CENG 113 – Programming Basics

Assignment 4

Due: 09.01.2024 - 23:59

Assignment Description

For this assignment, your objective is to create a Python program for a team manager to efficiently manage the team tasks. The system should allow users to perform the following operations, adding tasks, assigning team members, completing tasks, generating a report with overall and task times. The project tasks are organized in a recursive structure.

Tasks Structure

Each task should be represented as a dictionary with the following keys:

- `id`: Unique identifier for the task.
- `description`: Brief description of the task.
- `assigned_to`: Team member assigned to the task.
- `completed`: Boolean indicating whether the task is completed. (if the task is completed)
- `time_estimate`: Estimated time (in hours) required to complete the task. (if the task doesn't have any subtask)
- `subtasks`: List of subtasks, each following the same structure. (if the task has subtasks)

Program Flow

Upon executing the program, it should display a list of all operations, prompting the user to select.

Operations:

1. Add a new task
2. Assign a task to a team member
3. Complete a task
4. Generate report
5. Exit

Expected Steps:

1. **Add a New Task:**
    - Implement a function `add_task_recursive` that allows the user to add a new task to the task list.
    - The function should prompt the user for task details such as description, assigned team member, and time estimate.
    - If the user chooses to add the task as a subtask, the function should be called recursively to handle the subtasks.
    - For every new task, completion process of the parent tasks needs to be updated if necessary.
2. **Assign a Task:**
    - Implement a function `assign_task` that allows the user to assign a task to a team member.
    - The function should prompt the user for the task ID and the new team member's name.
3. **Complete a Task:**
    - Implement a function `complete_task_recursive` that allows the user to mark a task as completed.
    - The function should prompt the user for the task ID to be completed.
    - If the task has subtasks, the function should be called recursively to complete all subtasks of the selected task as well.
4. **Generate Report:**
    - Implement a function `generate_report_recursive` that generates a final report.
    - The report should include task details such as ID, description, assigned team member, status (completed or pending), total time and remaining time.
    - The function should recursively traverse the task list and print the report.
    - Implement a function `calculate_time_recursive` that calculates the estimated and remaining task times of the project.
    - If the task has subtasks, the parent task estimated time needs to be calculated according to its subtasks.
    - Function should be called recursively to calculate given tasks and its subtasks.
    - Function should be able to calculate overall project times and individual task times.
5. **Exit:**
    - Implement a graceful exit mechanism that allows the user to exit the program.

Requirements

Students should implement all the functions outlined in the previous section following the provided specifications. If additional functions are introduced beyond those mentioned, it is essential to provide clear descriptions of their purposes and functionalities.

Submission Rules

- Assignments must be done and submitted individually. Students found to have cheated will automatically receive 0 points.
- You must submit your assignment by the specified deadline.
- The submitted file must contain your source code and **code explanations (Comments)**. Your program should be able to operate correctly.
- The name of the submitted file must be your student number. **(Ex. 123456.py)**
- Only Python files with .py and .ipynb extensions will be evaluated. **Files with .txt, .pdf, .jpeg etc. extensions will not be accepted.**
- **Please send your file without compressing it.**

Sample Output in Expected Format

Operations:

1. Add a new task
2. Assign task to a team member
3. Complete a task
4. Generate report
5. Exit

Please select an operation: 4

1. Complete Project Proposal (John Doe) -- Estimated Time to Finish: 16 out of 16 hours, Pending
-- 2. Research (Alice Brown) -- Estimated Time to Finish: 5 out of 5 hours, Pending
-- 3. Outline (Bob Johnson) -- Estimated Time to Finish: 11 out of 11 hours, Pending
---- 4. Introduction (Jane Smith) -- Estimated Time to Finish: 3 out of 3 hours, Pending
---- 5. Body (Jane Smith) -- Estimated Time to Finish: 6 out of 6 hours, Pending
---- 6. Conclusion (David Wilson) -- Estimated Time to Finish: 2 out of 2 hours, Pending

The total time of the project is: 16
The remaining time of the tasks to finish the project is: 16
Please press enter to continue.

Operations:

1. Add a new task
2. Assign task to a team member
3. Complete a task
4. Generate report
5. Exit

Please select an operation: 3

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1. Complete Project Proposal (John Doe)
-- 2. Research (Alice Brown)
-- 3. Outline (Bob Johnson)
---- 4. Introduction (Jane Smith)
---- 5. Body (Jane Smith)
---- 6. Conclusion (David Wilson)
Enter task ID: 3
Task 'Outline' marked as completed.
Please press enter to continue.

Operations:

1. Add a new task
2. Assign task to a team member
3. Complete a task
4. Generate report
5. Exit

Please select an operation: 1

0. New Task
1. Complete Project Proposal (John Doe)
-- 2. Research (Alice Brown)
-- 3. Outline (Bob Johnson)
---- 4. Introduction (Jane Smith)
---- 5. Body (Jane Smith)
---- 6. Conclusion (David Wilson)

To add a new task, enter 0. To add a subtask, select the task ID: 5

Final situation after task completion if we get a report:

1. Complete Project Proposal (John Doe) -- Estimated Time to Finish: 5 out of 16 hours, Pending
-- 2. Research (Alice Brown) -- Estimated Time to Finish: 5 out of 5 hours, Pending
-- 3. Outline (Bob Johnson) -- Estimated Time to Finish: 0 out of 11 hours, Completed
---- 4. Introduction (Jane Smith) -- Estimated Time to Finish: 0 out of 3 hours, Completed
---- 5. Body (Jane Smith) -- Estimated Time to Finish: 0 out of 6 hours, Completed
---- 6. Conclusion (David Wilson) -- Estimated Time to Finish: 0 out of 2 hours, Completed

The total time of the project is: 16
The remaining time of the tasks to finish the project is: 5

Please enter the task description: New Task

Please enter the task responsible: Burak Korcuklu

Please enter the estimated time for the task: 8

New task is added.

Please press enter to continue.

Final situation after new task if we get a report:

1. Complete Project Proposal (John Doe) -- Estimated Time to Finish: 13 out of 18 hours, Pending

-- 2. Research (Alice Brown) -- Estimated Time to Finish: 5 out of 5 hours, Pending

-- 3. Outline (Bob Johnson) -- Estimated Time to Finish: 8 out of 13 hours, Pending

---- 4. Introduction (Jane Smith) -- Estimated Time to Finish: 0 out of 3 hours, Completed

---- 5. Body (Jane Smith) -- Estimated Time to Finish: 8 out of 8 hours, Pending

------ 6. New Task (Burak Korcuklu) -- Estimated Time to Finish: 8 out of 8 hours, Pending

---- 7. Conclusion (David Wilson) -- Estimated Time to Finish: 0 out of 2 hours, Completed

The total time of the project is: 18

The remaining time of the tasks to finish the project is: 13

Operations:

1. Add a new task
2. Assign task to a team member
3. Complete a task
4. Generate report
5. Exit

Please select an operation: 2

1. Complete Project Proposal (John Doe)

-- 2. Research (Alice Brown)

-- 3. Outline (Bob Johnson)

---- 4. Introduction (Jane Smith)

---- 5. Body (Jane Smith)

------ 6. New Task (Burak Korcuklu)

---- 7. Conclusion (David Wilson)

Please select a task: 6

Please enter the new team members name: Jane Smith

Task New task assigned to Jane Smith.

Final situation after task assignment if we get a report:

1. Complete Project Proposal (John Doe) -- Estimated Time to Finish: 13 out of 18 hours, Pending

-- 2. Research (Alice Brown) -- Estimated Time to Finish: 5 out of 5 hours, Pending

-- 3. Outline (Bob Johnson) -- Estimated Time to Finish: 8 out of 13 hours, Pending

---- 4. Introduction (Jane Smith) -- Estimated Time to Finish: 0 out of 3 hours, Completed

---- 5. Body (Jane Smith) -- Estimated Time to Finish: 8 out of 8 hours, Pending

------ 6. New Task (Jane Smith) -- Estimated Time to Finish: 8 out of 8 hours, Pending

---- 7. Conclusion (David Wilson) -- Estimated Time to Finish: 0 out of 2 hours, Completed

The total time of the project is: 18

The remaining time of the tasks to finish the project is: 13