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Food Order Information System at Coffee Shop by Applying the Multilever Feedback Queue Algorithm

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ABSTRACT

The rapid development of business encourages every entrepreneur to make a different form of service to attract customers. Fast service is its own attraction for customers. The application of a queue or scheduling system in the kitchen or chef can be done to avoid the accumulation of food orders in the kitchen or chef so that the time for serving food can be done quickly. Multilevel Feedback Queue is one of the scheduling algorithms on CPU scheduling in the computer's Operating System. The Multilevel Feedback Queue algorithm allows the process to move queues. If a process takes too long to consume CPU, then it will be moved to a lower queue thus the process of CPU interaction becomes less and the time is fast. In this study, a Web-based food ordering application was developed by applying a Multilevel Feedback Queue to create a food order queue.

Keywords:

Information systems, web, php, MySQL

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INTRODUCTION

The rapid development of the business encourages every entrepreneur to make a different form from other businesses, one of which is the coffee shop business, in this case it requires an efficient sales system, more attractive, prioritizing beauty, cleanliness and neat service, so that consumers are impressed when entering the coffee shop [1]. Service quality is a dynamic condition related to products, services, people, processes, and the environment that meet or have expectations with five main dimensions, namely realibility, responsiveness, assurance, empathy and tangibles. The quality of service, especially in coffee shops, greatly affects customer satisfaction, so that customers will not be disappointed or move to other coffee shops.

Generally, the problem that is often experienced by coffee shops is the accumulation of food orders at the chef, as a result of which some customer orders are often confused with other orders and also preparations that take a long time. Another problem that arises is customer convenience in ordering food, many waitresses are waiting at the customer's table so that customers are not comfortable ordering food [2].

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The solution offered by the coffee shop is the provision of an information system that can be accessed through the customer's smartphone so that customers can easily order food. To avoid the accumulation of food orders in the kitchen or chef, one solution is to implement a queue or scheduling system in the kitchen or chef [3]. This queue system can choose high and low priority, in a coffee shop the high priority system is the most orders or an easy and fast way of serving.

Multilevel Feedback Queue is one of the scheduling algorithms commonly used in CPU scheduling in the creation of Operating Systems, the multilevel feedback queue algorithm allows processes to move queues. If a process takes too long to consume CPU, it will be moved to a lower queue. This is beneficial for the interaction process because it only takes up a small amount of CPU time. Likewise with the process that waits too long. In this study, the application of the Multilevel Feedback Queue Algorithm in the creation of a web-based food ordering application for coffee shops will be discussed. The Multilevel Feedback Queue algorithm is used to create a queue for food orders at chefs, so that the time used for serving food is faster and increases customer satisfaction at the coffee shop [4][5].

METHODS

In the development of information systems built using initial models (prototypes). Prototypes are used to get feedback from users or other stakeholders to understand and identify real needs. Thus, the prototype method helps reduce the risk of design errors and application failures because it allows for remediation before the overall implementation. The stages of the prototype method in system development are as follows [6]:

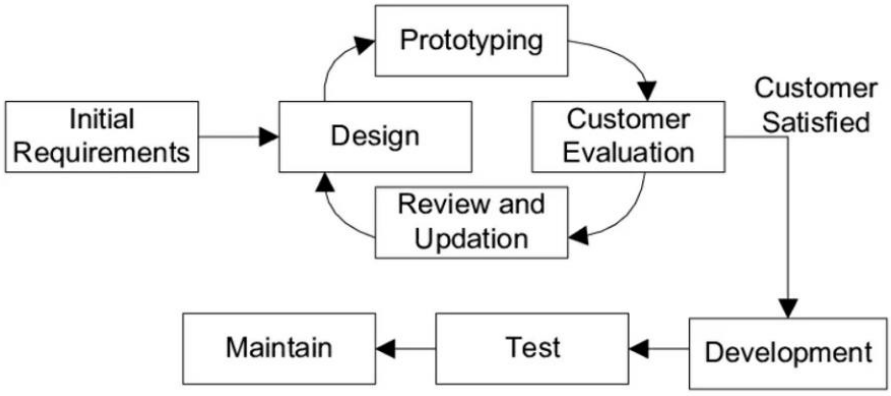

Figure 1. Prototype Model

The stages of the prototype method involve a series of steps that must be followed in the development of a prototype. Each stage plays a crucial role in understanding user needs, identifying problems, and creating effective prototypes. Here are the stages of the prototype method in general [7]:

1. Identify Needs
   The first stage in the prototype method is to identify and understand the needs of users and stakeholders. Through interviews, research, and discussions, the software development team must get the right information about what users want from the application or system to be built.
2. Prototype Design
   Once the needs are known, the next step is to design a prototype. This could be a rough or early prototype that has basic features or it may be a more advanced prototype with key features already designed.

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3. Prototype Development
   This stage involves making a prototype based on an agreed design. The software development team must create a prototype that can work, although it may only have a few features that are perfectly built at this stage.
4. Testing and Evaluation
   Once the prototype is developed, this stage involves testing and evaluation. The prototype is shown to users and other stakeholders to get input and feedback. This helps to identify problems, shortcomings, and changes that need to be made to meet the actual needs.
5. Revisions and Improvements
   Based on the feedback received, the prototype was then revised and improved. The software development team should take that input seriously and make changes accordingly to create a better version of the prototype.
6. Repetition
   This stage can be repeated multiple times, depending on the complexity and scale of the project. Each iteration brings further improvements until the prototype reaches a satisfactory level and fits the user's needs.
7. Final Product Development
   Setelah prototipe dianggap sesuai dan memenuhi kebutuhan pengguna dengan baik, tahap terakhir adalah mengembangkan produk perangkat lunak final berdasarkan desain dan fitur yang telah disempurnakan dari prototipe.

Multilevel Feedback Queue

Multilevel Feedback Queue (MLFQ) is a CPU scheduling algorithm used in operating systems to organize processes based on priority, which can dynamically change according to process behavior. MLFQ uses multiple queues with different priority levels. Processes that are in the high-priority queue will be scheduled first before the processes in the low-priority queue. Here are the key steps in MLFQ [8]:

1. Process Initiation:
   The new process is put into the top-level queue with the highest priority.
2. Process Scheduling:
   - The process is taken from the queue head with the highest priority that is not empty.
   - If the process completes within the allotted time, it exits the system.
   - If a process uses the entire time allotte, it is moved to a lower priority queue.
3. I/O-Bound Process Handling:
   If a process blocks for I/O, it is promoted to a higher priority queue.
4. CPU-Bound Process Handling:
   Processes that use too much CPU time will be moved to a lower priority queue.
5. Starvation Handling:
   Processes that wait too long in a low-priority queue will be promoted to a higher-priority queue to prevent starvation.
6. Recurring Scheduling:
   - Schedulers always start by taking the process from the highest priority queue that is not empty.
   - If a new process enters the queue with a higher priority, it will preempt the process in the queue with a lower priority

To understand more clearly the Scheduling of Tiered Feedback Queues can see the diagram below:

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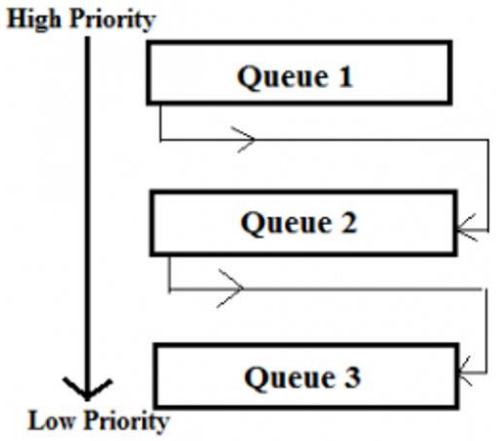

Figure 2. Tiered Feedback Queue Scheduling diagram

for example it is assumed that queues 1 and 2 follow round robin with time quantums 4 and 8 respectively and queue 3 follow FCFS. The implementation of MFQS is given below:

- When a process starts running, the operating system can put it in one of the three queues above, depending on its priority. For example, if the process is a background process, then the operating system does not want the process to be assigned to a higher priority queue such as queues 1 and 2. The operating system will immediately assign it to the lower priority queue, which is queue 3. Let's say our current process under consideration has significant priority, then the process will be given queue 1.
- In queue 1 the process is executed for 4 units and if the process completes on those 4 units or gives the CPU for I/O operations on those 4 units then the priority of this process does not change and if the process appears again in the ready queue then the process starts its execution again in Queue 1.
- If a process in queue 1 is not completed in 4 units then its priority is reduced and moved to queue 2.
- Points 2 and 3 above also apply to queue 2 processes but the time quantum is 8 units. In the general case, if a process is not completed within the quantum of time, then it will be shifted to a lower priority queue.
- In the last queue, the process is scheduled with the FCFS method.
- A process in a lower priority queue can only be run if the higher priority queue is empty.
- A process that runs on a lower priority queue will be disrupted by a process that enters a higher priority queue.

Problem in the above implementation: A process in a low-priority queue can starve because some short processes consume all the CPU time. Solution: The simple solution is to increase the priority of all processes after a certain time interval and put them all in the highest priority queue.

RESULTS AND DISCUSSION

The design of the system is made to meet the needs of users regarding a clear picture of the system to be created and implemented. The global system design uses the UML modeling language consisting of Use Case Diagram, Activity Diagram, and Sequence Diagram [9].

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Use Case Diagram

A modeling to describe the interaction between one or more actors related to the information system to be created. The following is an overview of the use case diagram of the system created as below [10].

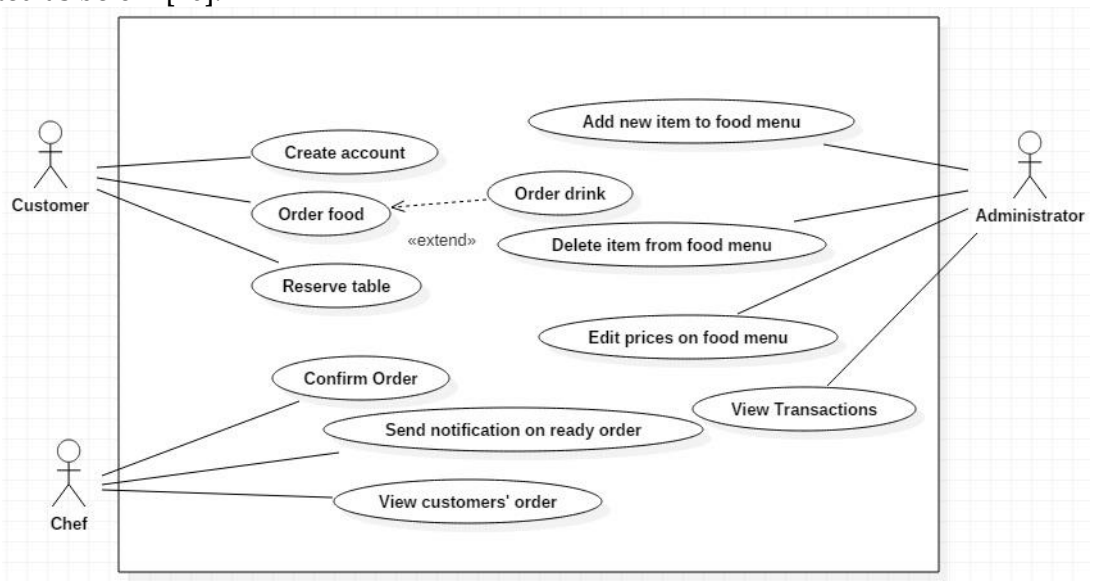

Figure 3. Use case diagram system

Activity Diagram

The activity diagram shows the development of the use case diagram using the activity flow. The activity diagram of the system can be depicted as follows [11].

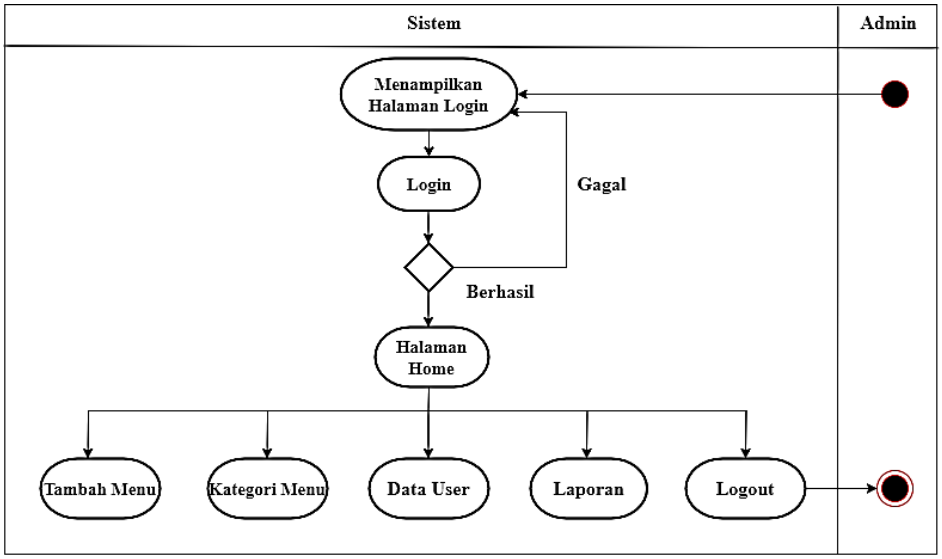

Figure 4. Activity diagram system

Sequence Diagram

Sequence Diagrams describe the interactions between objects and show the communication between them. Here's an overview of what the sequence diagram looks like from the system [12].

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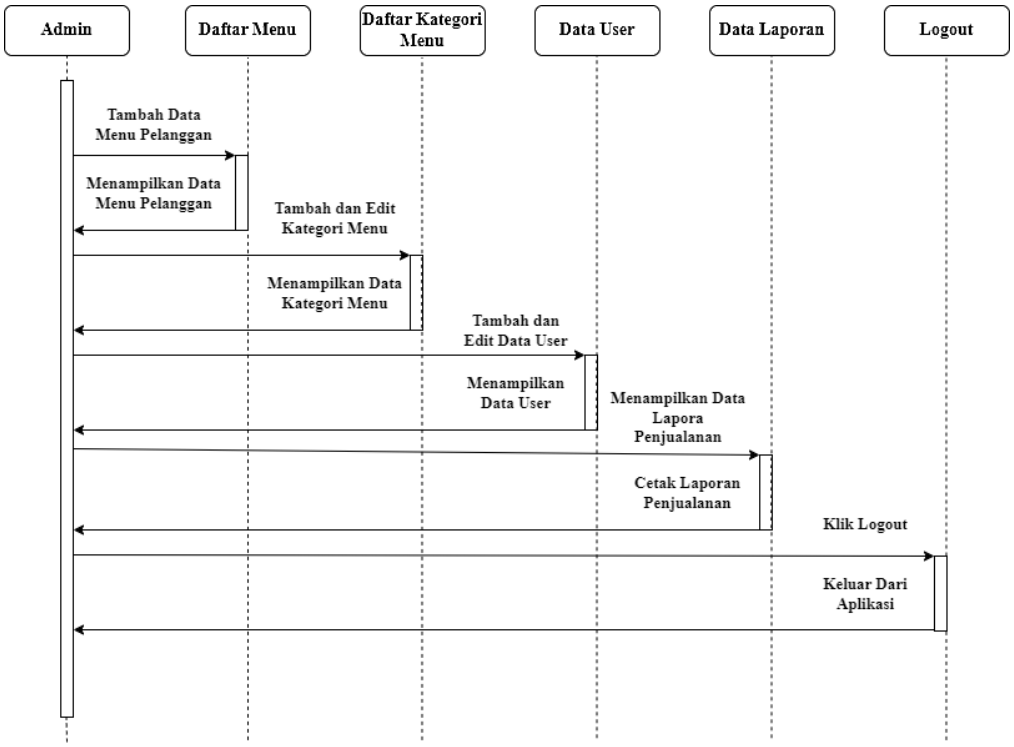

Figure 5. Sequence diagram system

Application Views and Testing

The following is a display of the results of food ordering design using the multilevel feedback queue algorithm.

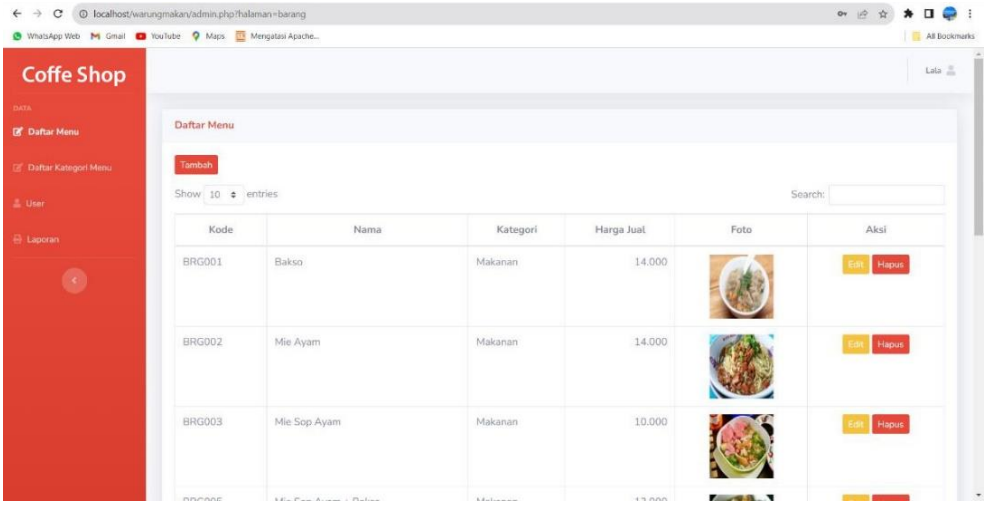

Figure 6. Admin menu list display

The menu list page is the first view after logging in to the website containing various food and beverage menus and on this page the admin can make changes for various types of menus in the coffee shop.

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The Category List Menu page contains a grouping of the menus available at the Coffee Shop, namely food, drinks and snack menus. The image of the page display of the menu category list can be seen in the image below.

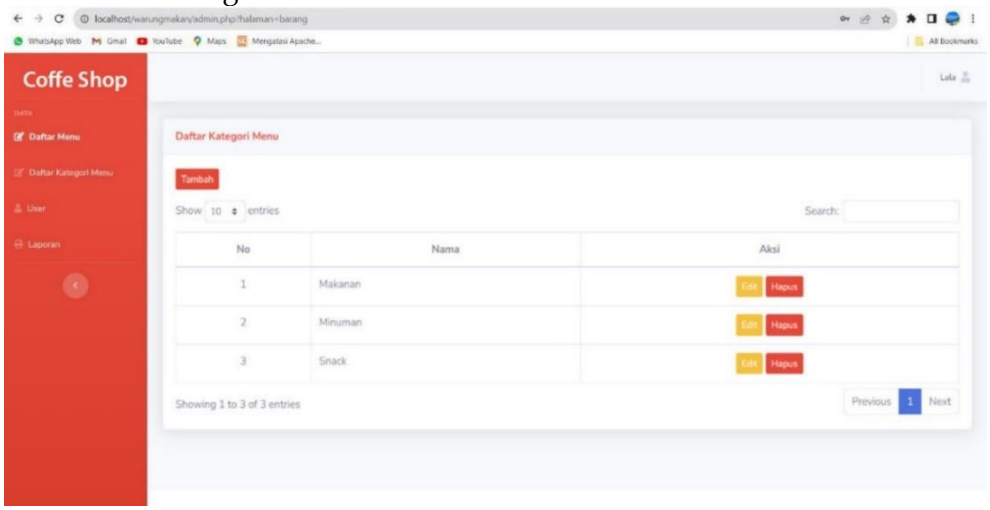

Figure 7. View of the admin menu category list page

The Purchase Transaction page is used by users or customers to order food, drinks or snacks that are equipped with the total price. The purchase transaction page can be seen in the image below:

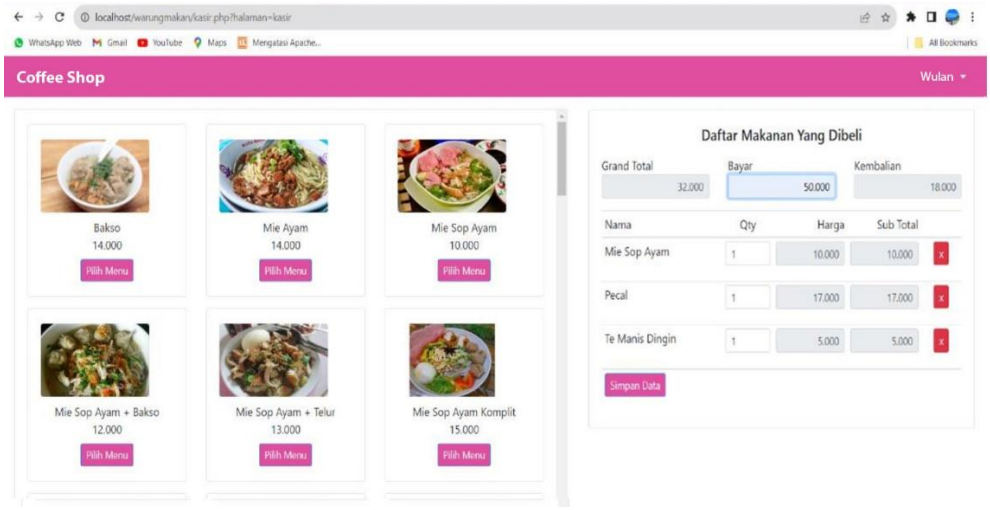

Figure 8. Purchase transactions page

CONCLUSION

The Multilevel Feedback Queue (MLFQ) algorithm can be used to create a queuing system for ordering food. Serving using the MLFQ method is faster than FCFS (First Come First Serve) because in MLFQ there is a distribution of priorities and food serving is done based on existing priorities. Add orders and send them from Android-based applications to web-based applications using web service facilities. Displays a list of orders along with their order status and changes if there are updates. Control the order queue based on the time the order is sent to the kitchen and change the order status, accessed by the kitchen using a web browser.

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