Simulation Model Of Hotels By Using Discrete Event System

Asst. Lecture. Zena Salah Hussein,
computer science
Al_Mustansiriyah University, Baghdad_ Iraq
E-mail zezefun@yahoo.com

Abstract:

In this paper propose a new approach for the hotel management problem. The proposal approach is based on counting "prices for Room and Suite " and provide a varying discount for the guests in state of reservation in previous time. the goal is being to maximize the guest satisfaction at affordable prices and provide priority to reservation from guests than without reservation, and taking into account the other services that offer free booking in the case of him.

in this paper apply an optimization algorithm was applied by using Monte Carlo simulator that simulates all the hotel's processes, such as reservations arrivals, Length of Stay, room prices, suite prices, etc.

Keywords: Hotel, Reservation, without Reservation, Model, Room, Suite, guest, Price.

محاكاة لنمذجة عمل الفنادق اعتمادا على نظام الحدث المتقطع

م.م. زينة صالح حسين
الجامعة المستنصرية- كلية العلوم – قسم علوم الحاسوب

الخلاصة :

في هذا البحث يقترح نهجا جديدا لمشكلة إدارة الفنادق. ويستند النهج المقترح على حساب "أسعار الغرفة والجناح"، وتقديم خصم للنزلاء في حالة الحجز في وقت سابق. كما انه يهدف البحث إلى تحقيق أقصى قدر من رضا للنزلاء بأسعار معقولة وتوفير الأسبقية للنزيل الذي لديه حجز مسبق عن غيره ، مع الأخذ بعين الاعتبار الخدمات الأخرى التي تقدم مجانا في حالة الحجز من دونه .كما وانه في هذه الدراسة تم تطبيق امثل خوارزمية وذلك باستخدام طريقة محاكاة تحاكي جميع العمليات في الفندق، مثل حجوزات الوافدين، طوله مدة الإقامة، أسعار الغرف، سعر الجناح، الخ.

1. Introduction

The hotel should have a policy prohibiting employees from accepting advantages which include any gift, loan, commission, employment, contract, services etc., from persons with whom they have official dealings. If staff members are allowed to accept token gifts, the permissible value should be specified. For activities where it is customary for customers to offer tips to staff, lay down policy and system for dealing with tips offered [1].

Hotel energy consumption is influenced by physical and operational parameters. The physical parameters common to most buildings include size, structure and design of the building (prevailing architectural / construction practices), geographical and climatic location, the age of the facility, the type of energy and water systems installed, the way these systems are operated and maintained, types and amounts of energy and water resources available locally, as well as energy-use regulations and cost. Operational parameters that influence energy use in hotels include operating schedules for the different functional facilities in the hotel building, the number of facilities (restaurants, kitchens, in-house laundries, swimming pools and sports centers, business centers, etc.), services offered, fluctuation in occupancy levels, variations in customer preference relevant to indoor comfort, on-site energy conservation practices, as well as culture and awareness of resource consumption among personnel and guests.[2]

1.1 Hotel Classification:

The hotel classification was separated different types and ranges of accommodation into several categories based on a range of criteria. Hotel accommodations can allow for five to seven categories to be applied. [3]

- **One Star Hotels**
  Hotels in this classification are likely to be small and independently owned, with a family atmosphere. Services may be provided by the owner and family on an informal basis. There may be a limited range of facilities and meals may be fairly simple. Lunch, for example, may not be served. Some bedrooms may not have en-suite bath/shower rooms. Maintenance, cleanliness and comfort should, however, always be of an acceptable standard.
- **Two Star Hotels**
  In this classification hotels will typically be small to medium sized and offer more extensive facilities than at the one star level. Some business hotels come into the two star classification and guests can expect comfortable, well equipped, overnight accommodation, usually with an en-suite bath/shower room.
- **Three Star Hotels**
  At this level, hotels are usually of a size to support higher staffing levels, and a significantly greater quality and range of facilities than at the lower star classifications. Reception and the other public rooms will be more spacious and the restaurant will normally also cater for non-residents. All bedrooms will have fully en-suite bath and

shower rooms and offer a good standard of comfort and equipment, such as a hair dryer, direct dial telephone, toiletries in the bathroom. Some room service can be expected, and some provision for business travelers.

- **Four Star Hotels**
  Expectations at this level include a degree of luxury as well as quality in the furnishings, decor and equipment, in every area of the hotel. Bedrooms will also usually offer more space than at the lower star levels, and well designed, coordinated furnishings and decor. The en-suite bathrooms will have both bath and fixed shower. There will be a high enough ratio of staff to guests to provide services like porter age, 24-hour room service, laundry and dry-cleaning. The restaurant will demonstrate a serious approach to its cuisine.

- **Five Star Hotels**
  Here you should find spacious and luxurious accommodation throughout the hotel, matching the best international standards. Interior design should impress with its quality and attention to detail, comfort and elegance. Furnishings should be immaculate. Services should be formal, well supervised and flawless in attention to guests' needs, without being intrusive. The restaurant will demonstrate a high level of technical skill, producing dishes to the highest international standards. Staff will be knowledgeable, helpful, well versed in all aspects of customer care, combining efficiency with courtesy.
  The study aims to show the role played by good of management works in hotels and provides to guest care services, guest satisfaction at affordable prices and encourage repeat again.

2. Related Works

Dr. Suryakant Lasune at 2011 discussed the concept of Mergers and acquisitions had been a very important market entry Main object of this research paper is to show the marketing strategies and quality management of five star hotels in order to improve its revenue and the research problem is, how can Marketing Strategies and Quality Management improve future revenue with the special reference to selected five star hotels in India.[4]

Amir F. Atiya at 2009 considered the concept Forecasting hotel arrivals and occupancy is an important component in hotel revenue management systems. In this paper we proposed a new Monte Carlo simulation approach for the arrivals and occupancy forecasting problem. In this approach we simulate the hotel reservations process forward in time, and these future Monte Carlo paths will yield forecast densities. A key step for the faithful emulation of the reservations process is the accurate estimation of its parameters.[5]

K.H. Yang at 2002 discussed the concept of annual power consumption of a five-star hotel was analyzed with computer simulation, followed by full scale experiment for validation. Comparative result of the two indicates that significant energy savings, can be expected in this high-rise building if the chiller plant, especially the chilled water distribution system can be renovated with variable speed driven pumps.[6]

3. System Description:

Hotels often operate around the clock, meaning that there are two groups working alternately in order to keep the hotel open day and night to provide the services needed by the guest of the restaurant, which offers where all varieties of food and swimming pools, as well as places to practice games such as (chess, the game of billiards, ect…), also provide Banquet hall and other services rooms. Hotel have a number rooms may be rooms with one bed or rooms with two beds or more and also be a number of suites each one have a room for sleeping and living, and in addition to the bathroom and shower.

3.1 Acknowledging with the Proposing System

The proposed system is a simulate hotels model. The guest arrival to hotel toward to reception and employer question for customer if have a prior reservation, then check date of arrival the number of (days and month) and registration date of depart from hotel, also the employer ask guest if the reservation about suite or room then he take to guest number and key a cording to suite or room, otherwise the guest want to new reservation and recording length of stay on hotel and if he need room or suite until he leave from hotel. **Figure (1)** summarize the customer flow through hotels by a flow chart.

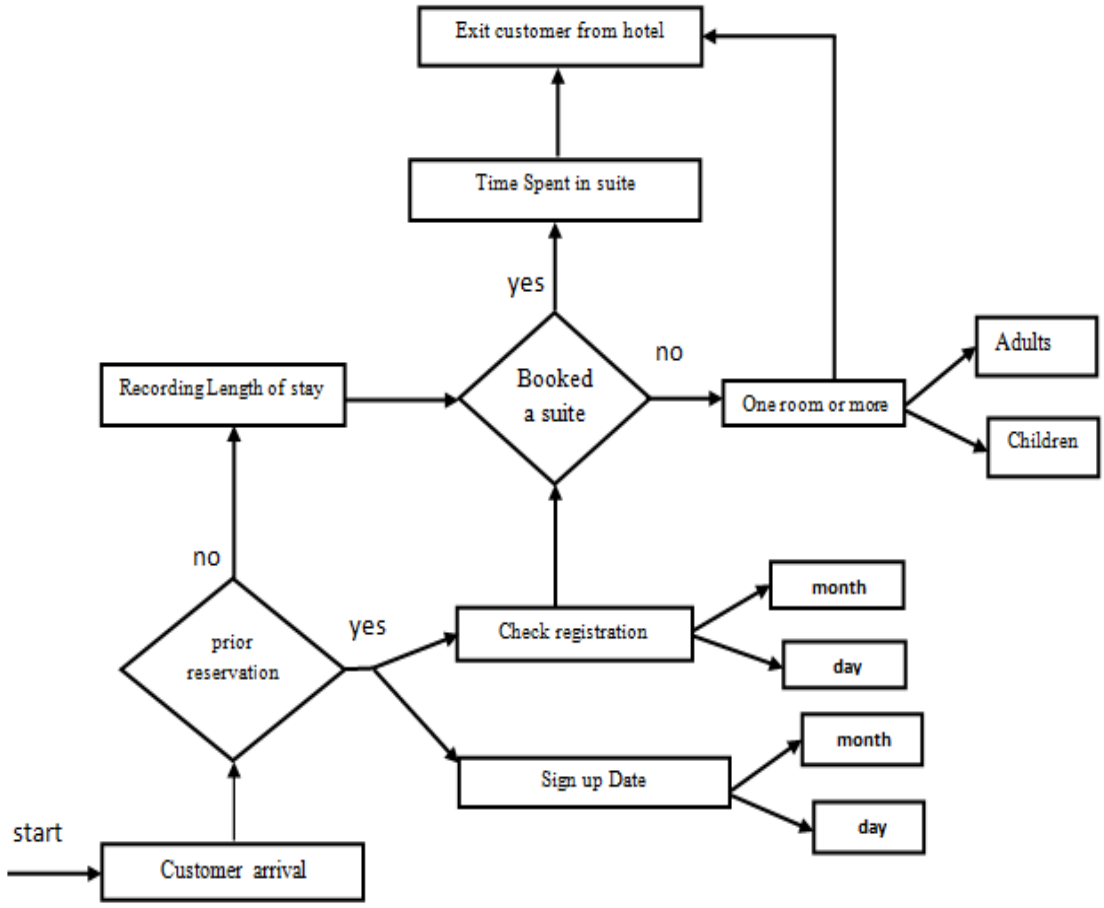

Fig. (1) Flow chart of proposed hotel model

3.2 Methodology

The methodology of simulation models applied in Hotels to represent the customer reservation room or suite and how to calculate prices for each them.

by the following steps:

1. Generate pseudo random number using function RND ( ).
2. Transform this number in to random variable exponentially distributed to represent the inter arrival time:

$$\text{Inter arrival} = -\frac{1}{l}\log(\text{random number})$$

3. Generate another pseudo random number
4. Transform this number to random variable exponentially distributed to Represent the time of length of stay and prices in Room and Suite:

$$\text{Length of Stay time} = -\frac{1}{m_1}\log(\text{random number})$$

$$\text{Room Price} = -\frac{1}{m_2}\log(\text{random number})$$

$$\text{Suite Price} = -\frac{1}{m_3}\log(\text{random number})$$

5. Calculate arrival time, depart time , Price Depart($)

- arrival time (guests) =inter arrival time (previous guests)+ arrival time (current guests)
- Depart time= arrival time + Length of Stay time
- Price Depart($)=Room Price($) or Suite Price($)

4. Results and Discussion.

By means of the created simulation model, with preliminary assigned for the two scenarios, each scenarios have number of guests the incoming flow, intensity of the incoming flow (arrival rate), if the guests reservation room or suite then stay in hotels period of time until leave the hotel is simulated the operation of the system "Hotel Model".

Scenario 1 – simulation of the "Hotel Model" as **Room and Suite Reservation model** having Poisson incoming flow about the guests with an average inter-arrival time. **Figure (2)** shows a sample of the program tabular results to simulation model of Room or Suite Reservation when $l = 0.4$, $m_1 = 0.3, m_2 = 0.009 and m3 = 0.02$, and not required to count the prices of addition service because guest is reservation in pervious time, in addition represent the room reservation by value of (1) but if the guest need to reservation suite represent by value (1) and room reservation by value(0). Display the results as graphical scheme, represent the rates of prices in room and suite for a **Figure(3).**

DayName	interarrTime	arrivaltime	LenghtofStay	roomReser	RoomPrice	SuiteRese	SuitePrice	PriceDepart	LeaveHotel
1	2	2	0.5	1	3.2	0	0	3.2	2.5
2	0.3	2.3	1.8	0	0	1	154.7	154.7	4.1
3	0.2	2.5	0.1	0	0	1	49.2	49.2	2.6
4	0.2	2.7	2	0	0	1	2.6	2.6	4.7
5	1.1	3.8	1	1	3.3	0	0	3.3	4.8
6	1.3	5.1	0.9	1	15.1	0	0	15.1	6
7	2.2	7.3	0.4	1	15.9	0	0	15.9	7.7
8	0.9	8.2	3	1	0.2	0	0	0.2	11.2
9	0.6	8.8	1.3	1	0.3	0	0	0.3	10.1
10	3.7	12.5	8.3	1	0.4	0	0	0.4	20.8
11	0.9	13.4	0.4	1	28.8	0	0	28.8	13.8
12	2.1	15.5	1.9	1	38.6	0	0	38.6	17.4
13	2	17.5	1.8	1	0.7	0	0	0.7	19.3
14	2.1	19.6	0.9	1	22.9	0	0	22.9	20.5
15	1.5	21.1	2.2	1	11.1	0	0	11.1	23.3
16	0.8	21.9	1.1	1	19.7	0	0	19.7	23
17	4.2	26.1	2.7	1	9.8	0	0	9.8	26.8
18	0.4	26.5	0.2	0	0	1	62	62	26.7
19	0.8	27.3	4.6	1	5.8	0	0	5.8	31.9
20	1	28.3	0.4	1	4.6	0	0	4.6	28.7

Fig. (2) Tabular results of Room and Suite Reservation model

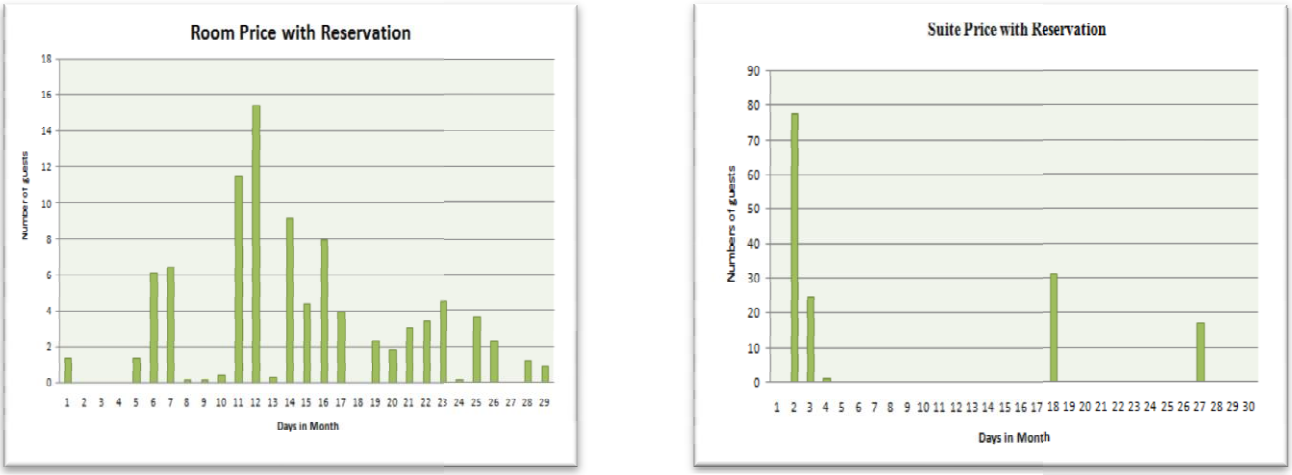

Fig. (3) Rates of Room Price and Suite Price with Reservation

Scenario 2 – simulation of the "Hotel Model" as **Room and Suite without Reservation model** having Poisson incoming flow about the guests with an average inter-arrival time. **Figure (4)** shows a sample of the program tabular results to simulation model of Room or

Suite Reservation when $l = 0.2$, $m_1 = 0.03, m_2 = 0.9$. If guest departure from hotels push the counts of room or suite and the counts of addition service because is not reservation in pervious time. also may refers to the room by value (1) and suite by value (0) and vice versa. Display the results as graphical scheme, represent the rates of prices in room and suite without reservation model in **Figure(5).**

DayName	interarrTime	arrivaltime	RoomwithoutRes	RoomPrice	SuitewithoutRes	suiteprice	ServicePrice	PriceDepart
1	2	2	1	1.3	0	0	5.5	6.8
2	0.3	2.3	0	0	1	77.3	17.6	94.9
3	0.2	2.5	0	0	1	24.6	0.8	25.4
4	0.2	2.7	0	0	1	1.3	20.2	21.5
5	1.1	3.8	1	1.3	0	0	10.5	11.8
6	1.3	5.1	1	6.1	0	0	8.7	14.8
7	2.2	7.3	1	6.4	0	0	3.9	10.3
8	0.9	8.2	1	0.1	0	0	29.7	29.8
9	0.6	8.8	1	0.1	0	0	12.6	12.7
10	3.7	12.5	1	0.4	0	0	83.1	83.5
11	0.9	13.4	1	11.5	0	0	4.5	16
12	2.1	15.5	1	15.4	0	0	19.2	34.6
13	2	17.5	1	0.3	0	0	18.3	18.6
14	2.1	19.6	1	9.1	0	0	8.7	17.8
15	1.5	21.1	1	4.4	0	0	22.4	26.8
16	0.8	21.9	1	7.9	0	0	10.8	18.7
17	4.2	26.1	1	3.9	0	0	26.8	30.7
18	0.4	26.5	0	0	1	31	1.7	32.7
19	0.8	27.3	1	2.3	0	0	46.5	48.8
20	1	28.3	1	1.8	0	0	3.6	5.4
21	6.3	34.6	1	3	0	0	16.9	19.9

Fig. (4) Tabular results of Room and Suite without Reservation model

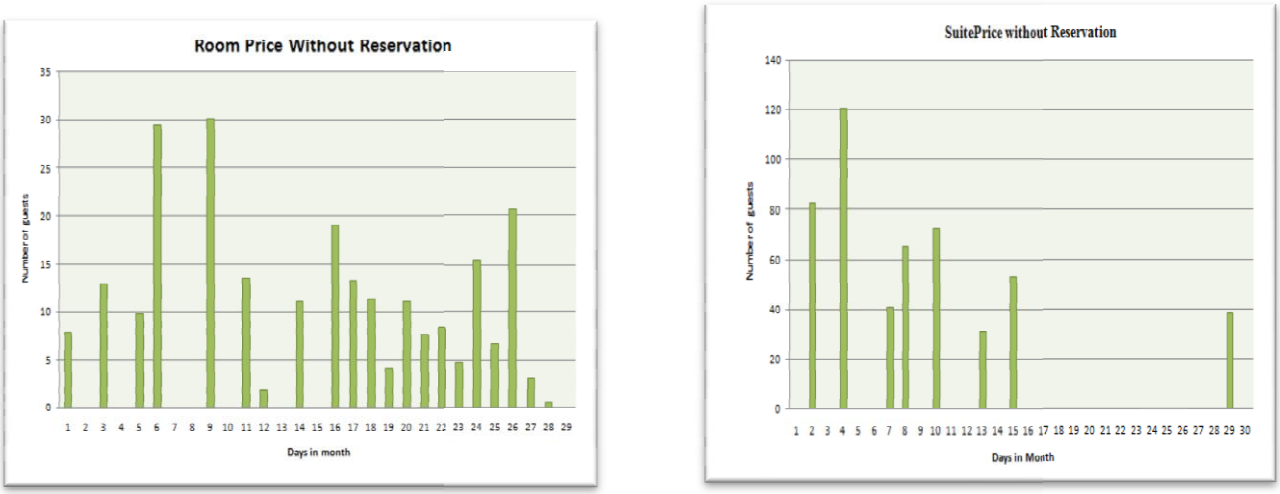

Fig. (5) Rates of Room Price and Suite Price without Reservation

5. Conclusions:

The simulation model simulating the guests reservation in hotels an illustrative the following special features:

- The suite prices in reservation model (**10.4**) is greater than room prices in some model(**7.9**).
- The average of prices departure in reservation model (**18.3**) is smaller than the average of prices departure in model without reservation (**32.3**) because guest pushed the prices of addition service.
- The rates of room in each models is smaller than the rates of suite during month; but room prices in model without reservation is same or greater than prices of suites in model of reservation.
- And conclude from the foregoing that people prefer to pre-booking the suite instead of room because the lower cost and wider the place.

References:

1. **Java Road, "Corruption Prevention Department", Independent Commission Against Corruption, North Point, Hong Kong, 2009.**
2. **Hotel Energy Solutions, "Analysis on Energy Use by European Hotels: Online Survey and Desk Research", Madrid Spain, www.untwo.org, 2011.**
3. **Caribbean Tourism Organization, " Hotel Classification System", 2002.**
4. **Dr. Suryakant Lasune, "Marketing strategies and quality management of five star hotels in order to improve its revenue with special reference to selected five star hotels in Mumbai", www.abhinavjournal.com, VOLUME NO.1, ISSUE NO.4, 2005.**
5. **Amir F. Atiya, "Forecasting Hotel Arrivals and Occupancy Using Monte Carlo Simulation", Cairo University, Giza, Egypt, amir@alumni.caltech.edu, 2009.**
6. **K.H. Yang and S.C. Wu, "COMPUTER SIMULATION AND EXPERIMENTAL VALIDATION OF A MODERN HOTEL ON BUILDING ENERGY CONSERVATION", National Sun Yat-Sen University, Kaohsiung, Taiwan 80424, 2002.**