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Determining the Shortest Path for Souvenir Delivery to Tourist Attractions in Pamekasan Using Excel Solver

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ABSTRACT

Pamekasan, as one of the districts in East Java, is famous for its various interesting tourist attractions. As the number of tourists increases, the need for typical Pamekasan souvenirs also increases. This encourages souvenir craftsmen to look for efficient ways to distribute their products to tourist attractions. One method that can be used is to use Solver Excel to determine the shortest path for sending souvenirs. This research aims to determine the shortest path for sending souvenirs from production sites to tourist attractions in Pamekasan using Solver Excel. The research method used is quantitative using Excel Solver. The data used is data on the distance between production sites and tourist attractions in Pamekasan. This data was obtained from the Pamekasan Regency Tourism and Culture Office. The research results show that Solver Excel can be used to determine the shortest route for sending souvenirs from production sites to tourist attractions in Pamekasan so that it can help souvenir craftsmen to save time and costs in distributing their products.

Keywords: *Excel Solver, Distribution, Phortest Path*

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INTRODUCTION

Pamekasan, a regency in East Java, is famous for its beautiful beach tourism and various typical souvenirs. The beauty of nature and the uniqueness of Madurese culture become the main attraction for tourists visiting Pamekasan. Madurese souvenirs, such as Madurese batik, wood carving crafts, and Madurese accessories, become one of the main attractions for tourists (Adejumobi, 2019). The souvenir entrepreneurs in Pamekasan want to reach as many tourist attractions as possible to increase their sales (Begen, 2019).

However, determining the shortest path for the delivery of souvenirs to various tourist attractions is a challenge. The distance between tourist attractions in Pamekasan varies (Mohanraj, 2023). Souvenir entrepreneurs need to consider distance, travel time, and transportation costs in determining the shortest path, which is important to minimise operational costs and increase profits (Vamsikrishna, 2021).

Excel Solver, an optimisation tool available in Microsoft Excel, can help souvenir entrepreneurs in determining the shortest path (Birch, 2022). Solver Excel can be used to solve a variety of optimisation problems, including the problem of determining the shortest path (Bravo-Sepúlveda, 2023). By using Solver Excel, souvenir entrepreneurs can determine the most efficient souvenir delivery path, thus saving time and costs (Ahmed, 2022).

This research aims to apply Excel Solver in determining the shortest path for sending souvenirs to 10 tourist attractions in Pamekasan. It is hoped that this research can help souvenir entrepreneurs in Pamekasan in improving the efficiency of souvenir delivery and increasing their profits.

RESEARCH METHODOLOGY

The research methodology to determine the shortest path of souvenir delivery to tourist attractions in Pamekasan using Excel Solver can be designed as follows:

Data Collection

The initial step in this research is to collect the necessary data. Relevant data includes the location of tourist attractions in Pamekasan, souvenir marketing locations, the distance between each location (Stoilova, 2020).

Use of Excel Solver

Solver is an Excel add-in that can be used to find the optimal solution of linear programming problems (Sharifian, 2024). The use of Solver involves adjusting the variables and constraints accordingly, then running Solver to find the shortest path that meets the set criteria (Zhang, 2021).

Validation of Results

Once the Solver has provided a solution, it is important to validate the results. This can be done by checking whether the resulting path is indeed the shortest path according to the mathematical calculations done earlier (Massaro, 2021).

Analysis of Results

Finally, the results of this study need to be analysed to evaluate the effectiveness and efficiency of the determined path (Wu, 2021). A sensitivity analysis can also be conducted to understand how changes in the input variables will affect the resulting solution (Sharifian, 2024).

By following this methodology, it is hoped that the research can provide a better understanding of the determination of the shortest path of souvenir delivery to tourist

attractions in Pamekasan using Excel Solver, as well as provide practical guidance for stakeholders involved in the management of souvenir distribution.

RESULT AND DISCUSSION

Data Collection

a) Collect data on geographical coordinates of tourist attractions in Pamekasan from trusted sources (e.g. Google Maps, OpenStreetMap).

b) Calculating the distance between tourist attractions using the Haversine distance formula or online tools.

c) Entering the distance data between tourist attractions into an Excel spreadsheet.

No	Dari	Ke	Jarak	Jalur
1	x	A	12	0
2	y	A	4	0
3	z	A	9	0
4	x	B	3	0
5	y	B	17	0
6	z	B	11	0
7	x	C	16	0
8	y	C	9	0
9	z	C	4	0
10	x	D	11	0
11	y	D	15	0
12	z	D	5	0
13	x	E	8	1
14	y	E	6	0
15	z	E	13	0

X = Pengirim 1	A= Pantai jumiang
Y= Pengirim 2	B= Pantai talang siring
Z= Pengirim 3	C= Api tak kunjung padam
	D= Bukit brukoh
	E= Pantai batu kerbuy

Figure 1. Data Obtained

Us of Solver Excel

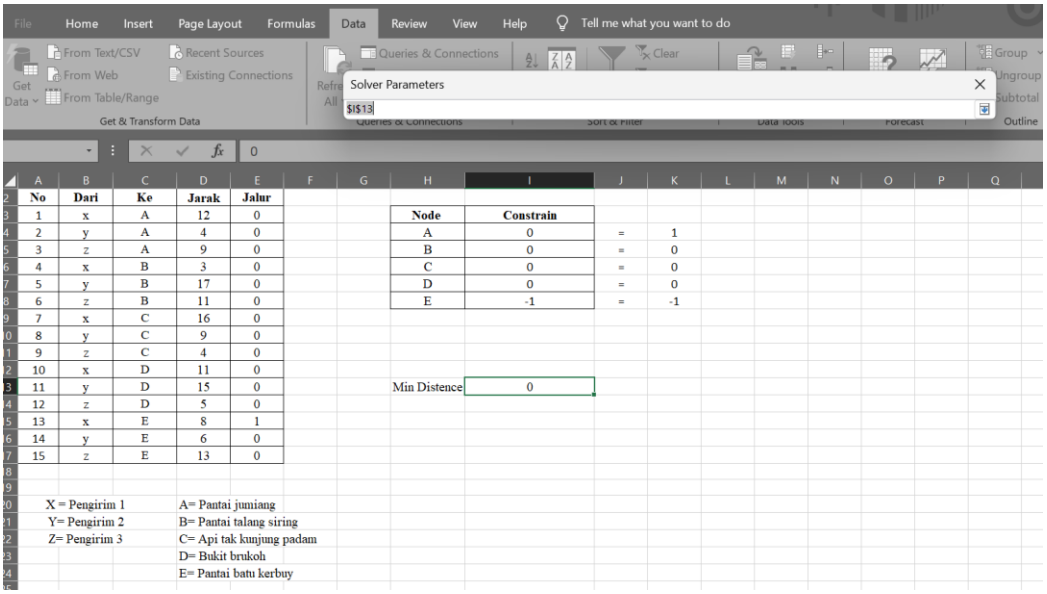


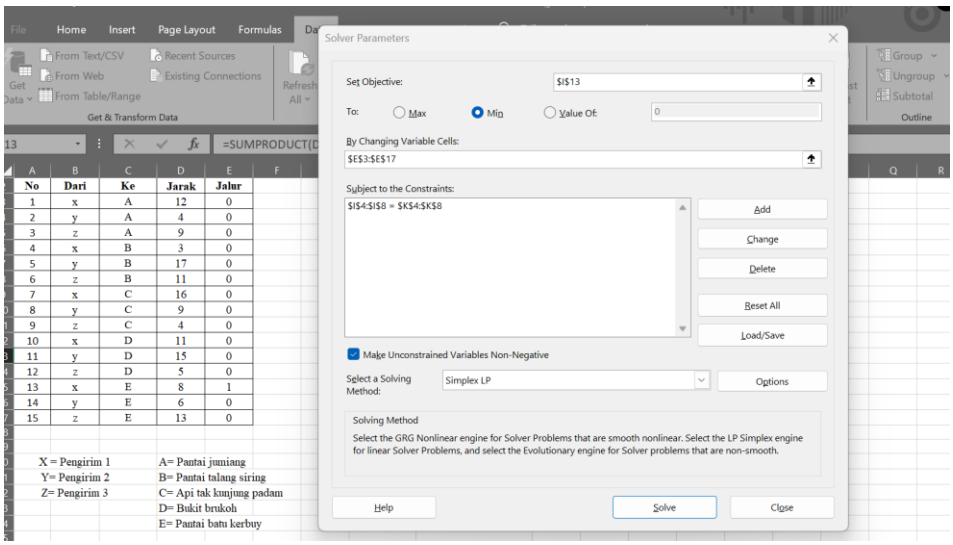
Figure 2. Open the sovel programme in excel

Description:

- Column B2: Souvenir sender
- Column C2: Destination tourism
- Column D2: Distance from souvenir sender to tourist attractions
- Column E2: Evacuation route
- Column H2: Node (Series of Paths)
- Column I2: Constraint =SUM(B3:B26,G3,E3:E26)-SUMIF(C3:C26,G3,E3:E26)
- Column K2: Constraint
- Column H10: Min distance =SUMPRODUCT(D3:D26,E3:E26)

Then run the solver:

Figure 3. Solver Process by Entering the Formulas



Description:

- Set Objective: $H$10
- Equal to: Min
- By Changing Variable Cells: $E$3:$E$26 (variabel keputusan)
- Subjet to the Constraints: $E$3:$E$26

Validation of Result

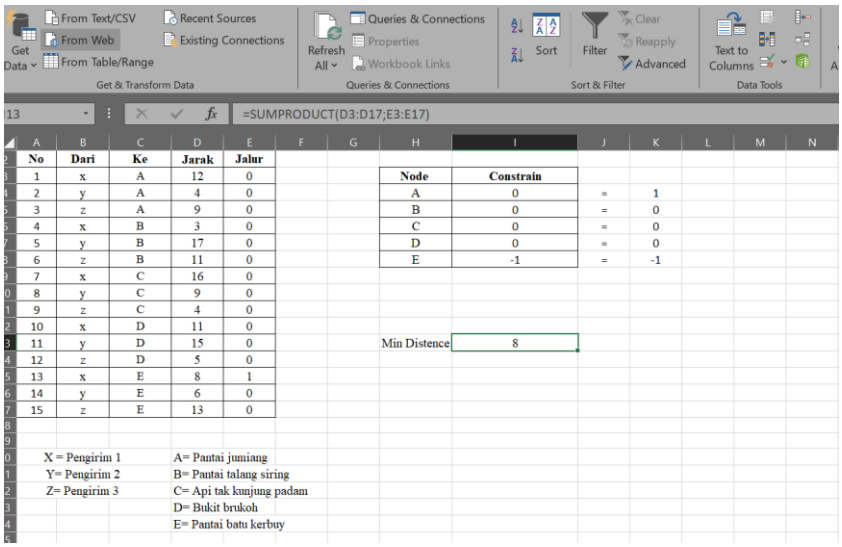


Figure 4. Data Results After Solver Process

Analysis of Results

From the solver results, the shortest path obtained is 8 km. In the Excel Solver, the objective function and constraints can be modelled in appropriate cells, by utilising the formulas and logic functions available (Massaro, 2021). After defining the objective

function, constraints, and other parameters, the Excel Solver can be run to find the optimal solution that satisfies the given constraints (Manish, 2023).

One of the main advantages of using Excel Solver in linear programming modelling is its ease of use (Vairavel, 2021). The Excel Solver is integrated with Microsoft Excel, so modelling and analysis can be done directly in an environment that is familiar to the user (Tokgoz, 2019).

CONCLUSION

Based on the research results contained in this assignment, it can be concluded that from the process of determining the shortest path for sending souvenirs to tourist attractions in Pamekasan using Excel Solver, it can be concluded that with a structured approach and using the right analytical tools, we can achieve efficient and optimised solutions.

The steps that include identifying the road network, creating the model in Excel, defining variables and constraints, using the Excel Solver, analysing the results, and finding the shortest path are an integral part of an effective decision-making process.

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