# Queue Simulation using the First In First Out Algorithm

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## Article Info

## ABSTRACT

In everyday life, many activities are found. One of them is waiting in line. Queuing is a boring thing. Moreover, the queue arrangement was irregular and officers did not pay attention to who was queuing first. So it is not uncommon to cause complaints and even get angry. Therefore, to handle problems in queuing, queuing simulation is applied using the first in first out algorithm. With this algorithm, it can help determine who will be served first. Simulation is a way that is done to apply a more real system estimate. In this case, the writer uses the first in frst out algorithm. The first in first out algorithm, which is first to enter, first to exit. In this case, who is the first to queue, he will be served first and finish first. In this way, it is hoped that it can help in determining who will be served first. So that there are no complaints from customers at the Parkson department store shopping center.

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## 1. INTRODUCTION

In modern times, everything is required to be fast. This is due to the increasing number of population in the world and the influence of technological developments. Increased competition which leads to fulfilling the demands of consumers' needs both in quantity and quality has caused the business world, especially the retail world to continue to strive to improve services and flexibility in order to adapt and innovate quickly and accurately. One of the things that stands out in a direct service to consumers is the service at the customer service center. One retail company that provides customer service center facilities is Parkson Department Store.

The various services available at the Parkson Department Store customer service center include the creation of new members, collecting vouchers and an information center. This service requires the customer to wait in a queue. However, the queuing service at the customer service center at Parkson has not yet found the best quality. So that the guards often have problems determining the front and back lines in the queue. So that officers have difficulty in determining the order of people to be served. This is because there are still many people who do not appreciate queuing culture and always want to be selfish, want to be ahead of others and get the fastest service.

Moreover, you have to queue in a long queue. So that there are many complaints and often the customer gets angry in public[1]. Determining the order of customers queuing for various services is very difficult, especially on holidays and weekends where the number of customers is more than normal days.

With the development of information technology in various service fields, it can be used as a support for public services and even becomes an important point as an added value for service quality, and can also be used to overcome various problems that are often experienced by an agency or company. Referring to this, Parkson Department Store can take advantage of information technology as a solution to overcome queuing problems at customer service centers.

Therefore, the authors try to find a queuing solution, namely in the form of a queue simulation using the First In First Out (FIFO) algorithm using the Single Queue Multi Server model, where one queue can serve more than one service[2]. It is hoped that this method can reduce problems in queues so that services at the Parkson Department Store customer service center can be maximized[3].

## 2. RESEARCH METHOD

In carrying out this research, clear and structured stages are needed, in order to facilitate the process, it is necessary to make a diagram design such as the diagram below:
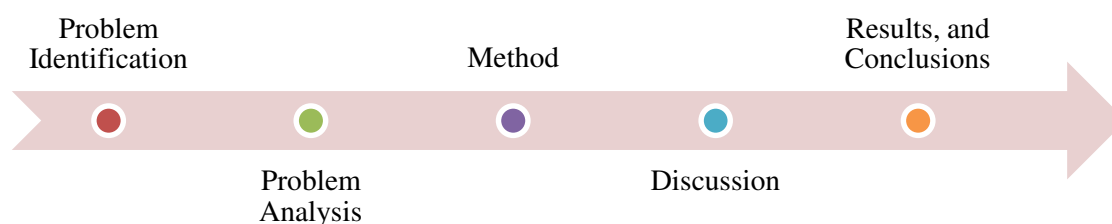


Figure 1. Diagram of Methods and Research Stages

Method is the unity of methods, procedures, work concepts, rules and postulates that are used by a science, art or other discipline. Systems development methodology means methods, procedures, work concepts, rules, postulates that will be used to develop an information system.

### 2.1. Basic theory

#### A. Simulation

The simulation model is a testing tool that applies several important aspects, including past data, in providing alternative actions that support decision making. Simulation is a technique of imitating the operations or processes that occur in a system with the help of a computer device and is based on certain assumptions so that the system can be studied scientifically[4].

Simulation is the right tool to use, especially if you are required to carry out experiments in order to find the best comments from system components. This is because it is very expensive and takes a long time if the experiment is tried in real terms. By conducting a simulation study, in a short time the right decision can be determined and at a cost that is not too big because everything is simply done by computer[5]. The purpose of simulation is to study system behavior, develop an understanding of the interaction of parts of a system and an understanding of the system as a whole.

#### B. Queue

Queuing is the arrival of the customer to get service, waiting to be served if the service facility (server) is still busy, getting service and then leaving the system after being served. From this point of view, system efficiency can be estimated by evaluating the average time measure of a single queue or separate queues[6]. A queuing process is a relationship process with the arrival of a customer at a service facility, then waiting in a line (queue) if all the waiters are busy, and finally leaving the service[7].

#### C. Algorithm First In First Out (FIFO)

Algorithm is a sequence of steps to solve a problem. FIFO (First In First Out) is a non-preemptive, non-priority scheduling algorithm. Each process is given an execution schedule based on the order in which it arrives[6]. Once the process gets its execution quota, the process will run until it's finished. FIFO (First In First Out) is rarely used alone but is combined with other algorithms because it can cause short jobs to wait for long jobs to be completed, or important jobs to wait for less important jobs[8].

FIFO (First In First Out) is suitable for batch systems where the user interacts very rarely, but is very bad for interactive systems and real-time systems, as it tends to give poor response times[9]. For example, there are three processes, namely P1, P2, P3 that are waiting to be scheduled with a predicted burst time of 24 ms (milli second or milli second), 3ms, and 3ms respectively. It is assumed that all three processes enter at almost the same time, namely the 0th second.

## 3. RESULTS AND DISCUSSION

### A. Queuing and Service Procedures at Parkson Department Store

In providing services to customers, Parkson department store Medan uses a manual queuing system as follows:

1. Customers who wish to make member cards, issued vouchers and information will enter the customer service center area.
2. The clerk will welcome and invite the customer to sit down, while the other customers wait in the queue to be served after the previous customer has finished being served. However, in this case the officer will let the visible customer sit without knowing who has queued first. And not infrequently this causes complaints from customers about who is queuing first.
3. The clerk will ask customer needs, whether to make a member card, issued voucher or an information.
4. After the customer has been served, the clerk will call the next customer who has been queued.

### B. Member Card Making Procedure

1. Customer comes to the officer to fill in the data for making a member card.
2. After the data is received by the officer, the officer will verify and input the data to print the card.
3. Members have finished printing to be submitted to the customer.

### C. Analysis of the Application of the First In First Out Algorithm

After doing research and analyzing how the queues that occurred at Parkson department store, three officers were faced with a busy and undirected queue. The clerk has difficulty calling the customer who will be served next. For this reason, observations are made by recording each arrival, waiting time, time served and time out. So that you can get the following data. With the simulation design of various service queues using the Single Queue Multi Server model using the First In First Out algorithm, the following calculations can be done :

Table 1.Scheduling data

| Customer | Time arrived | Service time | Time out | Waiting time | Time in the system | Server |
|----------|--------------|--------------|----------|--------------|--------------------|--------|
| A | 8.2 | 2 | 10.2 | 0 | 2 | 1 |
| B | 10.2 | 5 | 15.2 | 0 | 5 | 2 |
| C | 11.5 | 6 | 20.2 | 3.7 | 9.7 | 3 |
| D | 16 | 7 | 28.2 | 5.2 | 12.2 | 1 |
| E | 18.2 | 5 | 33.2 | 10 | 15 | 3 |
| F | 20 | 4 | 37.2 | 13.2 | 17.2 | 2 |
| G | 25 | 5 | 42.2 | 12.2 | 17.2 | 1 |
| H | 30 | 4 | 46.2 | 12.2 | 16.2 | 3 |
| I | 40 | 7 | 53.2 | 6.2 | 13.2 | 2 |
| J | 50 | 7 | 60.2 | 3.2 | 10.2 | 1 |

The following is the queue simulation algorithm using the first in first out algorithm. At Parkson Department Store, it is listed on the main menu display in the fifo (first in first out) menu.

```
Read B, C, D, E, F
If (D1>B2) and (D1<B2) then
        D=D2+C2
        D=B2+C2
Else
```

```
                        If (D1>B2) then
                        E=B1-B2, 0
                Else

                        F=C+E
                        Endif
                Endif
        Write (D, E, F)
```

Information :
A. = customer name column
B. = time column arrived
C. = column of service time
D. = time out column
E. = waiting time column
F. = time column in the system

## 4.   CONCLUSION

The formation of a single queue multi-server model in queuing simulation is to have one entry route but many servers in the system. The first in first out algorithm is applied to the queue simulation for taking queue numbers. It will be seen who will be called first to be served. The queue simulation design is designed with a first in first out algorithm, so that it can be proven that the first customer comes out based on the algorithm.

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