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Delivery Route Estimation on a Web-Based Restaurant Delivery System using Greedy Algorithm

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Abstract
Food delivery application services have been significantly developed in Indonesia. However, several areas have not received application services like this. Orders made by several restaurants still use social media such as Whatsapp, Facebook, and cell phones. Traditional ordering does not have sufficient means to calculate the cost of delivery of orders resulting in cost-efficiency problems. In addition, order delivery routes are a problem for couriers who have to deliver several orders at once. This research builds a web-based restaurant delivery system by applying a greedy algorithm to optimize routes and shipping costs. The results of this study indicate that the greedy algorithm can determine the best route for couriers to make deliveries so that shipping costs become lower. This research contributes as one proof of the application of the greedy algorithm to business problems and restaurants may use the resulting system to increase the effectiveness of order delivery.
Keywords: delivery application, delivery route, greedy algorithm, prompt route, restaurant system.

1. Introduction
Food ordering and delivery services are increasingly popular globally (Dana et al., 2021), including in Indonesia (Nabila, 2022). The growing development of application services in the world today causes technology dependency (Hormes et al., 2014; Longstreet & Brooks, 2017). Technology has become a tool that changes human habits in doing many things online (Sheth, 2020). One of the cases is the rapid changes in how a consumer orders food at a restaurant or cafe.

Based on the observations in this study, restaurants in Bajawa District, Ngada Regency, East Nusa Tenggara Province, Indonesia have not yet adopted online food ordering service systems which have already existed in big cities and other areas in Indonesia. Ordering food at restaurants in the area is still done conventionally, where customers come to the restaurant, view the menu and order food, then pay for the order. If the customers want to have a delivery order, usually they will save the restaurant's owner or waiter's phone number, to be contacted via cell phones and WhatsApp instant messages. However, there are several problems that often occur in conventional transactions. Customers find it difficult to see the restaurant's menu, the delivery time is quite long if there is a buildup of orders in one day, and the shipping costs are quite high due to the ineffectiveness of the order delivery route by the restaurant.

Research related to food ordering and delivery service information systems has been widely discussed, including: 1) Das (2018) who examined consumer perceptions of online food ordering and delivery services to determine overall consumer satisfaction with online food delivery service; 2) Latifah and Adam (2021) proposed a web-based online delivery service system application, so that it can make it easier for customers in a restaurant that still uses a food delivery system by telephone; 3) Wati (2018) created an Android-based delivery system to meet customer satisfaction and improve service and be able to compete with food stalls. The implementation of applications or web services for ordering food in restaurants has not been evenly distributed throughout all regions in Indonesia, including in Ngada Regency.

This research was conducted to design an information system for food ordering and delivery services at a restaurant in Bajawa District by using the Greedy algorithm to determine the distance or delivery route and the cost of food orders delivery. Based on the problems that have been presented, this study will develop a web-based information system for food delivery that applies the Greedy algorithm for route optimization and order delivery costs. The application of the Greedy algorithm is expected to be able to assist restaurants in Ngada Regency in determining which location should be delivered first, which in turns should help reduce the delivery cost effectively.

2. Literature Review

2.1. Restaurant information system

A restaurant is a business that serves dishes and provides a place to enjoy them at certain service rates (Wirangga et al., 2014). Currently, several restaurants also provide take-out and delivery services (Wirangga et al., 2014) to facilitate service to customers. To facilitate customer service, many restaurants use delivery systems that are already on the market, such as Gosford, Grab Food, Shopee Food, and so on. However, various restaurants also have self-managed delivery systems.

Several previous studies have conducted research related to food ordering systems and restaurant delivery systems. Trupthi et al. (2019) proposed an online food ordering system that makes it easy for customers to overcome the weaknesses of conventional queuing systems. The system was developed taking into account all the problems associated with all users included in the system (Trupthi et al., 2019). Based on the results of the study, the system helps customers easily place orders, provides information needed to make orders to customers, helps restaurants and mess halls receive orders, and modifies data, thus helping admins control all food systems (Trupthi et al., 2019).

Marbun (2021) found a problem in a restaurant that sells a number of food menus that still use the traditional way of writing and making invoices by hand. Marbun (2021) proposed a web-based food ordering information system with a design based on the Unified Modeling Language. The results of the study show that restaurant employees can better manage menu sales data (Marbun, 2021).

Türkeş et al. (2021) conducted research on the impact of the COVID-19 pandemic causing the blocking of activities by the government and the restrictions imposed in Romania had an adverse impact on restaurant activities, forcing their adaptation to new situations and producing creative innovations that caused changes to the way restaurants deliver food to consumers through platforms food ordering and delivery. The study analyzed the impact on attitudes and intentions to use food delivery platforms by restaurant managers in Romania during the COVID-19 pandemic through data collected based on a questionnaire, and analyzed with software (Türkeş et al., 2021). The results showed that the four variables of innovation, namely business strategy innovation, technology innovation, financial innovation and social innovation, had different influences on behavioral intentions and attitudes towards the use of ordering and delivery platforms. The results can become key points in more efficient material management of financial resources and human resources, thereby increasing the commercial performance of restaurants (Türkeş et al., 2021).

2.2. Greedy algorithm

The Greedy algorithm is an optimization problem solving algorithm with every definite step to get the best decision (Pramesti et al., 2021; Saputra et al., 2021). The Greedy algorithm has several contexts for solving optimization problems using several main elements, namely: (1) A set of candidates with C notation which contains several candidate solutions; (2) Selection Function which functions as a selection predicate to reach the optimal solution; (3) Feasibility Function as a statement that the solution formed does not violate the constraints that have been determined; and (4) the objective function is to maximize or minimize the solution value of the problem (Saputra et al., 2021).

Greedy algorithm research was conducted by Kurniawan et al. (2021) regarding the problem of the absence of a minimum route determination system which results in long car deliveries. Researchers use the Greedy Algorithm to determine the minimum route and apply the Traveling Salesman Problem concept (Kurniawan et al., 2021). The results of the study by Kurniawan et al. (2021) shows that the Greedy algorithm can determine more minimum routes than using the manual method. Then similar research on the Greedy algorithm was carried out by Hayati and Yohanes (2014) who found the shortest route from two points and the distance to be traveled. The approach used in the Greedy algorithm gives the best results, namely the local optimum choice at each optimal step with the shortest distance Other previous research used the Greedy algorithm to solve problems with the distribution of drug products and daily necessities (Usman & Oktiarso, 2018), resulted a route optimization and changes in distribution costs, especially fuel.

3. Methods

3.1. Data collection

Data collection in this study was carried out by observation method. Observations are made to collect data or information as a reference for designing and analyzing the needs of ordering and delivery systems in restaurants. The results of data collection are used by researchers to determine the functional and non-functional requirements of the restaurant information system to be built.

3.2. Software development

In developing the restaurant messaging system software, this research uses the waterfall software development model. The Waterfall model has phases that must be passed before proceeding to the next phase in the software development process (Sommerville, 2015). The stages in the waterfall model are directly a reflection of various basic software development activities such as (1) Requirements analysis, (2) System and software design, (3) System implementation, (4) Unit testing, system integration and testing, operation, and (5) Maintenance (Sommerville, 2015).

3.2.1. System requirement analysis

System requirements analysis is perfomed to understand the users' needs toward the restaurant food ordering system. There are two types of requirements analyzed, namely functional requirements and non-functional requirements. Functional requirements are the requirements for the facilities needed and what activities are carried out by the system in general (Nugroho, 2016). Non-functional requirements are the requirements that focus on the behavior of the system (Alimuddin et al., 2020). There are four most important requirements analyzed, such as:

1) Requirements related to buyers in placing orders,
2) Requirements related to restaurants in managing orders,
3) Requirements related to courier in delivering and carrying out transactions and ordering systems, and
4) Non-functional requirements for restaurant food delivery systems are carried out by finding the needs for reliability, availability, security, and portability.

3.2.2. System Model

Fig. 1 shows the flow of the buyer's food ordering process. In this process the buyer can add menus to the basket and enter the basket page. Furthermore, if the buyer wants to continue ordering, the buyer checks out and fills in the buyer's data and address to see shipping costs and total payment. The Greedy process occurs when the buyer selects an order address on the map. The address will be stored and sorted with other order addresses based on the day of the order. Then the buyer confirms the order and the buyer can see the invoice after the order is paid.

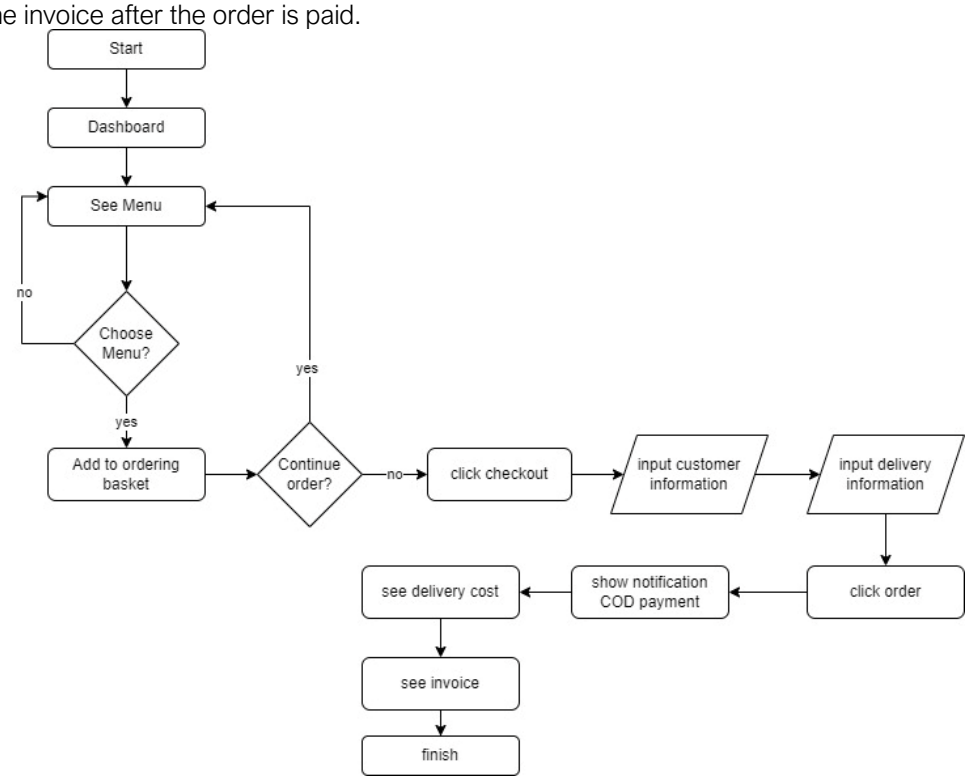

Fig. 1. Ordering flow.

Fig. 2 shows the flow of the order management process by the restaurant admin. Admin can create food categories, manage food menus, view buyer orders, view payment data and recap of order transactions and view invoices to buyers. The payment process is carried out by the courier with payments made by COD (Cash on Delivery) as shown in Fig. 3. The courier enters the delivery menu and sees the order to be delivered. After that the courier clicks the "Delivered" button to confirm the order. After arriving at the destination, the courier makes a cash transaction with the buyer and agrees to pay.

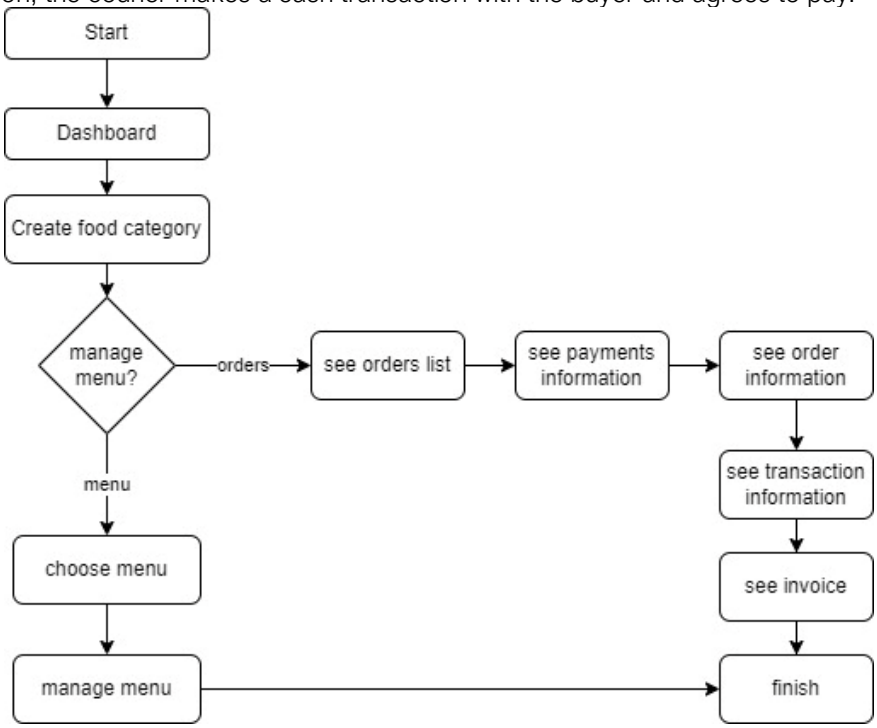

Fig. 2. Admin process flow.

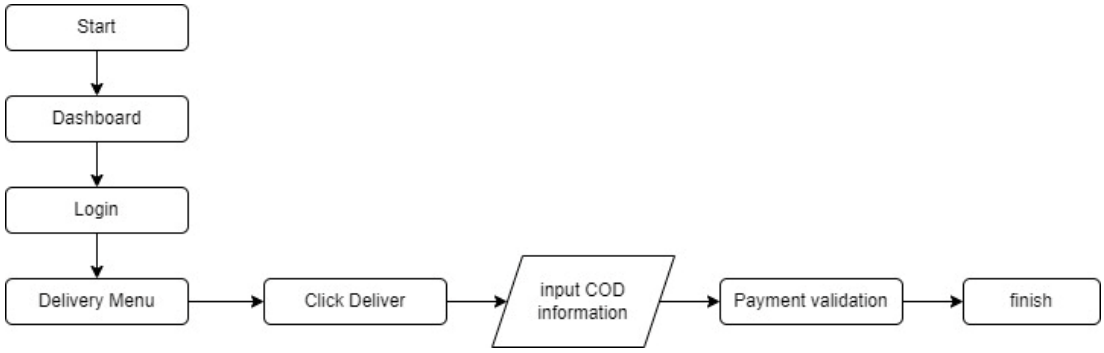

Fig. 3. Courier process flow.

A use case diagram or what is usually referred to as a use case diagram is a series/description of a group that are interrelated and form a regular system that is carried out or supervised by an actor (Djaelangkara et al., 2015). This study describes the functional requirements of the system into a use case diagram shown in Fig. 4 with the point of view of the buyer actor. At the order checkout, the buyer fills in the buyer's data, enters the delivery address, views the shipping costs, views information on how to pay, and orders. After placing an order the buyer can see the total invoice, order status, make COD payments and view invoices. This study also developed use case diagram for admins and courier.

This study also developed other system models to support the system development, such as use case diagram, activity diagram, and sequence diagram. The development of activity diagrams and sequence diagrams is a derivative of use case diagrams.

3.2.3. System development

The user interface of the front page of the restaurant application is the display that appears the first time when the user (admin, buyer and courier) opens the restaurant application, which is shown in Fig. 5. On this page the user can see a list of food menus in the restaurant. Users can also see the status of the

available food menu. When the user (buyer) wants to add a menu to the cart, it will be redirected to the application login page. After the customer makes a menu selection, the customer can checkout by selecting the point or order address on the map and filling in the order details.

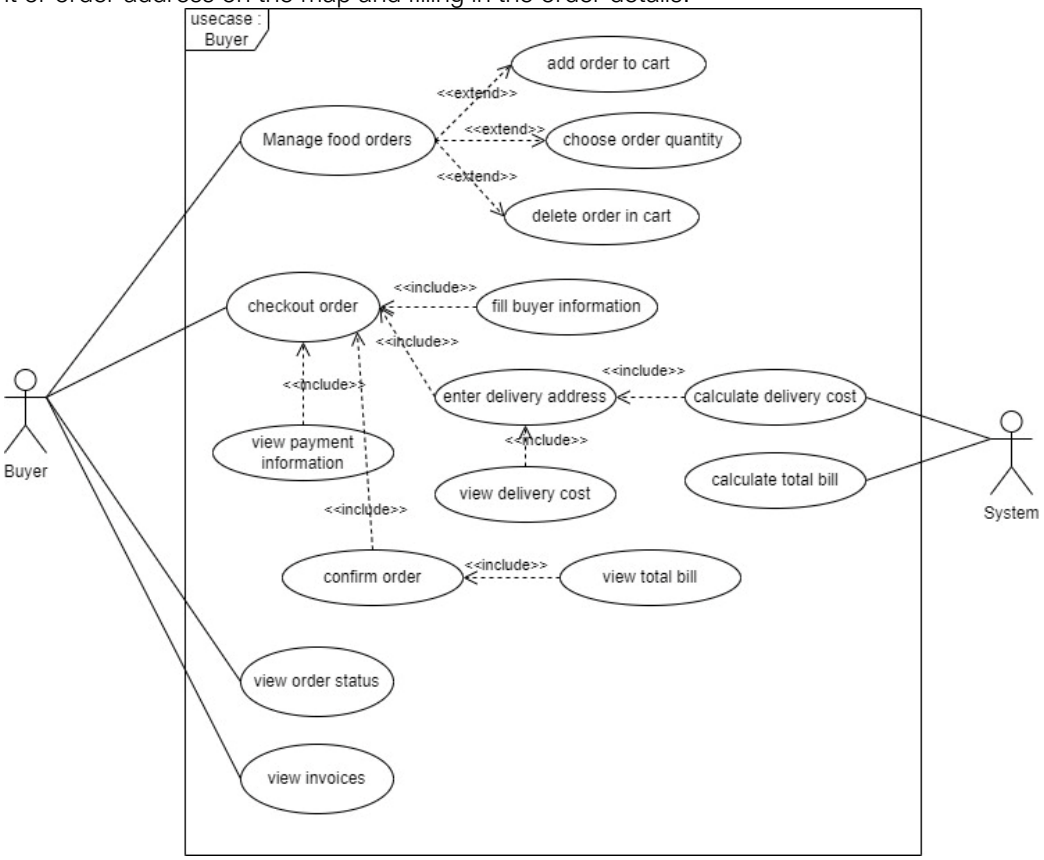

Fig. 4. Buyer use case diagram.

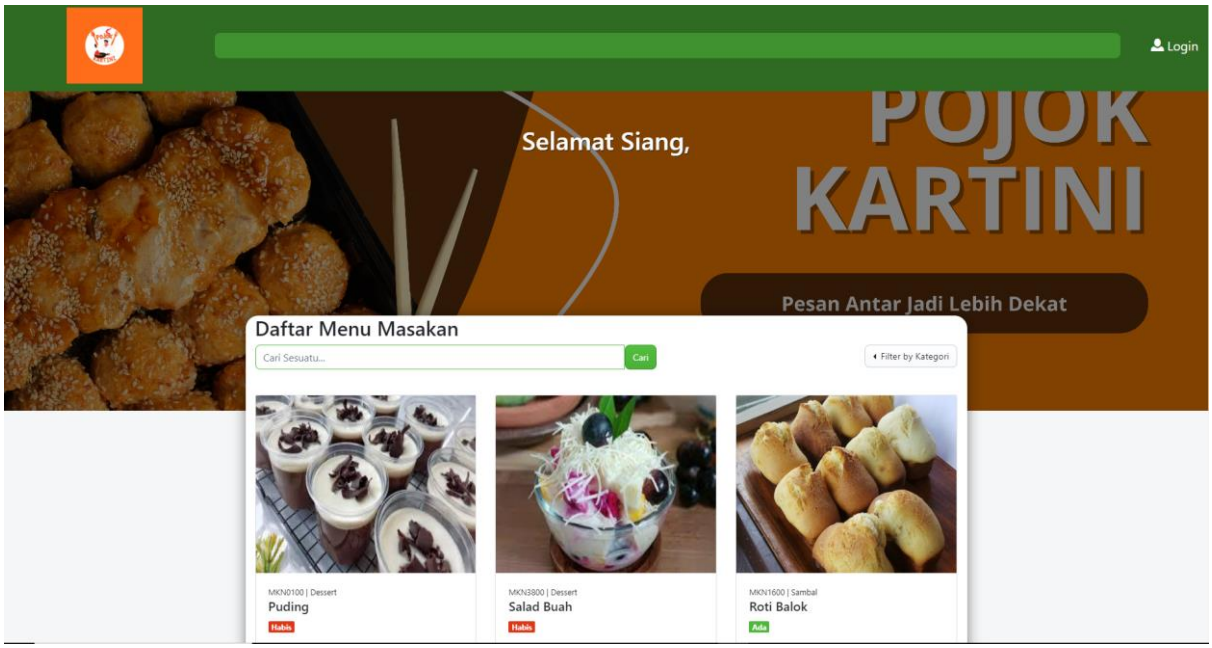

Fig. 5. Front-page user interface.

The route to be followed by the courier based on Greedy algorithm calculations starting from the original destination to the next destination is shown in Fig. 6. namely the destination of origin is the location that has been visited and the next location is the location that will be visited from the location of origin. In the proposed application there is a courier page that functions to change the status of the buyer's order by

confirming the order when clicking the "Delivered' button. Orders are sorted based on the calculation of the shortest distance using the Greedy algorithm. The courier can then make changes to the payment status of the order after the order has been delivered.

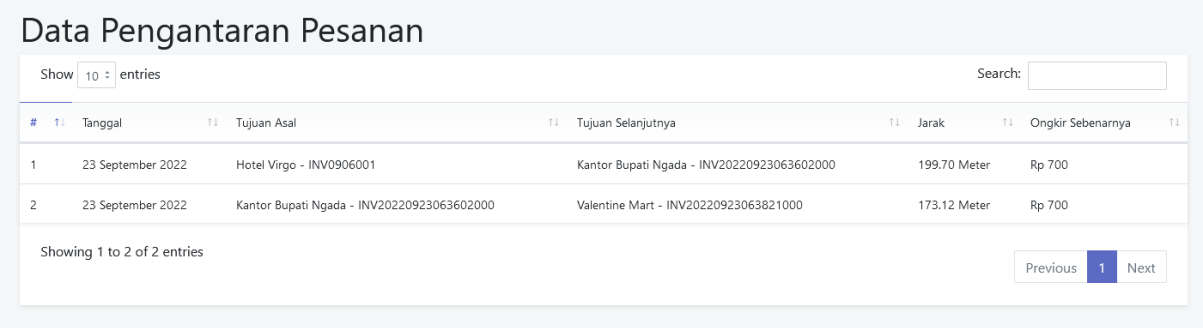

Fig. 6. Delivery route user interface.

3.2.4. System testing

This restaurant-to-restaurant messaging system was tested using the blackbox test method and user acceptance testing. This is done to ensure that the system built is in accordance with user needs and can correctly perform Greedy calculations for route optimization and order shipping costs.

3.3. Greedy algorithm implementation

This study utilized the Greedy algorithm pseudocode implemented by Sampurno et al. (2018), as shown in Algorithm 1.

Algorithm 1. Greedy Algorithm

```
1   p(1:n), w(1:n), x(1:n), m, content, n x(1:n) = 0
2   content = m
3   for i = 1 to do n do
4       if w(i) > content then
5           exit
6       endif
7           x(i) = 1
8           content = content− w(i)
9   repeat
10      if i ≤ n then
11          x(i) = content/W(i)
12      endif
```

Greedy algorithm testing is applied using location sampling data with different coordinates. To find the fastest or shortest route with the Greedy algorithm based on Kekal et al. (2021) can be done with Eq. (1), described as follow:

$$D(i) = L_1 + next\ vertex\ weight \quad (1)$$

1. Check the side associated with the first location with the smallest weight (distance) to the next vertex or location. This distance becomes the first shortest route (L_1).
2. Determine the next shortest route (D) in the following way:
   a) Eq. (1) is used to calculate the first distance added to the next weight. If there are other routes, then add the distance of the route with the previous distance.
   b) Choose $D(i)$ which has the smallest distance, then do a comparison if there are other routes. If the other route has a smaller distance than $D(i)$, then that route is the route that will be calculated next.
3. Repeat the search process for the next shortest route using the second stage.

Greedy algorithm forms a solution step by step. The approach used in the Greedy algorithm is to make a choice that gives the best gain, namely by making the optimum choice at each step with the hope that the rest leads to the overall optimal solution (Pramesti et al., 2021). The results of this Greedy algorithm calculation will produce the optimal fastest alternative route.

4. Results and Discussion

Greedy algorithm testing is applied using location sampling data with different coordinates. At this stage, data processing is carried out by collecting several locations that will be visited by the courier at one time. Locations to be visited include Hotel Virgo, Valentine Mart, and the Regent's Office.

First, testing is carried out by calculating the distance from each location point. The calculation is performed by calculating the distance to each location point on Google Maps by providing 4 locations with distances between locations based on the results of calculations from Google Maps which are in Table 1.

Table 1
Distance between locations.

Origin	Destination	Distance (Meter)
R	A	406.5
A	B	199.11
B	C	172.11
R	B	637.92
B	C	172.31
C	A	233.46
R	C	654.97
C	B	172.31
B	A	199.11

Then, the shortest path calculation is done by Greedy method. The calculation is performed by determining the shortest route from each point. The calculation process uses the Greedy method which is assisted by using a graph with location points that are interconnected with the distance at each point as shown in Fig.7.

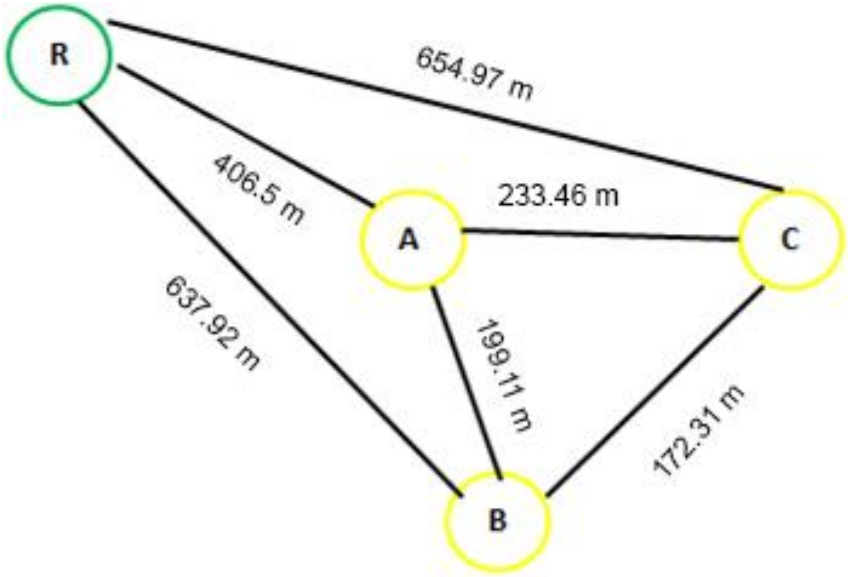

Fig. 7. Route illustration.

Table 2
Calculation of route distance with Greedy.

Step	Route	Total Distance (meter)
1	R-A	406.5
2	A-B	605.61
3	B-C	777.92
4	C-R	1,432.89

Table 3
Calculations with other routes.

Step	Route	Total Distance (meter)
1	R-B	637.92
2	A-B	810.23
3	B-C	1,043.69
4	C-R	1,450.19

Model calculation is done by calculating the distance traveled on the route to be visited. The point chosen as the next route becomes the starting point for carrying out the next calculation. Calculation of the shortest distance first starts from the starting point of the restaurant.

Table 2 shows the iteration of calculations with the Greedy algorithm to the destination location. The calculation results from the Greedy algorithm show that the shortest route is route 1 with travel routes namely, R (Restaurant) – A (Virgo Hotel) – B (Regent Office) – C (Valentine Mart) – R with a total distance of 1,432.89 meters or 1.43 km (optimum). Furthermore, a comparison of the results of travel routes is carried out which is calculated based on other travel routes, namely R–B–C–A–R. Table 3 shows the distance calculation with other routes.

Other travel routes, as shown in Table 3, produce a total distance of 1,450.19 meters or 1.45 km, which is not optimal. The results of the total distance above prove that the Greedy algorithm can determine the optimal distance from the restaurant's starting point to the destination location with the R–A–B–C–R route and a total distance of 1.43 km. Then from the results of the calculation of the Greedy route above, a comparison is made with the results obtained from the Food Delivery Application in Fig. 6. From the results above, it is known that the route traveled is R–A–B–C. Based on this comparison, the Greedy algorithm is proven to provide results that are quite accurate and can be used to make decisions about which location the courier will go to first when delivering orders.

5. Conclusions

This study aims to develop a web-based restaurant delivery system capable of providing delivery route optimization so that delivery costs can be lower by using the Greedy algorithm. This study used the waterfall method to develop information systems. The results of this research show that the Greedy algorithm is able to calculate the fastest route to make several deliveries at one time. Therefore, restaurants can carry out the effectiveness of order delivery if there are several orders at one time. Shipping cost optimization calculations still use distance and route calculations from the Greedy algorithm. This study also successfully carried out a comparative test between the calculation results of the algorithm that was built with the results of calculations on Google Maps. The test results show that the Greedy algorithm applied to the system is able to provide optimum results for the fastest routes and delivery costs.

This research has drawbacks in terms of optimizing shipping costs. Several other constraints and indicators need to be added to the calculation. Future research can optimize shipping costs by determining calculation indicators that take into account various factors and use different algorithms. Further research is also expected to be able to provide tracking features for the location of the customer and the courier.

Although this research has several shortcomings, the results of this study contribute academically as one of the proofs of using the Greedy algorithm for direct application to business problems. This research also contributes practically to the industry by producing a delivery information system that can be used by restaurants. So that later it can help restaurants innovate and increase the effectiveness of delivering orders to customers.

6. CRediT Authorship Contribution Statement

Carmelita Margaretha Jawa Wando: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, and Writing – review & editing. **Intan Dzikria:** Conceptualization, Supervision, Validation, and Writing – review & editing.

7. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

8. Acknowledgments

The authors would like to thank the anonymous referees for their helpful comments and suggestions.

9. Data Availability

Data will be made available on request.

10. Funding

No funding was received for this study.

11. Ethical Approval

Ethical approval No patient-identifying parts in this paper were used or known to the authors. Therefore, no ethical approval was requested.

12. References

Alimuddin, M. B., Arifin, M. Z., & Hariono, T. (2020). Rancang Bangun Sistem Pendataan Warga Nahdlatul Ulama untuk Optimasi Pelayanan. *Saintekbu : Jurnal Sains Dan Teknologi*, *12*(2), 74–82.

https://ejournal.unwaha.ac.id/index.php/saintek/article/view/385

Dana, L. M., Hart, E., McAleese, A., Bastable, A., & Pettigrew, S. (2021). Factors associated with ordering food via online meal ordering services. *Public Health Nutrition*, *24*(17), 5704–5709. https://doi.org/10.1017/S1368980021001294

Das, J. (2018). Consumer Perception Towards 'Online Food Ordering and Delivery Services': An Empirical Study. *Journal of Management*, *5*(5), 155–163. https://iaeme.com/MasterAdmin/Journal_uploads/JOM/VOLUME_5_ISSUE_5/JOM_05_05_015.pdf

Djaelangkara, R. T., Sengkey, R., & LAntang, O. A. (2015). Perancangan Sistem Informasi Akademik Sekolah Berbasis Web Studi Kasus Sekolah Menengah Atas Kristen 1 Tomohon. *Jurnal Teknik Elektro Dan Komputer*, *4*(3), 86–94. https://ejournal.unsrat.ac.id/v3/index.php/elekdankom/article/view/8324

Hayati, E. N., & Yohanes, A. (2014). Pencarian Rute Terpendek Menggunakan Algoritma Greedy. *IENACO (Industrial Engineering National Conference) 2014*, 391–397. http://publikasiilmiah.ums.ac.id/handle/11617/4535

Hormes, J. M., Kearns, B., & Timko, C. A. (2014). Craving Facebook? Behavioral addiction to online social networking and its association with emotion regulation deficits. *Addiction*, *109*(12), 2079–2088. https://doi.org/10.1111/add.12713

Kekal, H. P., Gata, W., Nurdiani, S., Rini, A. J. S., & Wita, D. S. (2021). Analisa Pencarian Rute Tercepat Menuju Tempat Wisata Pulau Kumala Kota Tenggarong Menggunakan Algoritma Greedy. *Jurnal Ilmiah Ilmu Komputer Fakultas Ilmu Komputer Universitas Al Asyariah Mandar*, *7*(1), 9–15. https://doi.org/10.35329/JIIK.V7I1.179

Kurniawan, M., Sulaksono, D. H., Agustini, S., & Indraina, F. (2021). Optimasi Rute Minimum Menggunakan Metode Greedy Berbasis Mobile. *Prosiding Seminar Nasional Teknik Elektro, Sistem Informasi, Dan Teknik Informatika (SNESTIK)*, *1*(1), 135–140. http://ejurnal.itats.ac.id/snestik/article/view/1772

Latifah, L., & Adam, M. (2021). Aplikasi Sistem Layanan Pesan Antar Online Berbasis Web Pada Sebuah Rumah Makan EatIt. *Jurnal Ilmiah Komputasi*, *20*(2), 269–274. https://ejournal.jak-stik.ac.id/index.php/komputasi/article/view/2761

Longstreet, P., & Brooks, S. (2017). Life satisfaction: A key to managing internet & social media addiction. *Technology in Society*, *50*, 73–77. https://doi.org/10.1016/j.techsoc.2017.05.003

Marbun, D. R. (2021). Perancangan Sistem Informasi Pemesanan Menu Makanan di Twin Seafood & Resto Rantauprapat Berbasis Web. *Informatika*, *9*(2), 71–76. https://doi.org/10.36987/INFORMATIKA.V9I2.1950

Nabila, M. (2022). *Laporan Grab 2022: Layanan Pesan-Antar Makanan Masih Dapati Tren Pertumbuhan*. Daily Social. https://dailysocial.id/post/tren-pertumbuhan-food-delivery-indonesia-2022

Nugroho, F. E. (2016). Perancangan Sistem Informasi Penjualan Online Studi Kasus Tokoku. *Simetris: Jurnal Teknik Mesin, Elektro Dan Ilmu Komputer*, *7*(2), 717–724. https://doi.org/10.24176/SIMET.V7I2.786

Pramesti, L. M., Prajoko, P., & Asriyanik, A. (2021). Penerapan Metode Algoritma Greedy Untuk Menentukan Rute Terdekat Pada Objek Wisata Palabuhanratu. *Jurnal Teknologi Informatika Dan Komputer*, *7*(2), 70–81. https://doi.org/10.37012/JTIK.V7I2.636

Sampurno, G. I., Sugiharti, E., & Alamsyah, A. (2018). Comparison of Dynamic Programming Algorithm and Greedy Algorithm on Integer Knapsack Problem in Freight Transportation. *Scientific Journal of Informatics*, *5*(1), 40–49. https://doi.org/10.15294/SJI.V5I1.13360

Saputra, S. F., Gata, W., Sulistyowati, D. N., Rozi, F., & Kadafi, A. R. (2021). Implementasi Pengiriman Barang dengan Algoritma Greedy PT. Astra International, Honda Kalimantan Timur. *Jurnal INSTEK (Informatika Sains Dan Teknologi)*, *6*(2), 160–169. https://doi.org/10.24252/INSTEK.V6I2.23992

Sheth, J. (2020). Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, *117*(January), 280–283.

Sommerville, I. (2015). *Software Engineering* (10th ed.). Pearson. https://www.amazon.com/Software-Engineering-10th-Ian-Sommerville/dp/0133943038

Trupthi, B., Rakshitha, R. R., Akshaya, J. ., & Srilaxmi, C. . (2019). Online Food Ordering System. *International Journal of Recent Technology and Engineering*, *8*(2S3), 834–836. https://doi.org/10.35940/ijrte.B1156.0782S319

Türkeş, M. C., Stăncioiu, A. F., Băltescu, C. A., & Marinescu, R.-C. (2021). Resilience Innovations and the Use of Food Order & Delivery Platforms by the Romanian Restaurants during the COVID-19 Pandemic. *Journal of Theoretical and Applied Electronic Commerce Research*, *16*(7), 3218–3247. https://doi.org/10.3390/JTAER16070175

Usman, M. Z., & Oktiarso, T. (2018). Implementasi Algoritma Greedy Untuk Menyelesaikan Travelling Salesman Problem di Distributor PT. Z. *Journal of Integrated System*, *1*(2), 216–229. https://doi.org/10.28932/JIS.V1I2.1049

Wati, E. F. (2018). Aplikasi Sistem Layanan Pesan Antar Makanan Berbasis Android pada Kedai Ayam Remuk, Tangerang. *JISAMAR (Journal of Information System, Applied, Management, Accounting and Research)*, *2*(2), 1–12. http://journal.stmikjayakarta.ac.id/index.php/jisamar/article/view/31

Wirangga, I. W. Y., Piarsa, I. N., & Purnawan, I. K. A. (2014). Aplikasi Sistem Informasi Geografis Untuk Pemetaan Letak Suatu Rumah Makan Di Wilayah Denpasar. *Jurnal Ilmiah Merpati (Menara Penelitian Akademika Teknologi Informasi)*, *2*(2), 238–245.