CYCLE 16/30.....

Extract rule (r18, 18) from Agenda Manager

Rebuild the priority queue....Done! 17 rule(s) are in the Agenda Manager

['r17, 17', 'r16, 16', 'r15, 15', 'r13, 13', 'r9, 9', 'r14, 14', 'r7, 7', 'r12, 12', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r8, 8', 'r2, 2', 'r5, 5', 'r11, 11', 'r4, 4']

.....Processing CYCLE 17/30.....

Extract rule (r17, 17) from Agenda Manager

Rebuild the priority queue....Done! 16 rule(s) are in the Agenda Manager

['r16, 16', 'r13, 13', 'r15, 15', 'r12, 12', 'r9, 9', 'r14, 14', 'r7, 7', 'r11, 11', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r8, 8', 'r2, 2', 'r5, 5', 'r4, 4']

.....Processing CYCLE 18/30.....

Extract rule (r16, 16) from Agenda Manager

Rebuild the priority queue....Done! 15 rule(s) are in the Agenda Manager

['r15, 15', 'r13, 13', 'r14, 14', 'r12, 12', 'r9, 9', 'r8, 8', 'r7, 7', 'r11, 11', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r4, 4', 'r2, 2', 'r5, 5']

.....Processing CYCLE 19/30.....

Extract rule (r15, 15) from Agenda Manager

Rebuild the priority queue....Done! 14 rule(s) are in the Agenda Manager

['r14, 14', 'r13, 13', 'r8, 8', 'r12, 12', 'r9, 9', 'r5, 5', 'r7, 7', 'r11, 11', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r4, 4', 'r2, 2']

.....Processing CYCLE 20/30.....

Extract rule (r14, 14) from Agenda Manager

Rebuild the priority queue....Done! 13 rule(s) are in the Agenda Manager

['r13, 13', 'r12, 12', 'r8, 8', 'r11, 11', 'r9, 9', 'r5, 5', 'r7, 7', 'r2, 2', 'r10, 10', 'r3, 3', 'r6, 6', 'r1, 1', 'r4, 4']

.....Processing CYCLE 21/30.....

Extract rule (r13, 13) from Agenda Manager

Rebuild the priority queue....Done! 12 rule(s) are in the Agenda Manager

['r12, 12', 'r11, 11', 'r8, 8', 'r10, 10', 'r9, 9', 'r5, 5', 'r7, 7', 'r2, 2', 'r4, 4', 'r3, 3', 'r6, 6', 'r1, 1']

.....Processing CYCLE 22/30.....

Extract rule (r12, 12) from Agenda Manager

Rebuild the priority queue....Done! 11 rule(s) are in the Agenda Manager

['r11, 11', 'r10, 10', 'r8, 8', 'r4, 4', 'r9, 9', 'r5, 5', 'r7, 7', 'r2, 2', 'r1, 1', 'r3, 3', 'r6, 6']

.....Processing CYCLE 23/30.....

Extract rule (r11, 11) from Agenda Manager

Rebuild the priority queue....Done! 10 rule(s) are in the Agenda Manager

['r10, 10', 'r9, 9', 'r8, 8', 'r4, 4', 'r6, 6', 'r5, 5', 'r7, 7', 'r2, 2', 'r1, 1', 'r3, 3']

.....Processing CYCLE 24/30.....

Extract rule (r10, 10) from Agenda Manager

Rebuild the priority queue....Done! 9 rule(s) are in the Agenda Manager

['r9, 9', 'r6, 6', 'r8, 8', 'r4, 4', 'r3, 3', 'r5, 5', 'r7, 7', 'r2, 2', 'r1, 1']

.....Processing CYCLE 25/30.....

Extract rule (r9, 9) from Agenda Manager

Rebuild the priority queue....Done! 8 rule(s) are in the Agenda Manager

['r8, 8', 'r6, 6', 'r7, 7', 'r4, 4', 'r3, 3', 'r5, 5', 'r1, 1', 'r2, 2']

.....Processing CYCLE 26/30.....

Extract rule (r8, 8) from Agenda Manager

Rebuild the priority queue....Done! 7 rule(s) are in the Agenda Manager

['r7, 7', 'r6, 6', 'r5, 5', 'r4, 4', 'r3, 3', 'r2, 2', 'r1, 1']

.....Processing CYCLE 27/30.....

Extract rule (r7, 7) from Agenda Manager

Rebuild the priority queue....Done! 6 rule(s) are in the Agenda Manager

['r6, 6', 'r4, 4', 'r5, 5', 'r1, 1', 'r3, 3', 'r2, 2']

.....Processing CYCLE 28/30.....

Extract rule (r6, 6) from Agenda Manager

Rebuild the priority queue....Done! 5 rule(s) are in the Agenda Manager

['r5, 5', 'r4, 4', 'r2, 2', 'r1, 1', 'r3, 3']

.....Processing CYCLE 29/30.....

Extract rule (r5, 5) from Agenda Manager

Rebuild the priority queue....Done! 4 rule(s) are in the Agenda Manager

['r4, 4', 'r3, 3', 'r2, 2', 'r1, 1']

.....Processing CYCLE 30/30.....

Extract rule (r4, 4) from Agenda Manager

Rebuild the priority queue....Done! 3 rule(s) are in the Agenda Manager

['r3, 3', 'r1, 1', 'r2, 2']

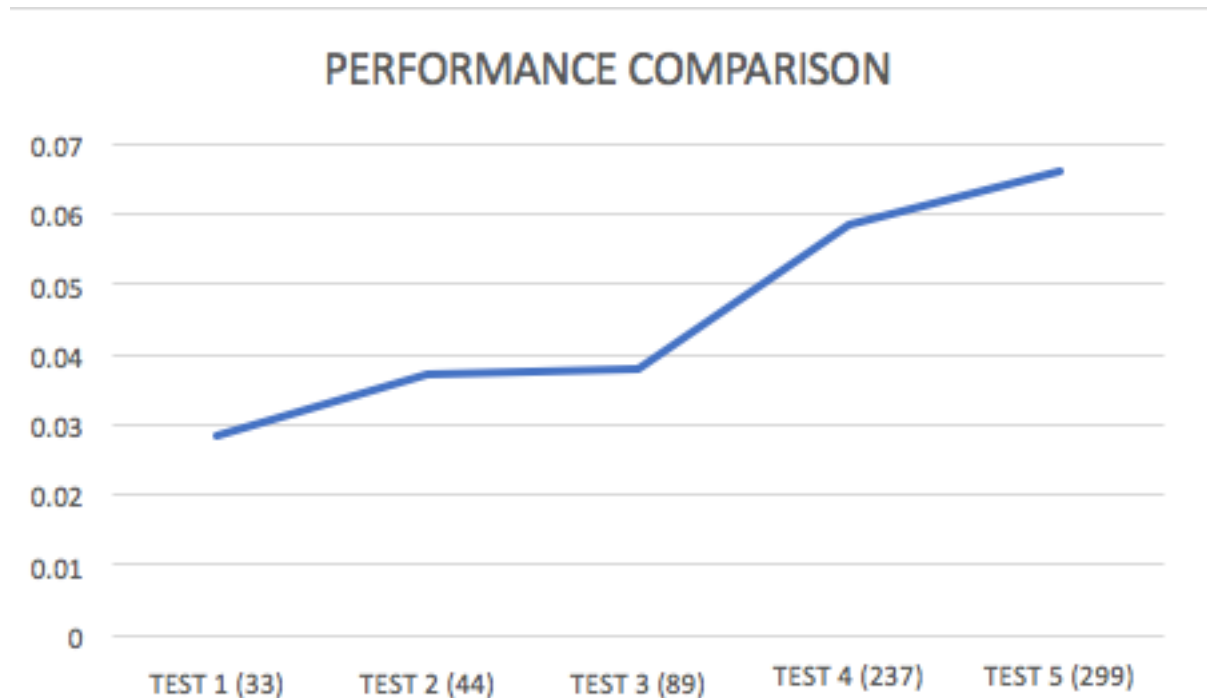
THE SYSTEM HALTS BECAUSE IT RUNS 30 CYCLES

Running time: 0.026824

III. Performance

We test our simplified agenda manager with different problems sizes: 33, 44, 89, 237 and

299. Performance result is shown in the graph below.



From the graph above, we can see that the running time is linear with the number of rules (or problem size). So, let analyze the algorithm to check what we see is “correct”.

In Cycle 1, we first build heap in from line 1 of the test file. Time to buildheap = $O(n)$

In the subsequence commands, we perform extract max, insert and delete rules to the queue.

Time to extract max, insert = $O(\log n)$

Time to delete = $O(1)$

=> Total running time $T(n) = O(n) + O(\log n) + O(\log n) + O(1)$. Because $O(1)$, $O(\log n)$ will be dominated by $O(n)$ when the size of the problem is big.

So, the worst case running time is: $T(n) = O(n)$.

This result is aligned with the performance graph above.