Parking Service Management with Hybrid Code Technology (HCT)

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Abstract— **Technology-based parking service management is an essential requirement in the parking service industry. The main obstacle in a parking service is the improper use of technology such as a server that is not working; the computer network at the gate is not coordinating well, thus making consumers dissatisfied. This paper proposes a solution in the form of technology to support parking services using Hybrid Code Technology (HCT) in billing receipts. The method used is barcode design on billing receipts, so that the parking service system can still provide optimum service when the network is lost. The results of this paper have successfully designed Hybrid Code Technology (HCT) for use in parking services. HCT consists of a unique code that can be used as a feature to distinguish whether a vehicle enters a parking area under normal conditions or when the system fails to work so that even when the computer network is not working, transaction identities can still be saved to the server.**

Keywords—Hybrid, parking, technology, service.

I. INTRODUCTION

Computer technology is the backbone of a large scale parking service. Reliable computer networks will provide service performance to continuous parking consumers. A company that operates a parking service has a great responsibility for the smooth service and security of parked vehicles. Therefore an excellent parking service payment system will have an impact on the efficiency of parking services [1]. Parking services must pay attention to timeliness, accuracy, reliability, security, and be able to provide security, a reliable reporting system, and detection of the presence of vehicles in the parking zone [2].

Parking technology is currently developing rapidly. The goal of the technology is sensing accuracy and speed of customer service. Vehicle detection technology such as Radio Frequency Identification (RFID) [3] is also used in parking services and services can run immediately [4], Parking Guidance Information Systems (PGIs) [5], [2], [6], parking system with Programmable Locig Controller (PLC) [7] reservation-based system for parking [8], smart parking parking [9], parking system with NFC technology [10], [11], parking system with wireless sensor network (WSN) [5] parking system with Zigbee technology [12], parking system with image processing technology [13] [14], [15], [16], [17].

Generally, a parking service consists of an entrance gate and an exit gate. The entrance gate is the gate where the vehicle enters the parking area, usually characterized by a vehicle barrier, while the exit gate is the gate where the vehicle leaves the parking area. At the entrance gate, the vehicle number and time are generally entered by the officer to the computer, and then the entrance gate computer sends data to the server, the server generates the transaction number and sends back to the entrance gate computer to instruct the manless machine to open the barrier. Menless will then print a receipt containing the transaction number and give the receipt to the consumer.

When the consumer vehicle exits the parking area, the customer will provide transaction receipt to the officer at the exit gate, and the officer will scan transaction data through the scan engine and then the computer will retrieve data from the server to display on the exit gate computer. The officer will then validate it by matching the number of the vehicle that came out with the data that is on the computer. If all the data available is suitable, then the parking bill will be given to the consumer. After the customer makes a payment, the exit barrier will open, and the customer's vehicle may exit the parking area.

The service system, as described above, can run well as long as the computer network system is working properly. In addition to that, in order for the system to work, the computer coordination between the entrance gate and exit gate should communicate with the server smoothly.

The problem occurs if the computer network is cut off. Most often, consumers do not care about the problem and demand that the parking service runs well, and the entrance gate and exit gate run smoothly. Thus, in conditions where the computer network is not running well, the server cannot be accessed, then a solution is needed so that the parking service can work on the condition that the server is inaccessible or the network fails to work.

This paper proposes a solution so that parking consumer services can run smoothly on the condition of a computer or server network failing to be accessed by an entrance gate or exit gate computer.

II. METHOD

The proposed method is to create a unique code design in the form of a barcode that will be printed on the parking service transaction receipt. This unique code is generated by

the computer for two different conditions, namely when the computer network runs well and when the computer network fails to work, or the server cannot be accessed.

The flow of service procedures at the gate entry and gate entry is observed to create a barcode with a unique code during normal network conditions (online), and engineering is also carried out to obtain a barcode engineering with a unique code when the network has a problem (offline).

Hybrid Code Technology (HCT) design is designed on a computer network by involving one entry gate and one entrance gate with one server unit as a data storage center of each computer. It is assumed that the network uses cable. Then interference will be given to the network path so that computers from the entrance gate and exit gate cannot communicate with the server.

III. RESULT AND DISCUSSION

Fig.1 shows the architecture of computer network systems in general parking services. The network system consists of a server and a computer as a client. The client is a computer that is at the entrance gate station and exit gate station. At the entrance gate station consists of a computer, this computer indicates the number of the entrance gate in a parking system. The number of entrance gates is proportional to the number of computers provided at the gate of the station.

At the exit gate station consists of a computer, this computer indicates the number of exit gate in a parking system. The number of exit gates is proportional to the number of computers provided at the station's exit gate.
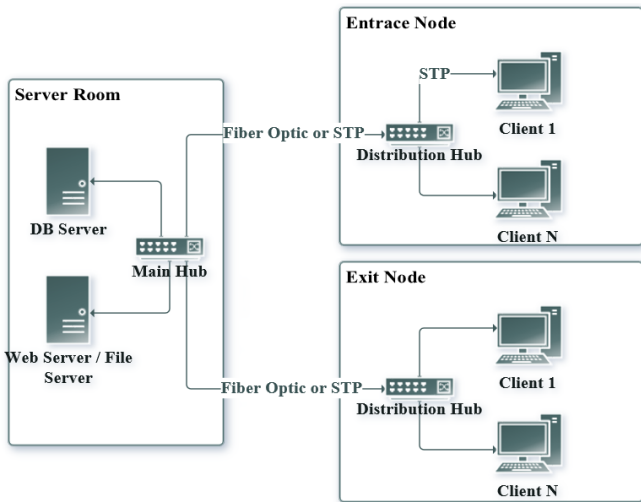

Fig.1. The architecture of Hybrid Code Technology (HCT) for online condition

Fig.2. Indicates a disrupted computer network system, so that computers at the station's entrance gate and exit gate station can not access the server. Disturbances like this in parking service technology in general usually make the entrance gate station and exit gate station unable to serve consumers. Consumers can go out or enter, but the billing data and parking bill calculation do not occur, therefore with Hybrid Code Technology (HCT) service can run well during computer network communication disruptions.
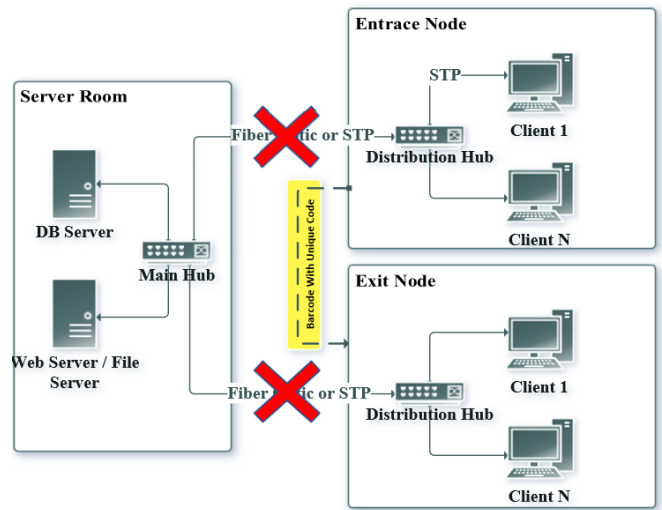

Fig.2. The architecture of Hybrid Code Technology (HCT) for offline condition

Fig.3 shows the workflow of the parking service at the entrance gate under normal (online) computer network conditions, where the server can be accessed by the entrance gate computer and interference does not occur. The initial procedure of Hybrid Code Technology (HCT) begins with the consumer pressing a button or placing a subscription parking card on the manless machine. The system will validate and store customer transaction data to a server which then manless machine will provide a transaction receipt through the printer machine and command the barrier gate to open.
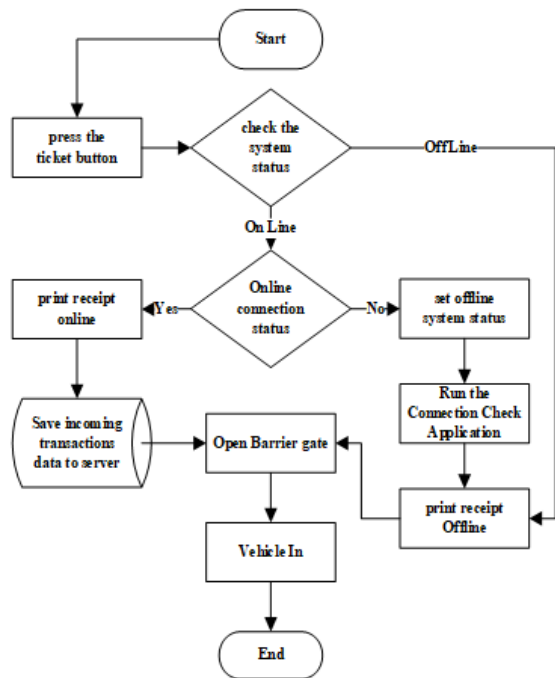

Fig.3. Flowchart of Hybrid Code Technology (HCT) for the entrance gate procedure

Fig.4 is a flow of parking service with the implementation of Hybrid Code Technology (HCT). When the vehicle exits the parking lot, the customer scans the parking ticket. The system will verify the transaction receipt or parking ticket to validate whether there is a unique code on the customer's ticket that is printed when the system is offline or online. The

computer at the exit gate will check the system status. If the system is online, the transaction will be directly saved to the server after the billing calculation is done. If the system is offline, the transaction will be temporarily stored in the exit gate station database. This treatment occurs as long as the entrance computer or exit gate computer can not access the server. Then if the server can be reaccessed (online), automatically, all billing transaction data at the exit gate station will be sent to the server.
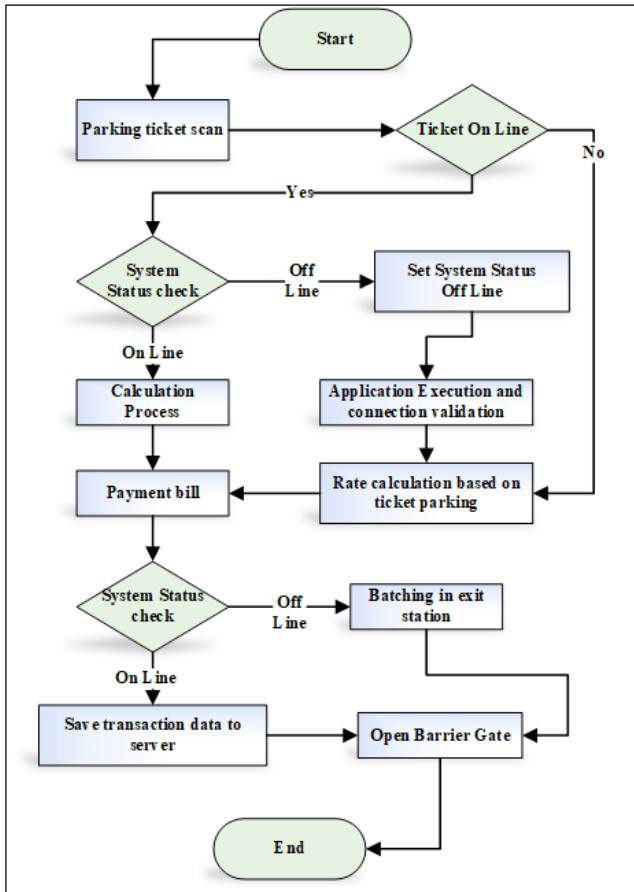

Fig.4. Flowchart of Hybrid Code Technology (HCT) for gate exit procedure

Hybrid Code Technology (HCT) will save many transaction data that occurs during a disrupted parking service system. In a more extensive parking service system, Hybrid Code Technology (HCT) can be multiplied at each gate entry and exit.

A barcode proposed in this paper as part of Hybrid Code Technology (HTC) consists of the company brand, header text, entrance gate station code, entrance date and time, unique code, ticket number, entrance number, entrance gate station code, company domain , and greeting and warning (Fig. 5).

Fig.5 shows a barcode design with a unique code as a sign of whether the vehicle entered in the offline system. The entrance gate is the vehicle entrance code gate. From this code, the system will find out which gate number the customer is traversing. Entrance gate and time help the system know the time the vehicle is starting to get parking services. The ticket number is a parking service transaction number, and unique code is a sign that shows that the customer's vehicle is serviced at the time the system condition is interrupted (offline) or not interrupted (online). In this

paper, it is illustrated that on the online conditions are marked with a unique code of the number "01" (Fig. 5), while the offline conditions are marked with the number "09" (Fig. 6). The code will help the system can still calculate payment and parking services when the system is in trouble with computer network interruptions.
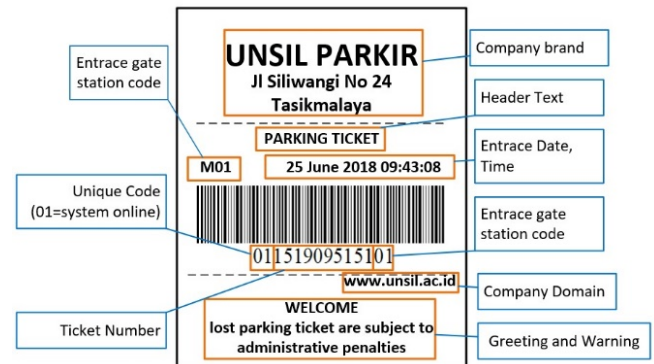

Fig.5. Hybrid Code Technology (HCT) barcode design for online condition
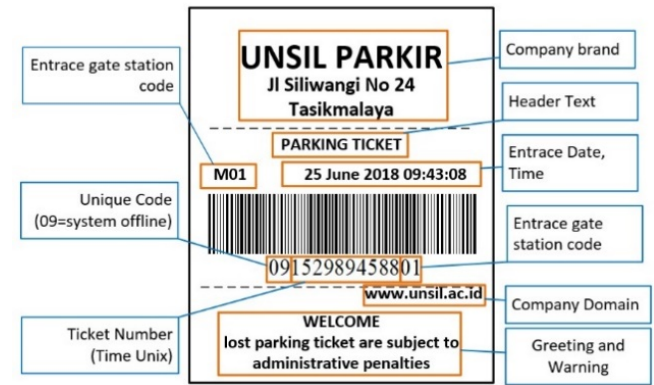

Fig.6. Hybrid Code Technology (HCT) barcode design for offline condition

Hybrid Code Technology (HTC) can be built with the same architecture as a parking system in general, what is different is when conditions are offline, in parking systems in general transaction data is stored on the entrance gate computer or in most data systems not stored digitally. Hybrid Code Technology (HTC) stores data when offline conditions on a unique code in the barcode on each consumer parking ticket. This is an important concern that data will be stored digitally at the exit but problems will occur if consumers lose parking tickets, therefore, a strategy is needed so that the parking lot does not lose

IV. Conclusions

The proposed Hybrid Code Technology (HTC) is a solution for parking services that use computer technology that is integrated with the server. HTC works especially at the time, when the computer network system at the entrance gate and exit gate can not access the server. Hybrid Code Technology (HTC) with unit code on the barcode printed on the transaction receipt becomes the media to provide a unique code which means that the customer is served on a reasonable condition with an online computer network system. This also means that it can communicate with the server or offline, or during the condition when the computer cannot communicate with the server.

Hybrid Code Technology (HTC) can be built on conventional parking management systems as long as the system uses computer technology in coordination with the server.

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