

Comp 182 Spring 2022

Project 4: Task Scheduling

Scheduling is an important activity that encompasses many everyday activities (e.g., determining which classes to take each semester). It is also used to optimize performance of applications, services, and utilization of computer resources. The scheduling problem covers important concepts and topics in computer science.

Definitions and Specifications:

A task (e.g., A B C ...) can be completed if it has no dependencies or all its dependencies are met. A dependency: (A, B) indicates that A has to be completed before B. A task list is a list of all tasks to be completed. A dependency list is a list of all dependencies for all task. The task list and dependency list will be read from a text file. A time step is the event when all task that can be completed is completed.

The task list and the dependency list can be modified according to user input. When a task is deleted, all dependencies for the deleted task are also deleted. Given the data in the taskData.txt and any changes provided through user input, provide the following information:

- 1) A valid ordering of task if one exist.
- 2) If no valid ordering is possible, identify a cycle that prevents a valid ordering.
- 3) If a valid ordering exist, indicate whether or not there is more than one.
- 4) Report the minimum number of time steps needed to complete all tasks.
- 5) For each time step, list all remaining tasks that can be completed during that time

The task list and dependency list are read into your project from a single text file ("taskData.txt"). The first line in the text file gives the task list. Tasks are separated by a space. The second line in the text file gives the dependency list. The dependencies are separated by a space.

taskData.txt example:

```
A B C D E F
(A,B) (A,C) (B,D) (C,D) (D,E) (E,F)
```

This project should also provide the option to (1) add new tasks, (2) delete a task, (3) add a dependency, and (4) quit. When the task list or the dependency list is modified, the program will recalculate the information above and display the updated information.

Sample Interaction:

When the data in taskData.txt is

A B C D E F

(A,B) (A,C) (B,D) (C,D) (D,E) (E,F)

Welcome to my Task Scheduling Project:

A valid ordering of tasks is as follows:

A B C D E F

There are other valid ordering of tasks.

The minimum number of time steps is five:

1: A

2: B C

3: D

4: E

5: F

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit

>> a

What tasks to you want to add?

Separate each task with a space.

Enter "none" if there is no task to be added.

>> G H

What dependencies does G have?

Separate each task with a space.

Enter "none" if there is no dependency to be added.

>> none

What tasks depend on G?

Separate each task with a space.

Enter "none" if there are no tasks that depend on G .

>> E F

What dependencies does H have?

Separate each task with a space.

Enter "none" if there is no dependency to be added.

> C

What depends on H?

Separate each task with a space.

Enter "none" if you do not.

>> B

A valid ordering of tasks is as follows:

A C H B D G E F

There are other valid ordering of task.

The minimum number of time steps is 7:

- 1: A G
- 2: C
- 3: H
- 4: B
- 5: D
- 6: E
- 7: F

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit

>>c

What dependency do you want to add?

>> (D,G)

A valid ordering of tasks is as follows:

A C H B D G E F

This is the only valid ordering of task.

The minimum number of levels is 8.

- 1: A
- 2: C
- 3: H
- 4: B
- 5: D
- 6: G
- 7: E
- 8: F

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit

>> b

What task do you want to delete?

>> Z

Z is not a valid task. No changes were made.

What do you want to do?

(a) add task (b) delete a task (c) add a dependency (d) quit.

>>b

What task do you want to delete?

>> A

A valid ordering of tasks is as follows:

C I B D G E F

This is the only valid ordering of task.
The minimum number of levels is 7.

1: C
2: H
3: B
4: D
5: G
6: E
7: F

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit
>>c

What dependency do you want to add?

>> (B,Z)
(B,Z) is not a valid dependency. No changes were made.

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit
>>c

What dependency do you want to add?

>> (B,C)

There is NO valid ordering of task.

There is a cycle: B C H B

What do you want to do?

(a) add tasks (b) delete a task (c) add a dependency (d) quit.
>>d