# Movie Theatre Project Report

## Introduction

The project involves the development of a movie theatre management system implemented in C++. The system facilitates tasks such as booking movie tickets, managing seat reservations, serving customers in ticket and snack queues, and canceling reservations. It simulates the operations of a real-world movie theatre, allowing customers to interact with the system to book seats for movies and order snacks.

## Problem Definition

The problem addressed by the project is the efficient management of a movie theatre's operations, including ticket booking, seat reservation, customer queues, and reservation cancellations. The system aims to provide a user-friendly interface for customers while ensuring smooth operations and effective utilization of resources within the theatre.

## Methodology

The methodology chosen to solve the problem involves object-oriented programming (OOP) principles and modular design. The system is divided into classes, each responsible for specific functionalities such as Movie management, Theatre management, and customer queues. Object-oriented design allows for easy maintenance, scalability, and extensibility of the system.

## Specifications of Algorithms Used

Various algorithms are employed to tackle different aspects of the theatre management system. For seat reservation, algorithms are used to check seat availability, reserve seats, and handle reservation cancellations efficiently. Queue management algorithms determine the order of service for customers in ticket and snack queues based on a first-come-first-serve basis. Additionally, file handling algorithms facilitate reading and writing booking information to files for persistence.

Algorithms used in this project include:

1. **Seat Reservation Algorithm**:
    - This algorithm manages the process of reserving seats for customers. It typically includes the following steps:
        - **Seat Availability Check**: The system checks the availability of seats for the selected movie and showtime. It scans through the seating arrangement to identify empty seats.
        - **Seat Selection**: Once seat availability is confirmed, the customer selects their desired seats. This selection involves visualizing the seating layout and choosing seats based on preference (e.g., proximity to the screen, aisle seats).
        - **Reservation Confirmation**: After seat selection, the system confirms the reservation, marking the selected seats as unavailable to other customers.
        - **Reservation Cancellation Handling**: The algorithm should also include provisions for canceling reservations, which involves releasing the reserved seats and updating the availability status accordingly.
2. **Queue Management Algorithm**:
    - This algorithm orchestrates the order in which customers are served in ticket and snack queues. It aims to optimize service efficiency while ensuring fairness and customer satisfaction. Key components include:
        - **Queue Prioritization**: The system prioritizes customers based on arrival time.
        - **Service Time Estimation**: It estimates the time required to serve each customer based on the a random number generator, generating number between 1 and 5.
        - **Queue Progress Monitoring**: The algorithm continuously monitors the progress of each queue, notifying customers of their position in the queue.

3. **File Handling Algorithm**

    - This algorithm manages the storage and retrieval of booking information from external data sources, typically in file formats such as text files. It encompasses operations such as:

        - **Data Storage**: The system stores booking details, including reserved seats, movie preferences, and time, in a structured format.
        - **Data Retrieval**: When required, the system retrieves booking information from storage to fulfill customer queries, update reservation statuses, or generate reports.
        - **Data Persistence**: The algorithm ensures the durability of stored data, handling scenarios such as system restarts or failures by persisting data changes to disk and recovering from inconsistencies or errors.

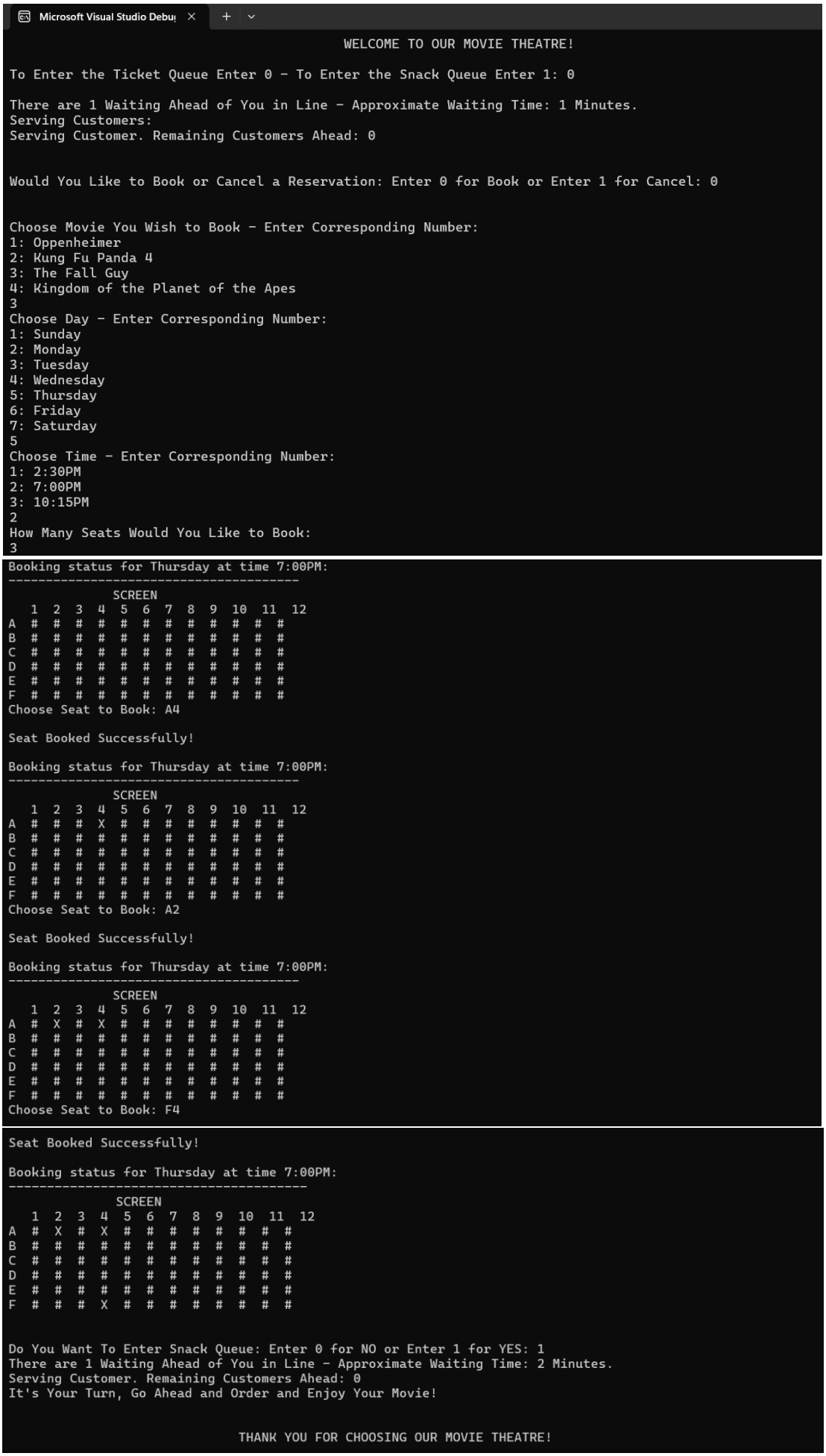
**Data Specifications**

The system processes input data related to movie details, including names, showtimes, and seating arrangements (rows and columns). Customer inputs include selections for booking movies, choosing showtimes, specifying seat numbers, and joining ticket or snack queues. This data is processed and managed by the system to facilitate smooth operations.

**Experimental Results**

Upon execution, the system simulates the operations of a movie theatre, allowing customers to interact with the interface to perform various tasks. Customers can book tickets, reserve seats, join queues for ticket and snack purchases, and cancel reservations as needed. The system provides real-time feedback on queue status, estimated waiting times, and reservation availability, enhancing the overall user experience.

Example Output For Booking:



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Microsoft Visual Studio Debu
                                        WELCOME TO OUR MOVIE THEATRE!

To Enter the Ticket Queue Enter 0 - To Enter the Snack Queue Enter 1: 0

There are 1 Waiting Ahead of You in Line - Approximate Waiting Time: 1 Minutes.
Serving Customers:
Serving Customer. Remaining Customers Ahead: 0


Would You Like to Book or Cancel a Reservation: Enter 0 for Book or Enter 1 for Cancel: 0


Choose Movie You Wish to Book - Enter Corresponding Number:
1: Oppenheimer
2: Kung Fu Panda 4
3: The Fall Guy
4: Kingdom of the Planet of the Apes
3
Choose Day - Enter Corresponding Number:
1: Sunday
2: Monday
3: Tuesday
4: Wednesday
5: Thursday
6: Friday
7: Saturday
5
Choose Time - Enter Corresponding Number:
1: 2:30PM
2: 7:00PM
3: 10:15PM
2
How Many Seats Would You Like to Book:
3
Booking status for Thursday at time 7:00PM:
---------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  #  #  #  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  #  #  #  #  #  #  #  #  #
Choose Seat to Book: A4

Seat Booked Successfully!

Booking status for Thursday at time 7:00PM:
---------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  #  #  X  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  #  #  #  #  #  #  #  #  #
Choose Seat to Book: A2

Seat Booked Successfully!

Booking status for Thursday at time 7:00PM:
---------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  X  #  X  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  #  #  #  #  #  #  #  #  #
Choose Seat to Book: F4

Seat Booked Successfully!

Booking status for Thursday at time 7:00PM:
---------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  X  #  X  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  X  #  #  #  #  #  #  #  #


Do You Want To Enter Snack Queue: Enter 0 for NO or Enter 1 for YES: 1
There are 1 Waiting Ahead of You in Line - Approximate Waiting Time: 2 Minutes.
Serving Customer. Remaining Customers Ahead: 0
It's Your Turn, Go Ahead and Order and Enjoy Your Movie!


                                THANK YOU FOR CHOOSING OUR MOVIE THEATRE!
```

Example Output For Cancelling Empty Show:

```
                                        WELCOME TO OUR MOVIE THEATRE!

To Enter the Ticket Queue Enter 0 - To Enter the Snack Queue Enter 1: 0

There are 7 Waiting Ahead of You in Line - Approximate Waiting Time: 18 Minutes.
Serving Customers:
Serving Customer. Remaining Customers Ahead: 6
Serving Customer. Remaining Customers Ahead: 5
Serving Customer. Remaining Customers Ahead: 4
Serving Customer. Remaining Customers Ahead: 3
Serving Customer. Remaining Customers Ahead: 2
Serving Customer. Remaining Customers Ahead: 1
Serving Customer. Remaining Customers Ahead: 0


Would You Like to Book or Cancel a Reservation: Enter 0 for Book or Enter 1 for Cancel: 1


Choose Movie You Wish to Cancel Reservation For - Enter Corresponding Number:
1: Oppenheimer
2: Kung Fu Panda 4
3: The Fall Guy
4: Kingdom of the Planet of the Apes
3
Choose Day - Enter Corresponding Number:
1: Sunday
2: Monday
3: Tuesday
4: Wednesday
5: Thursday
6: Friday
7: Saturday
5
Choose Time - Enter Corresponding Number:
1: 2:30PM
2: 7:00PM
3: 10:15PM
3
Nothing is Booked in this Show!


Do You Want To Enter Snack Queue: Enter 0 for NO or Enter 1 for YES: 0


                                    THANK YOU FOR CHOOSING OUR MOVIE THEATRE!
```

Example Output for Cancelling Seat:

```
                                        WELCOME TO OUR MOVIE THEATRE!

To Enter the Ticket Queue Enter 0 - To Enter the Snack Queue Enter 1: 0

There are 5 Waiting Ahead of You in Line - Approximate Waiting Time: 13 Minutes.
Serving Customers:
Serving Customer. Remaining Customers Ahead: 4
Serving Customer. Remaining Customers Ahead: 3
Serving Customer. Remaining Customers Ahead: 2
Serving Customer. Remaining Customers Ahead: 1
Serving Customer. Remaining Customers Ahead: 0


Would You Like to Book or Cancel a Reservation: Enter 0 for Book or Enter 1 for Cancel: 1


Choose Movie You Wish to Cancel Reservation For - Enter Corresponding Number:
1: Oppenheimer
2: Kung Fu Panda 4
3: The Fall Guy
4: Kingdom of the Planet of the Apes
3
Choose Day - Enter Corresponding Number:
1: Sunday
2: Monday
3: Tuesday
4: Wednesday
5: Thursday
6: Friday
7: Saturday
5
Choose Time - Enter Corresponding Number:
1: 2:30PM
2: 7:00PM
3: 10:15PM
2
Booking status for Thursday at time 7:00PM:
------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  X  #  #  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  X  #  #  #  #  #  #  #  #
Choose Seat to Cancel: A2
Reservation cancelled successfully.
Booking status for Thursday at time 7:00PM:
------------------------------------
              SCREEN
   1  2  3  4  5  6  7  8  9  10  11  12
A  #  #  #  #  #  #  #  #  #  #  #  #
B  #  #  #  #  #  #  #  #  #  #  #  #
C  #  #  #  #  #  #  #  #  #  #  #  #
D  #  #  #  #  #  #  #  #  #  #  #  #
E  #  #  #  #  #  #  #  #  #  #  #  #
F  #  #  #  X  #  #  #  #  #  #  #  #


Do You Want To Enter Snack Queue: Enter 0 for NO or Enter 1 for YES: 0


                                    THANK YOU FOR CHOOSING OUR MOVIE THEATRE!
```

## Analysis and Critique

While the system effectively manages theatre operations and provides a user-friendly interface, there are areas for improvement. These include optimizing queue management algorithms for faster service, enhancing error handling to improve system robustness, and refining the user interface for better clarity and usability. Addressing these areas can further enhance the efficiency and effectiveness of the system.