Terna Engineering College
Computer Engineering Department
Program: Sem VIII

Course: Distributed Computing Lab (CSL802)

Faculty: Rohini Patil

Experiment No. 7

A.1 Aim: To Implement Chandi–Misra-Haas distributed deadlock detection algorithm.

PART B
(PART B: TO BE COMPLETED BY STUDENTS)

Roll No. 50	**Name:** AMEY MAHENDRA THAKUR
Class: BE COMPS B 50	**Batch:** B3
Date of Experiment: 25-02-2022	**Date of Submission:** 25-02-2022
Grade:	

B.1 Software Code written by a student:

- **ChandyMisraHaas.java**

No Deadlock:

```
print('''
    P1  P2  P3  P4  P5

P1   0   1   0   0   0
P2   0   0   1   0   0
P3   0   0   0   1   1
P4   0   0   0   0   0
P5   0   0   0   0   0
''')

a = [   [0, 1, 0, 0, 0],
        [0, 0, 1, 0, 0],
        [0, 0, 0, 1, 1],
        [0, 0, 0, 0, 0],
        [0, 0, 0, 0, 0] ]
```

Deadlock:

```
print('''
    P1  P2  P3  P4  P5

P1   0   1   0   0   0
P2   0   0   1   0   0
P3   0   0   0   1   1
P4   1   0   0   0   0
P5   0   0   0   0   0
''')

a = [   [0, 1, 0, 0, 0],
        [0, 0, 1, 0, 0],
        [0, 0, 0, 1, 1],
        [1, 0, 0, 0, 0],
        [0, 0, 0, 0, 0] ]
```

```
flag = 0

def aman(a, i, k):

        end = 5
        for x in range(end):
                if(a[k][x] == 1):
                        if(i == x):
                                print(f' S{k+1} ==> S{x+1}     ({i+1}, {k+1}, {x+1}) -------->
                        DEADLOCK DETECTED')
           global flag
           flag = 1
           break

        print(f' S{k+1} ==> S{x+1}     ({i+1}, {k+1}, {x+1})')
        aman(a,i,x)


print("CHANDY-MISRA-HAAS DISTRIBUTED DEADLOCK DETECTION
ALGORITHM")
print("__________________________________________________________________")
print()

x = 0
end = 5
i = int(input("Enter Initiator Site No. : "))
j = i - 1

print()
for k in range(end):

   if(a[j][k]==1):

      print(f' S{j+1} ==> s{k+1}     ({i}, {j+1}, {k+1})')
      aman(a,j,k)

if(flag == 0):
   print("\nNO DEADLOCK DETECTED")

print("__________________________________________________________________")
```

B.2 Input and Output:

- No Deadlock:

```
Command Prompt

C:\Users\ameyt\Desktop>python ChandyMisraHaas.py

     P1   P2   P3   P4   P5

P1   0    1    0    0    0
P2   0    0    1    0    0
P3   0    0    0    1    1
P4   0    0    0    0    0
P5   0    0    0    0    0

CHANDY-MISRA-HAAS DISTRIBUTED DEADLOCK DETECTION ALGORITHM
__________________________________________________________

Enter Initiator Site No. : 1

 S1 ==> s2      (1, 1, 2)
 S2 ==> S3      (1, 2, 3)
 S3 ==> S4      (1, 3, 4)
 S3 ==> S5      (1, 3, 5)

NO DEADLOCK DETECTED
__________________________________________________________
```

- Deadlock:

```
Command Prompt

C:\Users\ameyt\Desktop>python ChandyMisraHaas.py

     P1   P2   P3   P4   P5

P1   0    1    0    0    0
P2   0    0    1    0    0
P3   0    0    0    1    1
P4   1    0    0    0    0
P5   0    0    0    0    0

CHANDY-MISRA-HAAS DISTRIBUTED DEADLOCK DETECTION ALGORITHM
__________________________________________________________

Enter Initiator Site No. : 1

 S1 ==> s2      (1, 1, 2)
 S2 ==> S3      (1, 2, 3)
 S3 ==> S4      (1, 3, 4)
 S4 ==> S1      (1, 4, 1) --------> DEADLOCK DETECTED
 S3 ==> S5      (1, 3, 5)
__________________________________________________________
```

B.3 Observations and learning:

- This is considered an edge-chasing, probe-based algorithm.
- It is also considered one of the best deadlock detection algorithms for distributed systems.
- If a process makes a request for a resource that fails or times out, the process generates a probe message and sends it to each of the processes holding one or more of its requested resources.
- Each probe message contains the following information:
    - the id of the process that is blocked (the one that initiates the probe message);
    - the id of the process is sending this particular version of the probe message;
    - the id of the process that should receive this probe message.

- When a process receives a probe message, it checks to see if it is also waiting for resources.
- If not, it is currently using the needed resource and will eventually finish and release the resource.
- If it is waiting for resources, it passes on the probe message to all processes it knows to be holding resources it has itself requested.
- The process first modifies the probe message, changing the sender and receiver ids.

- If a process receives a probe message that it recognizes as having initiated, it knows there is a cycle in the system and thus, deadlock.

- The advantages of this algorithm include the following:
    - It is easy to implement.
    - Each probe message is of fixed length.
    - There is very little computation.
    - There is very little overhead.
    - There is no need to construct a graph, nor to pass graph information to other sites.
    - This algorithm does not find false (phantom) deadlock.
    - There is no need for special data structures.

B.4 Conclusion:

Successfully implemented Chandy-Misra-Haas distributed deadlock detection algorithm using python.

B.5 Question of Curiosity:

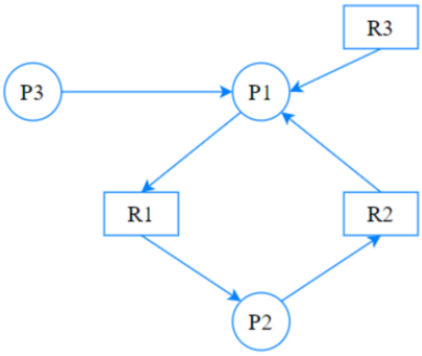
Q1: Consider the following statements: A deadlock detection algorithm must satisfy the following two conditions:

Condition 1: Progress (No false deadlocks): The algorithm should not report deadlocks that do not exist.
Condition 2: Safety (No undetected deadlocks): The algorithm must detect all existing deadlocks infinite time.

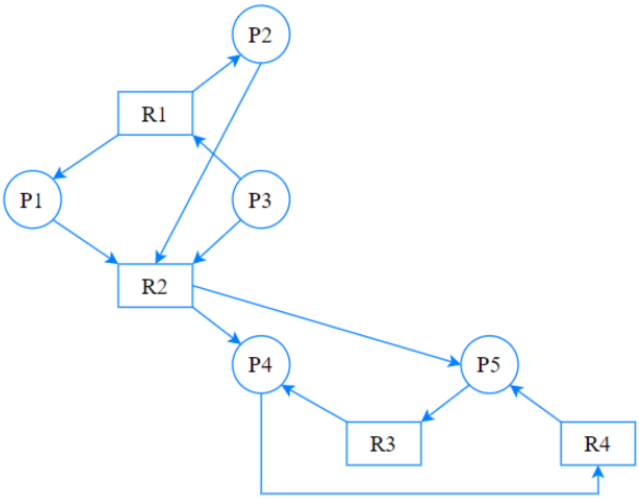
A. Both conditions are true
B. Both conditions are false
C. Only condition 1 is true
D. Only condition 1 is true

ANS: A. Both conditions are true

Q2: Consider the resource allocation graphs G1 and G2. What can be said about the deadlock conditions?



Graph 1



Graph 2

A. Both are deadlocked
B. G1 deadlocked, G2 not
C. G1 not, G2 deadlocked
D. None is deadlocked

ANS: A. Both are deadlocked

Q3: Which of the following problem we might face if we invoke the deadlock detection algorithm at the arbitrary interval?

A. There may be many cycles in the graph and it will not be possible to roll back the deadlocked processes anymore.
B. There may be many cycles in the graph and we would not be able to tell which of the many deadlocked processes caused the deadlock.
C. There may be no cycles in the graph and thus it will not be possible to know if any deadlock has happened.
D. All of the above.

ANS: B. There may be many cycles in the graph and we would not be able to tell which of the many deadlocked processes caused the deadlock

Q4: Consider the following statements related to distributed deadlock detection algorithms:

Statement 1: In path-pushing algorithms, distributed deadlocks are detected by maintaining an explicit global WFG. The basic idea is to build a global WFG for each site of the distributed system.

Statement 2: In an edge-chasing algorithm, the presence of a cycle in a distributed graph structure is be verified by propagating special messages called probes, along the edges of the graph. These probe messages are different from the request and reply messages.

A. Both statements are true
B. Both statements are false
C. Only statement 1 is true
D. Only statement 2 is true

ANS: A. Both statements are true