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FA22-BSE-035
DS theory
Assignment 01

DESCRIPTION: ·1 createTask(int id, string desc, int priority): This function is what we used in this code.

Produces a fresh task node with an exclusive ID, synopsis, and priority.

Gives back the pointer to the just established job.

·2 addTask(&head, Task*, int id, string desc, int priority):

Added a new job to the list while making sure it is arranged according to priority, with higher priority tasks coming first.

Places the task in the appropriate spot on the list.

3· viewTasks(head* task):

Each task in the list is shown along with its ID, priority, and description.

If there are no tasks available, a notification stating so is displayed.

Removes the job with the highest priority (the first item in the list) in

4· removeHighestPriorityTask(job*& head).

Should the list be empty, it displays4· removeHighestPriorityTask(Task*& head):

- Removes the task with the highest priority (first task in the list).
- If the list is empty, it shows a message that no tasks can be removed.

5· removeTaskByID(Task*& head, int id):

- Removes a task by its unique task ID.
- If the task is not found, it shows a message indicating the task wasn't located in the list.

6· main():

- Implements a menu-based system that allows the user to add tasks, view all tasks, remove tasks (by highest priority or ID), or exit the program.

LOGIC BEHIND CODE:

Here is the logic we used in code.

· 1 Task Node Structure:

- Each task is represented as a node containing the following:
- taskID: A unique identifier for the task.
- description: Details of the task.
- priority: A numeric value representing the importance of the task (higher numbers indicate higher priority).
- next: A pointer to the next node (task) in the list.

· 2 Adding Tasks:

- When a new task is added, the list is traversed to find the correct position based on its priority.
- The task is inserted either at the beginning (if it has the highest priority) or in the appropriate position where tasks with higher priority come before it.

·3 Viewing Tasks:

- The function traverses the entire list starting from the head (first node) and displays the task details of each node.
- If the list is empty, a message indicating "No tasks available" is displayed.

· 4 Removing the Highest Priority Task:

- Since the list is sorted by priority, the task with the highest priority is always the first node (head of the list).
- The head pointer is moved to the next task, and the previous first task is deleted from memory.

· 5 Removing a Task by ID:

- The list is traversed to find the task with the given taskID.
- Once found, the task is removed by adjusting the pointers of the previous node to skip over the node to be deleted.
- If the task is not found, an error message is shown.

·6 Main Menu Interaction:

- A loop presents a menu to the user, allowing them to add tasks, view all tasks, remove tasks by ID or highest priority, or exit the system.
- The program continues prompting the user until they choose the exit option.

```cpp
#include <iostream>
#include <string>

using namespace std;

// Structure for each Task (node in the linked list)
struct Task {
    int taskID;              // Unique ID for each task
    string description;      // Description of the task
    int priority;            // Priority of the task
    Task* next;              // Pointer to the next task (next node in the list)
};

// Function to create a new task node
Task* createTask(int id, string desc, int priority) {
    Task* newTask = new Task();       // Dynamically allocate memory for a new task
    newTask->taskID = id;             // Assign task ID
    newTask->description = desc;      // Assign task description
    newTask->priority = priority;     // Assign task priority
    newTask->next = nullptr;          // Set the next pointer to nullptr (end of the list)
    return newTask;                   // Return the newly created task
}

// Function to add a task to the list, sorted by priority
void addTask(Task*& head, int id, string desc, int priority) {
    Task* newTask = createTask(id, desc, priority);  // Create the new task

    // If the list is empty or the new task has higher priority than the first task
    if (head == nullptr || head->priority < priority) {
        newTask->next = head;  // Insert the new task at the start of the list
        head = newTask;
    } else {
        // Traverse the list to find the correct position for the new task
        Task* temp = head;
        while (temp->next != nullptr && temp->next->priority >= priority) {
            temp = temp->next;  // Move to the next task in the list
        }
        // Insert the new task at the correct position
        newTask->next = temp->next;
        temp->next = newTask;
    }
    cout << "Task added successfully.\n";
}

// Function to view all tasks in the list
void viewTasks(Task* head) {
    if (head == nullptr) {    // Check if the list is empty
        cout << "No tasks available.\n";
        return;
    }

    // Traverse the list and print each task's details
    Task* temp = head;
    while (temp != nullptr) {
        cout << "Task ID: " << temp->taskID << "\nDescription: " << temp->description
             << "\nPriority: " << temp->priority << "\n\n";
        temp = temp->next;  // Move to the next task in the list
    }
}

// Function to remove the task with the highest priority (first task)
void removeHighestPriorityTask(Task*& head) {
    if (head == nullptr) {  // Check if the list is empty
        cout << "No tasks to remove.\n";
        return;
    }

    // Remove the first task (highest priority)
    Task* temp = head;
    head = head->next;  // Move the head to the next task
    cout << "Task with ID " << temp->taskID << " removed.\n";
```


ss.cpp - Code::Blocks 20.03
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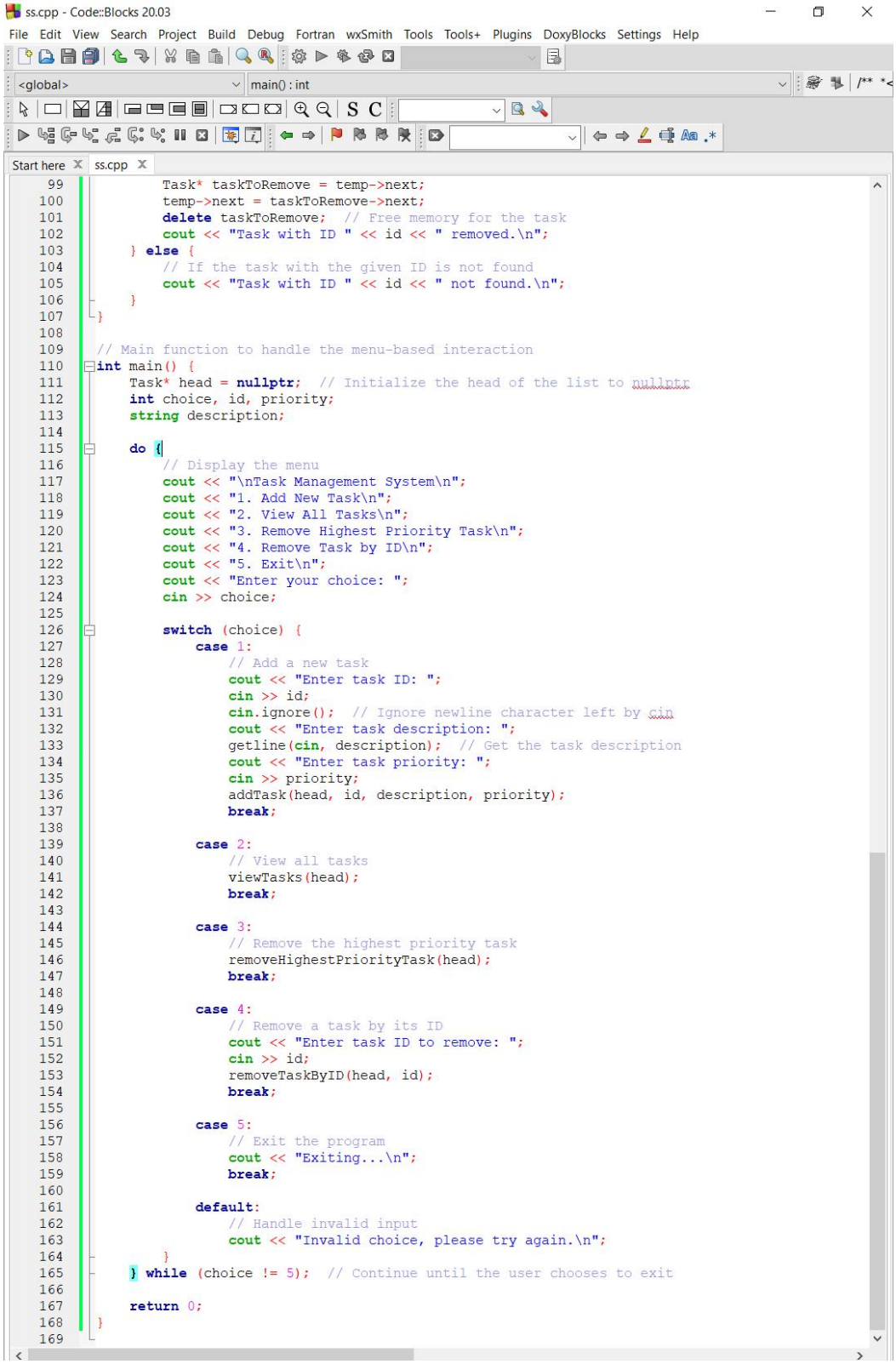
<global>
Start here
ss.cpp
71 cout << "Task with ID " << temp->taskID << " removed.\n";
72 delete temp; // Free memory allocated for the task
73 }
74
75 // Function to remove a specific task by its task ID
76 void removeTaskByID(Task*& head, int id) {
77 if (head == nullptr) { // Check if the list is empty
78 cout << "No tasks to remove.\n";
79 return;
80 }
81
82 // If the task to be removed is the first one
83 if (head->taskID == id) {
84 Task* temp = head;
85 head = head->next; // Move the head to the next task
86 delete temp; // Free memory for the task
87 cout << "Task with ID " << id << " removed.\n";
88 return;
89 }
90
91 // Traverse the list to find the task with the given ID
92 Task* temp = head;
93 while (temp->next != nullptr && temp->next->taskID != id) {
94 temp = temp->next; // Move to the next task
95 }
96
97 // If the task is found, remove it
98 if (temp->next != nullptr) {
99 Task* taskToRemove = temp->next;
100 temp->next = taskToRemove->next;
101 delete taskToRemove; // Free memory for the task
102 cout << "Task with ID " << id << " removed.\n";
103 } else {
104 // If the task with the given ID is not found
105 cout << "Task with ID " << id << " not found.\n";
106 }
107 }
108
109 // Main function to handle the menu-based interaction
110 int main() {
111 Task* head = nullptr; // Initialize the head of the list to nullptr
112 int choice, id, priority;
113 string description;
114
115 do {
116 // Display the menu
117 cout << "\nTask Management System\n";
118 cout << "1. Add New Task\n";
119 cout << "2. View All Tasks\n";
120 cout << "3. Remove Highest Priority Task\n";
121 cout << "4. Remove Task by ID\n";
122 cout << "5. Exit\n";
123 cout << "Enter your choice: ";
124 cin >> choice;
125
126 switch (choice) {
127 case 1:
128 // Add a new task
129 cout << "Enter task ID: ";
130 cin >> id;
131 cin.ignore(); // Ignore newline character left by cin
132 cout << "Enter task description: ";
133 getline(cin, description); // Get the task description
134 cout << "Enter task priority: ";
135 cin >> priority;
136 addTask(head, id, description, priority);
137 break;
138
139 case 2:
140 // View all tasks
141 viewTasks(head);


ss.cpp - Code::Blocks 20.03
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<global>
main() : int
Start here
ss.cpp
99 Task* taskToRemove = temp->next;
100 temp->next = taskToRemove->next;
101 delete taskToRemove; // Free memory for the task
102 cout << "Task with ID " << id << " removed.\n";
103 } else {
104 // If the task with the given ID is not found
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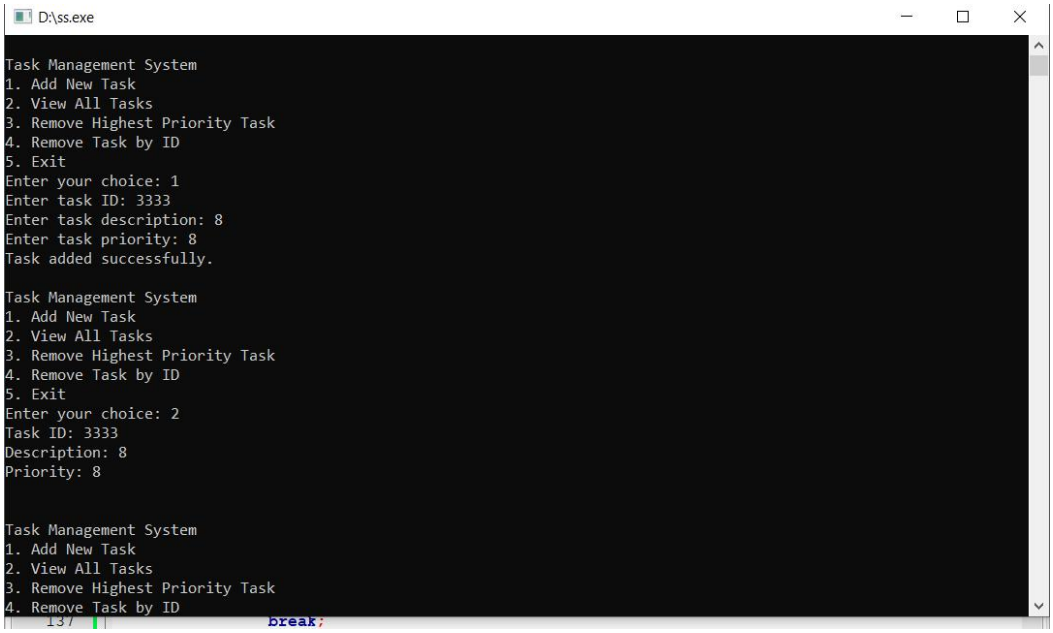
135 cin >> priority;
136 addTask(head, id, description, priority);
137 break;
138
139 case 2:
140 // View all tasks
141 viewTasks(head);
142 break;
143
144 case 3:
145 // Remove the highest priority task
146 removeHighestPriorityTask(head);
147 break;
148
149 case 4:
150 // Remove a task by its ID
151 cout << "Enter task ID to remove: ";
152 cin >> id;
153 removeTaskByID(head, id);
154 break;
155
156 case 5:
157 // Exit the program
158 cout << "Exiting...\n";
159 break;
160
161 default:
162 // Handle invalid input
163 cout << "Invalid choice, please try again.\n";
164 }
165 } while (choice != 5); // Continue until the user chooses to exit
166
167 return 0;
168 }
169


D:\ss.exe
Task Management System
1. Add New Task
2. View All Tasks
3. Remove Highest Priority Task
4. Remove Task by ID
5. Exit
Enter your choice: 1
Enter task ID: 3333
Enter task description: 8
Enter task priority: 8
Task added successfully.
Task Management System
1. Add New Task
2. View All Tasks
3. Remove Highest Priority Task
4. Remove Task by ID
5. Exit
Enter your choice: 2
Task ID: 3333
Description: 8
Priority: 8
Task Management System
1. Add New Task
2. View All Tasks
3. Remove Highest Priority Task
4. Remove Task by ID
137 break;