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Multilevel Algorithm Feedback Queue for Restaurant Order System

Ricky Salomo, Indra Ranggadara, Nia Rahma Kurnianda, Suhendra

Abstract: ***The purpose of writing this paper is to advance a restaurant that is have started out or even developing, with this business process will be make it easy and integrated to be as simple as possible so that customers who come to a restaurant no longer need to queue. In order to improve the quality of education on an ongoing basis both input, process and output in a study program, applications are needed that can support business processes[1]. The author makes the analysis of the system running using the UML (Unified Model Language), Multilevel Algorithm method used for analyzing the running system. The author designed this application so that the data that will be managed is integrated with the database, can be connected directly to the restaurant website and provide notifications to orders so that it makes will easy for customer to know the order process. The author focuses on combination scheduling order food and multilevel algorithm for queue restaurant order system***

Keywords: Queue, Scheduling Order, Multilevel Algorithm, Ordering, UML.

I. INTRODUCTION

Technological developments have had huge influence in the world of information technology and telecommunications. The emergence of various kind of application provides an option in increasing a work [2], both desktop based, web based but it is often often found in restaurants that still use the ordering system manually as in this restaurant which still uses manual recording. whereas service is one of the important processes in increasing value for the company and for customers [3] therefore, the development and use of existing technology is needed to help businesses in restaurants that will help ordering services be faster and easier and provide convenience for customers. In the development of technology that continues to advance, it is expected to be able to assist restaurants in providing satisfying services to customers and facilitate restaurants in delivering food order from the table to the cashier without having to come a waiter who comes by recording all orders ordered by customers, other than order usage food that is connected to the server can send order data. to the cashier and kitchen part of the restaurant. The selection of this web-based booking for one application development besides being easier to operate, also because the nature of flexible websites is one reason the authors chose this media to be developed in restaurant restaurants. At this time the restaurant still uses manual methods for ordering food and drinks where the waiter uses

drinks ordered by customers. In this manual system, it is known that paper and pens for ordering food and drinks encounter constraints, among others, the ordering of multiple redundancies, not the order of making orders due to overlapping order notes, especially when crowded, dull pencils, and pen or order paper which runs out [4] What makes ordering in a restaurant becomes unstructured and can reduce customer satisfaction

The following research data from customer satisfaction in restaurants for 6 month

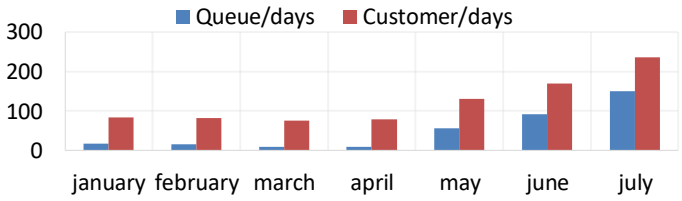

Figure 1 Customer statistical in restaurant for 6 month

From the data provided by the restaurant, it was explained that from Monday to Sunday, customer dissatisfaction had increased and the highest increase was found on Saturdays and Sundays, from research because it was caused by several factors, including too long orders due to the large number of visitors who arrived on that day, Orders that are still less structured or disappointed between the customer and waiter.

The differentiator of this study compared the previous research. Not yet an application that discusses food ordering using a multilevel algorithm feedback queue, there is no application design that discusses getting discounts by completing the quiz, there is no draft application that discusses chat features for ordering in the section. Cashier, the method uses a multilevel algorithm.

A. Research Problem

Based on the background, below are some questions in this study, namely: How to increase customer satisfaction in restaurants by using the multilevel algorithm feedback queue method?

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* Correspondence Author
Ricky Salomo*, Faculty of computer science, Mercu Buana University,Jakarta Barat,Indonesia,11650.Email:41814120082@student.Mercubuana.ac.id
Indra Ranggadara, Faculty of computer science, Mercu Buana University,Jakarta Barat,Indonesia,11650.Email:indra.ranggadara@mercubuana.ac.id
Nia Rahma Kurnianda, Faculty of Computer Science, Mercu Buana University, Jakarta, Indonesia.,Email: nia.rahma@mercubuana.ac.id
Suhendra, Faculty of Computer Science, Mercu Buana University, Jakarta, Indonesia.Email: suhendra.mercu@mercubuana.ac.id

B. Limitation Research

can only be accessed by the customer who uses the design of the ordering information system, designing information systems can only be accessed through a web browser with internet access, The design of the information system only contains a list of foods, discounts, prices that have been ordered by customers, Designing information systems is limited to streamlining queue time.

C. Object and Benefits

Twith a business process when the customer is invited to make an appointment to get a discount from a restaurant,restaurants are invited to develop by using an information system design with the MLFQ method,Restaurants will get the maximum benefit by finding and getting new customers using current business processes,The customer is curious about filling out the quiz to come back to the restaurant through the current business process.

II. METHODOLOGY

This paper aims to design a very effective ordering information system at restaurants so that customers do not need to queue very long and order food that is not too long of course.

A. Step Research

In the research method the researcher starts with the first step is to determine the topic to be researched by looking for problems that have not been resolved in the field. The second step is to determine in formula of the problem which then analyzes the problem using the SWOT method. The third step is conducting a literature review obtained through research books and journals that have been carried out previously. The fourth step is to study the research that has been done before and then compared to the research that we do. The fifth step is to directly interview all employees and directors of the Company how the process is currently running in the field[5]. The sixth step is to collect data obtained in the field which is then used as a reference material in making questionnaires given to all employees and directors as materials to analyze existing problems. next step is analyzing the data obtained by the SWOT method. The seventh step is to design and propose information systems based on existing problems based on the results of SWOT Analysis with the Multilevel Feedback Queue Algortihm of resolving these problems.

B. SWOT ANALYSIS

systematic identification of several factors to formulate a company's strategy. This analysis is based on a logical has maximum strength (opportunities) and opportunities (Opportunities), but simultaneously minimize weaknesses (Weaknesses) and threats (Threats). SWOT analysis is simply understood as testing of an organization's internal strengths and weaknesses, as well as opportunities and threats of its external environment. SWOT is a general device designed and used as an initial step in the decision-making process and as strategic planning in a variety of applications[6].

C. UML (Unified Modeling Language)

UML is a visual language in modeling that allows system developers to create a blueprint that can describe their vision of a system in a format that is standard, easy to understand, and provides a mechanism to easily communicate with others. In UML diagrams that are used are use case diagrams, activity diagrams, sequence diagrams, and class diagrams.

Unified Modeling Language is a diagram technique that can model from every system development project from analysis to design. In some cases, the same diagram technique is used throughout the development process[7]. In this case, the diagram starts as very conceptual and abstract. When the system was developed, diagrams evolved to include details that ultimately led to code creation and development. In other words, the diagram moves from documenting the requirements for putting the design. Overall, consistent notation, integration between diagram techniques, and application of diagrams throughout the development process make UML a strong and flexible language for analysts and developers[8].

D. MLFQ Algorithm

This algorithm is very similar to the FCFS algorithm. The difference is that this algorithm allows the process to move the queue. If a process takes too long a CPU, the process will be moved [9].

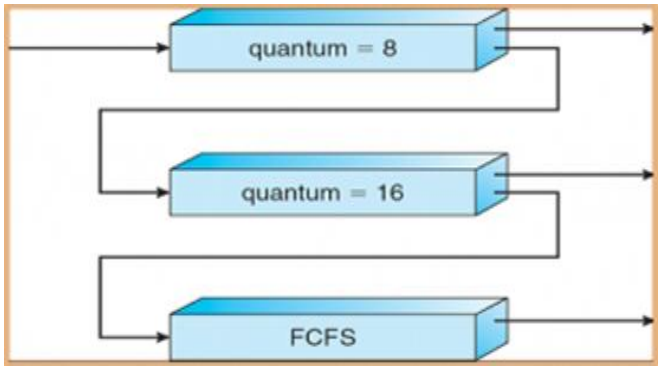

Figure 2 MLFQ Formula[9]

All newly arrived processes will be placed in queue 0 (quantum = 8 ms)

1. If a process cannot be completed in 8 ms , then the process will be stopped and moved to the first queue (quantum = 16 ms)
2. The first queue will only be done if there is no process in queue 0, and if a process in the first queue 1 is not completed in 16 ms, then the process will be moved to the second queue
3. The second queue will be done if the queue is 0 and 1 is empty.

Response time = start time item - arrival time item

$$\text{response time average} = \frac{\text{Total overall response}}{\text{Number of item}}$$

III. INFORMATION SYSTEM ARCHITECTURE

In this case the researcher uses the SWOT method to identify problems from running business processes as comparative data for the proposed process.

SW OT	STRENGHT	WEAKNESS
	Food Order Become Faster And Practical	Enabling The Data Error When The Food Cut
OPORTUNITY The Business Process While Can Efficiency The Way And Time In Ordering On The Restaurant	SO Food Order Become Faster And Practical	WO Make A Booking Condition Connected Directly By The Cash
THREAT	ST	WT
Input Errors Happened On The Order When It Was On	IMPROVING SECURITY SYSTEM FEATURES TO NOT BE EASY TO HACK BY PEOPLE WHO ARE NOT RESPONSIBLE	Make A Booking Condition Connected Directly By The Cash

A. *analysis of current processes*

At this stage explain the business processes that are currently running within the company:

Figure 3 Current business processes within the company

The picture above explains about ordering food as in general at restaurants usually by explaining the procedure as follows. Customers queue to order food for a customer, The cashier input orders based on food ordered and sort orders that eat on site or take away, The cashier gives the order data to the chef who then cooks the order, After the food is cooked, then the waiter takes the order ordered by the customer and delivers it, after that the customer gets the order he ordered, after completing the cashier, recap the report of income which will be reported to the supervisor, The boss checks the sales report in the cashier's recap, and recaps it into the sales report

B. *Use Case Diagram*

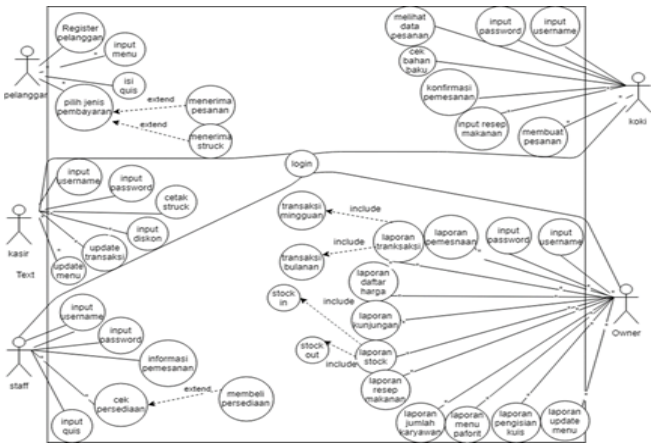

Figure 4 Use Case Diagram

To ensure that a system can run as expected, agencies need to implement it provisions / restrictions that can maintain the integrity / validity of data, do not damage the existing system or detrimental to the institution / organization[10]. In the use case above there are 5 actors involved in this process, namely Customer, cashier, Staff, chef, owner of this web-based design system and accessed through an internet connection. The customer performs a register of filling names and telephone numbers and table numbers after coming to the restaurant after that the customer orders food, after finishing ordering food the customer fills in a number of questions given to get a discount besides this method can also make customers curious to order food again, the Cashier Actor inputs the cashier's username and password to log into the database cashier, in the cashier system, actors can process orders, print struck orders, discount inputs based on the comprehensiveness of the questions given, update transactions, and update menus for updated menu orders that have been ordered and sold. After that the Staff Actor logs into the staff system menu to convey ordering information that is being processed by the customer and stock stock whether the stock is still there or not, only to estimate if the menu has not been updated. Then the staff checks the inventory in the staff system for the next staff make stock purchases of needed raw materials and staff can input quiz questions and update them. The Chef Actor login to enter the chef's login system. To make an order that has been ordered by the customer. in the use case with the actor owner here, the function is to see the owner of all types of reports done by employees at the restaurant, starting from seeing the order report here, it functions to see all types of items ordered by the customer, transaction reports that are used to see financial in and out of the restaurant , see the report on the number of employees connected with hrd data, of course in the restaurant, starting from the absence of employees and the number of employees in the restaurant, the paforit menu report that serves to improve the quality of the restaurant with the best-selling menu in the restaurant and finally there is an update report the menu is the entry and exit menu and the latest update menu and also all the remaining raw materials from the menu report.

C. *Class Diagram.*

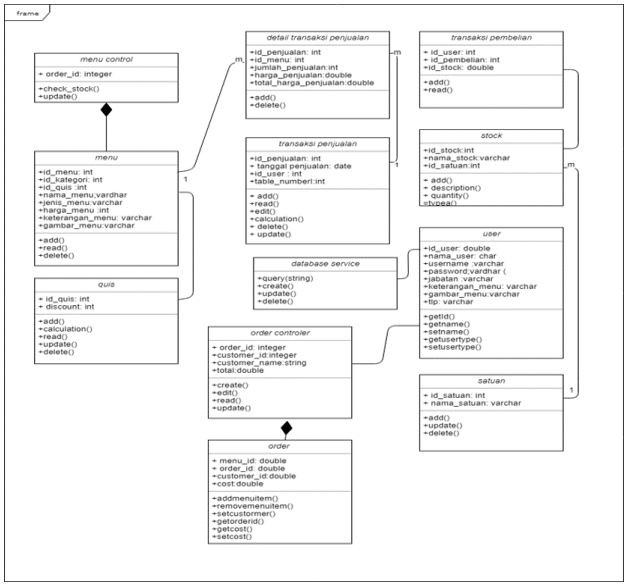

Figure 5 Class Diagram.

Class Diagram The application of human resources consists of class diagrams that will be implemented into the application to be created, class diagrams are also used as table designs that will be used in the application. In this application, there are 9 tables, which include: applicant user tables, employee user tables, replacement tables, performance tables, attendance tables, PIM tables, recruitment tables, career tables, cost planning tables Each table has a relationship with tables others. Data used to display information as needed is stored in a database consisting of several interrelated tables.

D. *Technology Architecture*

As for supporting facilities that become specifications in running
application in this study, namely:Processor: Core i-5,Memory (RAM): 4 GB,Storage Capacity: 500 GB, VGA: On Board Operating System: Windows 8.

E. Implementation Of The System Order

The parameters used for testing are the number of chefs and the large slot time. The output of the scheduling will be analyzed regarding the average response time of workmanship and fairness (whether the cooking sequence produced is in the order of FCFS) in terms of start time and finish time. The FCFS algorithm is used as a comparison in fairness testing because the sequence produced both start time and finish time is considered to represent fairness in a cooking scheduling case. The concept of fairness referred to in this study is the same as the concept of the FCFS algorithm, namely that the one that arrives earlier will get priority done earlier than the one who came after it. In addition, the cooking sequence used in restaurants in general is using the concept of the FCFS algorithm. Response time is calculated from the time the order starts to be cooked minus the time of arrival of the order. Response time is calculated per item worked. The response time assessment in this study is based on the average value that can be calculated from the total response time of all items divided by the number of items. Start time is the time or when an order starts working. Finish time is the time or when an order is completed.

In this algorithm the variable set at the beginning is the number of chefs and the size of the slot time. Slot time is the distance or size of each slot. Slots are used to group orders based on the time of arrival. For example if the limit time is specified is 60 seconds with the earliest order arrival time of 10:29:48, the latest order arrival time is 10:34:50,
then the slot distribution is Slot 1 = 10:29:48 - 10:30:48 ,Slot 2 = 10:30:49 - 10:31:49 ,Slot 3 = 10:31:50 - 10:32:50 , Slot 4 = 10:32:51 - 10:33:51, Slot 5 = 10:33:52 - 10:34:52 Fairness testing is done on MLFQ algorithm with FCFS comparison. Testing is done with the parameters "before", "after" and "index equal". For example there are results of the order finish time order.

Table 2 . parameter of finish time

PARAMETER OF FINISH TIME					
BEFORE		AFTER		INDEX SAME	
FCFS	**MLFQ**	**FCFS**	**MLFQ**	**FCFS**	**MLFQ**
2	2	2	2	2	2
1	1	1	1	1	1
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	8	7	8	7	8
8	9	8	9	8	9
9	7	9	7	9	7
10	10	10	10	10	10
11	11	11	11	11	11
12	12	12	12	12	12

based on Table 2, order 8 on FCFS is completed before orders 9, 10, 11 and 12, then order 8 on MLFQ must be done at least before orders 9, 10, 11 and 12. Because order 8 on MLFQ is completed before order 9, 7, 10, 11 and 12 then order 8 on MLFQ according to order 8 on FCFS. Another example, order 7 on FCFS is completed before orders 8, 9, 10, 11 and 12. While order 7 on MLFQ is completed before orders 10, 11 and 12 then order 7 on MLFQ does not match order 7 on FCFS.
The "after" parameter is used to compare the suitability of the MLFQ to FCFS in the event that an order is done after certain orders. Examples of "after" parameters based on Table 2 are orders 6 on FCFS done after orders 2, 1, 3, 4 and 5, then order 6 at MLFQ must be done at a minimum after orders 2, 1, 3, 4 and 5. Because order 6 on MLFQ done after orders 2, 1, 3, 4 and 5 then order 6 on MLFQ according to order 6 on FCFS. Another example, order 8 on FCFS is done after order 2, 1, 3, 4, 5, 6 and 7. While order 8 on MLFQ is done after order 2, 1, 3, 4, 5 and 6 then order 8 on MLFQ is not appropriate with order 8 on FCFS.

The "same index" parameter is used to compare the suitability of the position or order of an order on the MLFQ to the same order position or order on FCFS. For example, based on Table 3, order 3 on FCFS is at number 3 while order 3 on MLFQ is at number 3, then index order 3 on MLFQ and FCFS is appropriate.

Another example, order 7 on FCFS is at number 7 while order 7 on MLFQ is at number 9, then index 7 on MLFQ and FCFS is not appropriate .

The results of the calculation of the fairness finish time from Table 2 are the parameters "before" there are 11 orders that are appropriate, the parameter "after" there are 10 orders that are appropriate and the parameters "index equal" there are 9 corresponding orders. So that the average fairness finish time obtained is 83%.

At this stage, the order of implementation of the system is based on the priority scale from the highest to the lowest. Implementation in making standard reference human resource applications. The following is a table of sequences of system implementation based on priority order.

Table 3 . parameter of create order

Parameter	min	max
Menu id	1	30
Number of order items in 1 order	1	5
Number of orders in 1 order item	1	5
Order amount	10	20
Time interval	10 second	20 second

In this study the sample data order used is 15 parent orders. In the scheduling process, the parameters used are as shown in Table 5.

Table 4 . parameter of date

parameter	**Value**
Total chef	3.4.5
First slot time	10 second
Increment slot time	5 second
Max slot time	100second

Max Slot Time is half of the difference in the arrival of the first order Parent with the last order Parent in one case, the value is chosen so that in one case there are at least 2 scheduling slots.

response time algorithm FCFS, MLFQ, with time slots 30, 45 and 60 seconds in trials using chefs amounted to 3, 4, and 5. If observed the average response time of the MLFQ algorithm is the fastest compared to FCFS.

Table 5. Comparison of average Response Time per Slot

Slot time	**Koki**	**response time average**	
		FCFS	**MLFQ**
30	3	1400	1050
30	4	1050	787.5
30	5	840	630
45	3	2100	1575
45	4	1575	1181.25
45	5	1260	945
60	3	2800	2100
60	4	2100	1575

Max slot time + first slot time = average response time / number of items * slot time = / number of cooks = results in time interval = results * 0.25- results = to determine mlfq algorithm

IV. CONCLUSION

Based on the research, results and discussion that has been carry out and explained above, conclusions can be drawn:

1. The results of 19 trials and Comparison of average Response Time per Slot, in Table 4 shows the average MLFQ response time is faster than FCFS, both the parameters of chefs are 3, 4, and 5

2. Results of How to design an order queue information system using UML design has found 5 modules namely login, ordering, payment, quiz, structured reports so as to overcome the queues in ordering food in this globalization era.

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AUTHORS PROFILE

Ricky Salomo works as a Finance Division in one of the companies, I went to mercubuana university, computer science faculty.

Indra Ranggadara He got a bachelor degree in Informatics Engineering in 2014 and get a master degree in Industrial Engineering in 2015, and he gets other master degrees in Master Information System. He works as a lecture in the computer science department and his research focuses on Business Intellegence, E-Commerce, Enterprise Architechture, IT Governance and Valuation, Business.

Her name is Nia Rahma Kurnianda, she is a lecture in Information System Mercu Buana University. She is get bachelor and master degree from Budi Luhur University and the majority is information system. Her reseach is focus on design information system, database, and decision support system

His name is **Suhendra**, he is a lecture in Information System Mercu Buana University. He is get bachelor from Mercu Buana University and master degree from Budi Luhur University and the majority is information system. His reseach is focus on Programming and data mining.