Determination Location of Disturbance the Electricity Distribution Network for Efficiency SOP Repair of Distribution Networks Based on Google Maps

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Submission date: 26-Jun-2023 01:42PM (UTC+0700)
Submission ID: 2122818528
File name: Repair_of_Distribution_Networks_Based_on_Google_Maps_-_2021.pdf (2.3M)
Word count: 3443
Character count: 18820

Determination Location of Disturbance the Electricity Distribution Network for Efficiency SOP Repair of Distribution Networks Based on Google Maps

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Abstract. The Electric Power Distribution Network, which in this case is also called Feeder, UP3 Manokwari has 6 (six) feeders that are used in the distribution of electricity. Feeders include Elang feeders, Kasuari feeders, Nuri feeders, Mambruk feeders, Maleo feeders, and Merpati feeders. Each feeder has a distribution transformer to distribute the electrical network to customers. Facing the feeder distribution network disruption, PLN Company UP3 Manokwari had a hard time knowing the feeder location and the faulty feeder distribution transformer location, so field officers (Yantek) had a hard time finding the location. and sub-location of each feeder disturbance. This study aims to create a system containing location and sub-location information using Google Maps as a map display. This study uses the A * (A-Star) algorithm. The A-Star algorithm uses the closest approximate distance to reach the destination and has a heuristic value. The path search process is done by first determining the nodes and assigning a graph value for each node, then calculating the graph value that brings up the latitude and longitude values. The chart values are stored in the database and then calculated using the A-Star method. The result of this system is that yantek officers can view the information directly in the form of a map showing the location points and distribution transformers of the feeder that is experiencing disturbances, the system will check the user's position, and then the system will display the fastest route. from the officer's location to the location of the feeder experiencing disturbances.

Keywords: Location and Sub Location Disruption, Feeder Distribution Network, A-STAR Algorithm, Google Maps.

INTRODUCTION

The distribution system is an integral part of the electric power system. The distribution system is the electric power sub-system closest to the customer, which distributes electric power. Previous research that has been done related to the distribution system in a 20 KV distribution network is in determining the location of disruptions in short circuits using the impedance method [1]. The subsequent research is the disruption management of the process functions from identifying, isolating, and restoring disruptions. In this study, the isolation and restoration was carried out using a genetic algorithm method and load shedding efforts on the network experiencing voltage drops. To obtain the most optimal restoration to overcome disruptions in the distribution network [2]. The following research is to classify the handling of disturbances in the 20 KV electricity distribution network using the Neural Network algorithm [3]. Based on this research [7][15][21], a system will be created to display the location of mobile-based disturbances in the form of digital maps, displaying the types of disruptions that occur and a system for recording detailed reports of feeder distribution network disruption in real time. The next research is the research that which the author has researched with entitled "Classification of detection points and types of disturbances in the electrical power distribution network to improve the efficiency SOPs of the distribution network". The weakness of the previous research is that it is still difficult for field officers (yantek) to find the exact point of the location of the feeder fault, where each feeder can reach up to 10 km in length with distribution transformers, each feeder it has 13 to 53 distribution transformers. In relation to the problems that occurred in previous studies, in this study the author wants to build a system "Determination of the location of disturbances in the electrical distribution network for standard procedures to increase the efficiency of distribution networks based on Google Maps".

2021 2nd International Conference on Information Technology, Advanced Mechanical and Electrical Engineering (ICITAMEE)
AIP Conf. Proc. 2499, 050007-1–050007-9; https://doi.org/10.1063/5.0105954
Published by AIP Publishing. 978-0-7354-4286-3/$30.00

The A* algorithm is a Best First Search algorithm which is a combination of Uniform Cost Search and Greedy-Best First Search. This Uniform Cost Search will choose the smallest distance from the initial node to the next node to the destination node, while the Greedy-Best First Search that uses a heuristic function will estimate the cost from the initial node to the destination node. This heuristic has a very important role to control the search on the A* algorithm, so that this algorithm will find a complete always find a solution and optimal route [4-6][9-10][12-13][16][18-20][22]. This research, the author applies the A-star algorithm to obtain the shortest path from the location of the Yantek officer to the distribution transformer of the Manokwari distribution feeder who is experiencing interference.

In the operation of the electric power system there are often disturbances that can result in disruptions in the distribution of electricity to consumers, disruptions can occur due to earthquakes, fires, explosions at distribution substations, and other disturbances. This interference is a barrier from a system in operation or a state of an electric power distribution system that deviates from normal conditions. A disturbance in electrical equipment is defined as the occurrence of a malfunction in the electrical grid that causes the electric current to come out of the supposed channel. This disruption can occur in distribution refiners as well as distribution transformers [7][15][21].

The Manokwari distribution network there are 6 feeders, each feeder has a distribution transformer to distribute the electrical network to customers. The Rajawali feeder has 40 distribution transformers with a flow length of 10 km. The Kasuari feeder has 28 distribution transformers with a flow length of 16 km. The Feeder Nuri has 53 distribution transformers with a flow length of 12.8 km. The Mambruk feeder has 28 distribution transformers with a flow length of 20 km. The Maleo feeder has 13 distribution transformers with a flow length of 27.3 km. The Merpati feeder has 14 distribution transformers with a flow length of 5.7 km. If we track the distance from the location to the sub-location, it can be about 5 meters, up to 10 kilometers, making it difficult for field officers to walk past each feeder to determine the distribution transformer that is experiencing disturbances. This system was also developed by providing a mapping of each distribution feeder and transformer location that is funneled by a mobile client that is integrated with Google Maps to provide information on disturbances in the customer's distribution network directly [8][11][14][17].

RESEARCH METEDOLOGY

The framework of the research entitled “Determining the location of disturbances in the electricity distribution network for standard procedures for efficiency improvement of distribution networks based on Google Maps" Shown at Figure 1.

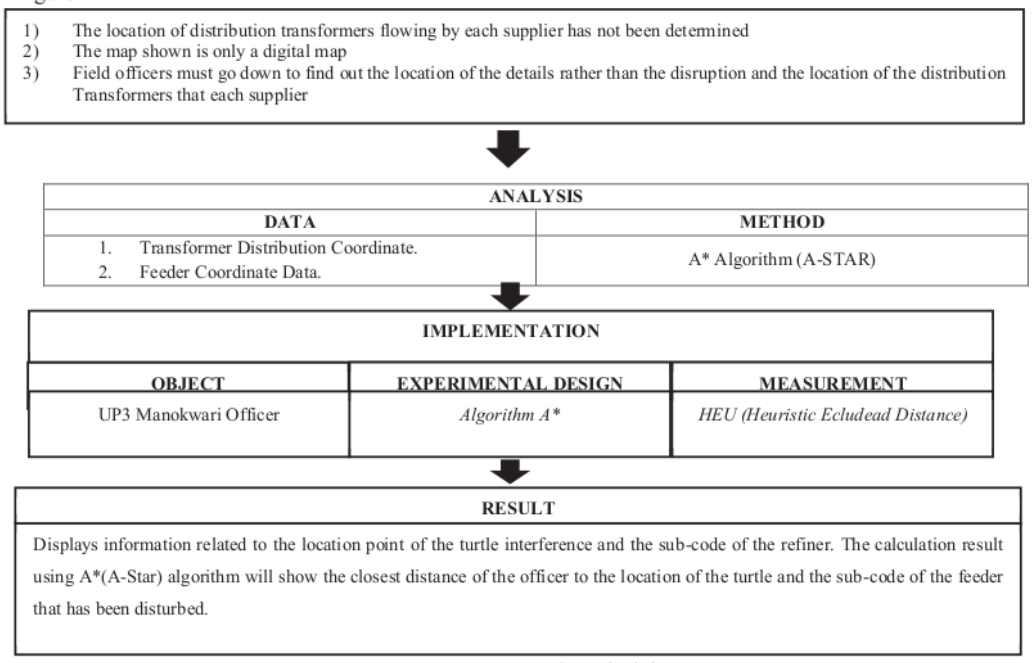

FIGURE 1. Research Methodology

TABLE 1. The Kasuari Feeder Coordinate Point

NAME OF THE TURTLE	COORDINATE POINT	ADDRESS
Cassowary Distiller	-0.8716670, 134.0653381	Bar, Sanggeng, Manokwari Bar., Manokwari Regency, Papua Bar. 98312
FCO Police	-0.8692220, 134.0793915	Manokwari, Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
FCO Hospital	-0.8713920, 134.0798035	Manokwari, Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
FCO Arowi	-0.8767890, 134.1241760	Manokwari, Arowi, Manokwari Tim., Manokwari Regency, Papua Bar. 98313
FCO Kodim	-0.8648420, 134.0767975	Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 1	-0.867875, 134.066769	Manokwari, Sanggeng, Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 2	-0.861675, 134.066783	Manokwari, Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 3	-0.860975, 134.074883	Jl. Brawijaya, Padarni, Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 4	-0.864831, 134.076789	Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 5	-0.868994, 134.078519	Manokwari, Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 6	-0.869586, 134.078681	Manokwari, Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 7	-0.872794, 134.081106	Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98311
CASSOWARY 8	-0.877406, 134.087156	Jl. Pasir Putih, Pasir Putih, Manokwari Tim., Manokwari Regency, Papua Bar. 98313
CASSOWARY 9	-0.877889, 134.091411	Jl. Pasir Putih, Pasir Putih, Manokwari Tim., Manokwari Regency, Papua Bar. 98313
CASSOWARY 10	-0.876783, 134.097172	Jl. Pasir Putih, Pasir Putih, Manokwari Tim., Manokwari Regency, Papua Bar. 98313
….	…	…
CASSOWARY 25	-0.857736, 134.072067	Jl. Merdeka No.77, Padarni, Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 26	-0.862406, 134.077525	Manokwari, Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar. 98312
CASSOWARY 27	-0.871919, 134.079075	Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar.
CASSOWARY 28	-0.864724, 134.079424	Manokwari Tim., Manokwari Bar., Manokwari Regency, Papua Bar.

UP3 Manokwari is a customer service unit that only takes care of customers who are in the UP3 manokwari area unit. With an area of 46,955 km2 with 676 villages, 6 districts, 72 districts, 5 ULP, and 5 other electrified islands. Number of customers registered with PLN Company UP3 Manokwari numbered 83,799 customers. PLN Company UP3 Manokwari has 6 feeders used in electricity distribution. UP3 Manokwari has 6 feeders, among others are; The Rajawali feeder, The Kasuari feeder, The Nuri feeder, The Mambruk feeder, The Maleo feeder, and The Merpati

feeder. Transformers are electrical power equipment that serves to transfer/transmit electric power alternating low voltage current to the voltage of the voltage or vice versa, at the same frequency, while the principle works through the clutch magnet or induction magnet and produces different voltage and current values.

RESULTS AND DISCUSSION

UP3 Manokwari is a customer service unit that only takes care of customers who are in the UP3 manokwari area unit. With an area of 46,955 km^2 with 676 villages, 6 districts, 72 districts, 5 ULP, and 5 other electrified islands. Number of customers registered with PLN Company UP3 Manokwari numbered 83,799 customers. PLN Company UP3 Manokwari has 6 feeders used in electricity distribution. UP3 Manokwari has 6 feeders, among others are; The Rajawali feeder, The Kasuari feeder, The Nuri feeder, The Mambruk feeder, The Maleo feeder, and The Merpati feeder. Transformers are electrical power equipment that serves to transfer/transmit electric power alternating low voltage current to the voltage of the voltage or vice versa, at the same frequency, while the principle works through the clutch magnet or induction magnet and produces different voltage and current values.

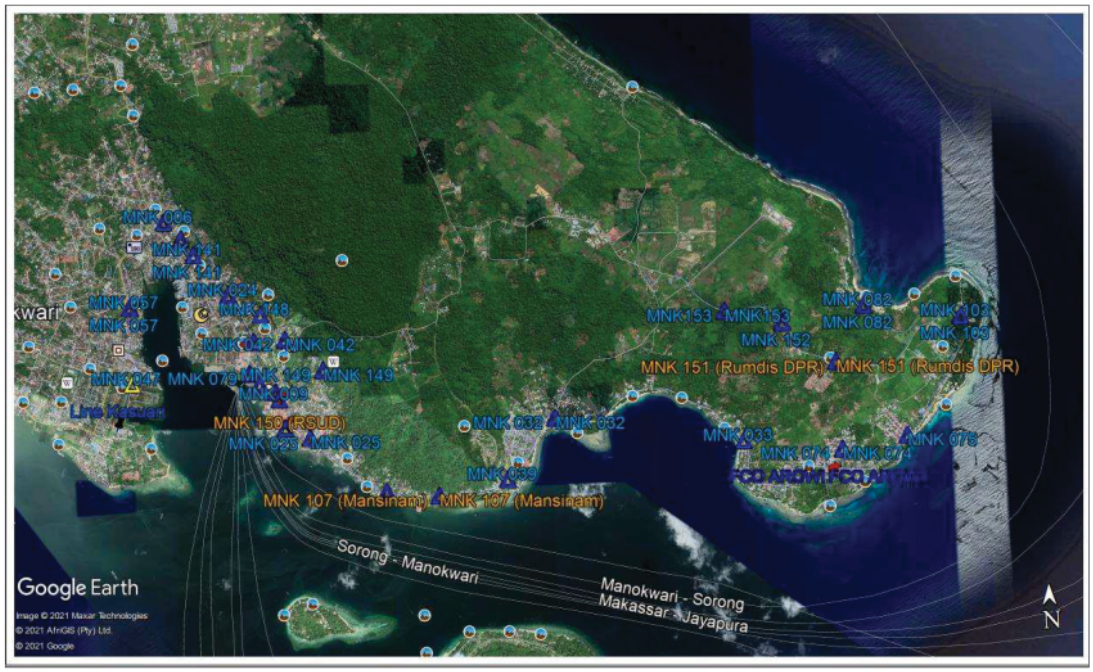

FIGURE 2. The Kasuari Feeder

Figure 2 shows PLN Company UP3 Manokwari has a total of 175 trafo distribution, the distribution transformer is supplied by each supplier. The Kasuari feeder has 28 trafo distribution, here is the flow of The Kasuari feeder. Figure 3 shows the system designed in determining the location and sub-location of disruption in Manokwari distribution feeder uses the A-Star Algorithm (A*) in the search for the shortest path.

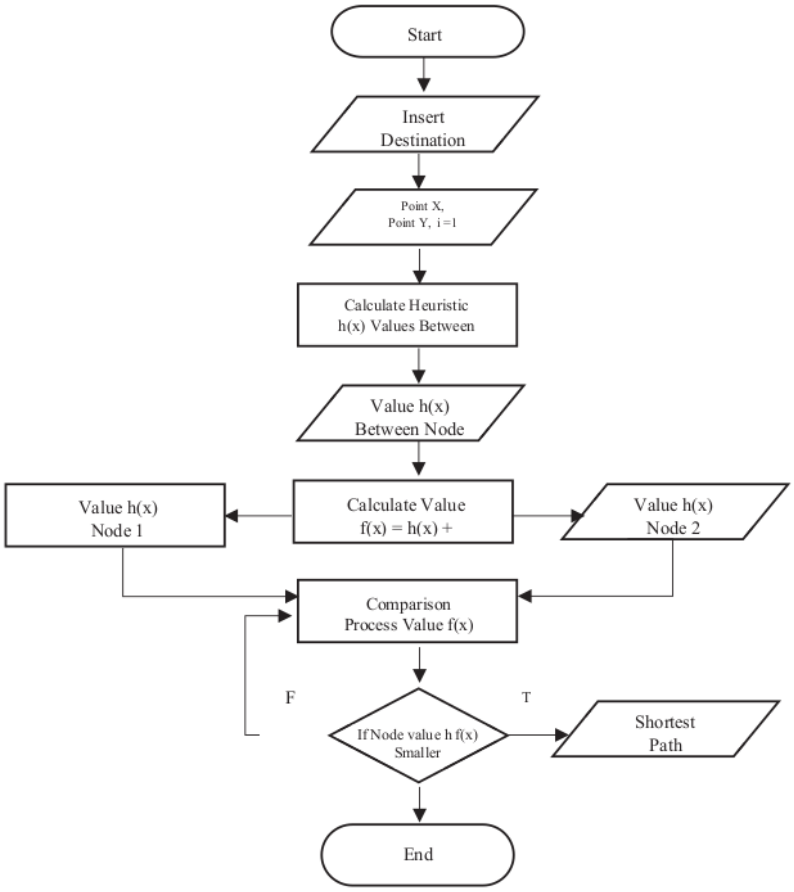

FIGURE 3. Algorithm A*

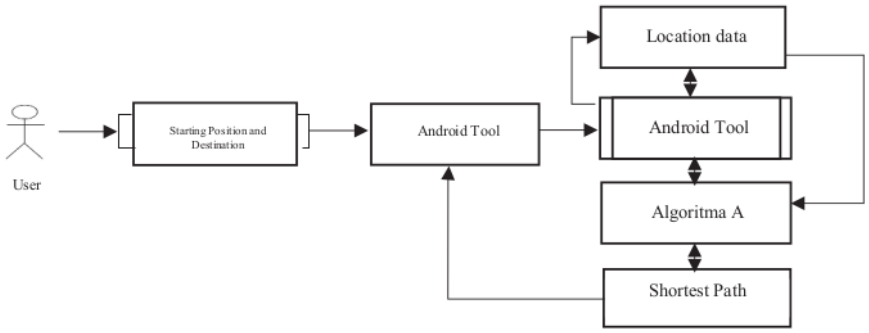

FIGURE 4. General Description of Systems

Figure 4 shows general description of systems. The algorithm is divided into two points, namely the points that can be passed or commonly called Open Lists and the points that cannot be passed, commonly known as Closed Lists. Functionally, the Close List works so that the algorithm does not recheck the points it has passed so that the search process can run faster and reduce the existence of an unlimited verification process at each point or node. The concept of finding the closest path in an algorithm is where the algorithm will stop if there is no more Open List or an end point has been determined.

$$f(n) = h'(n) + g(n) \quad (1)$$

With:

f (n) = evaluation function

g (n) = Actual cost or cost from node start to node n h '(n) = Estimated cost or cost from node n to destination node

h '(n) is the heuristic value determined by calculating the Euclidean distance heuristic formula. Here is the formula for HED.

$$d(x+y) = |\sqrt{(x1-x2)^2 + (y1-y2)^2}| \quad (2)$$

In algorithm A *, 2 queues are needed, namely:

OPEN LIST: containing the nodes that have been raised, they already have heuristic function, but they have not been tested and LIST CLOSED: contains the nodes that have been tested, an example is given in Table 2.

TABLE 2. Route Search Results

TESTING 1	
INITIAL COORDINATES : -0.871881, 134.065136	
FINAL COORDINATE : -0.8460030, 134.0520020	
Relationship 1: A-B-C-D-E-T	4.3 Km
Relationship 2: A-B-C-I-J-K-T	6.1 Km
The closest relationship is in relationship 1 = A-B-C-D-E-T With a distance of 4.3 Km	

Figure 5 shows the system is given a reporting point of disruption that aims so that yantek officers can enter information related to the disruption that occurs that will be there will be notifications and information that will be directly stored in the database system. In the system is also provided a location of interference that is useful to display the location point and sub-location of the supplier, the officer is required first to activate the GPS so that the system can check the position of the current officer. After that the officer chooses the location of the disturbance, then the system will display the nearest route from the officer's location to the location of the disturbance.

Figure 6 shows the system also has a recap of the supplier interference report based on the date that will be exported to the Excel file.

Figure 7 shows the system is given a facility to update the status to input detailed information about the disruption that occurred on the distribution network of the supplier, the officer yantek update the status of the officer by entering the relevant information of the cause of the disruption that occurred.

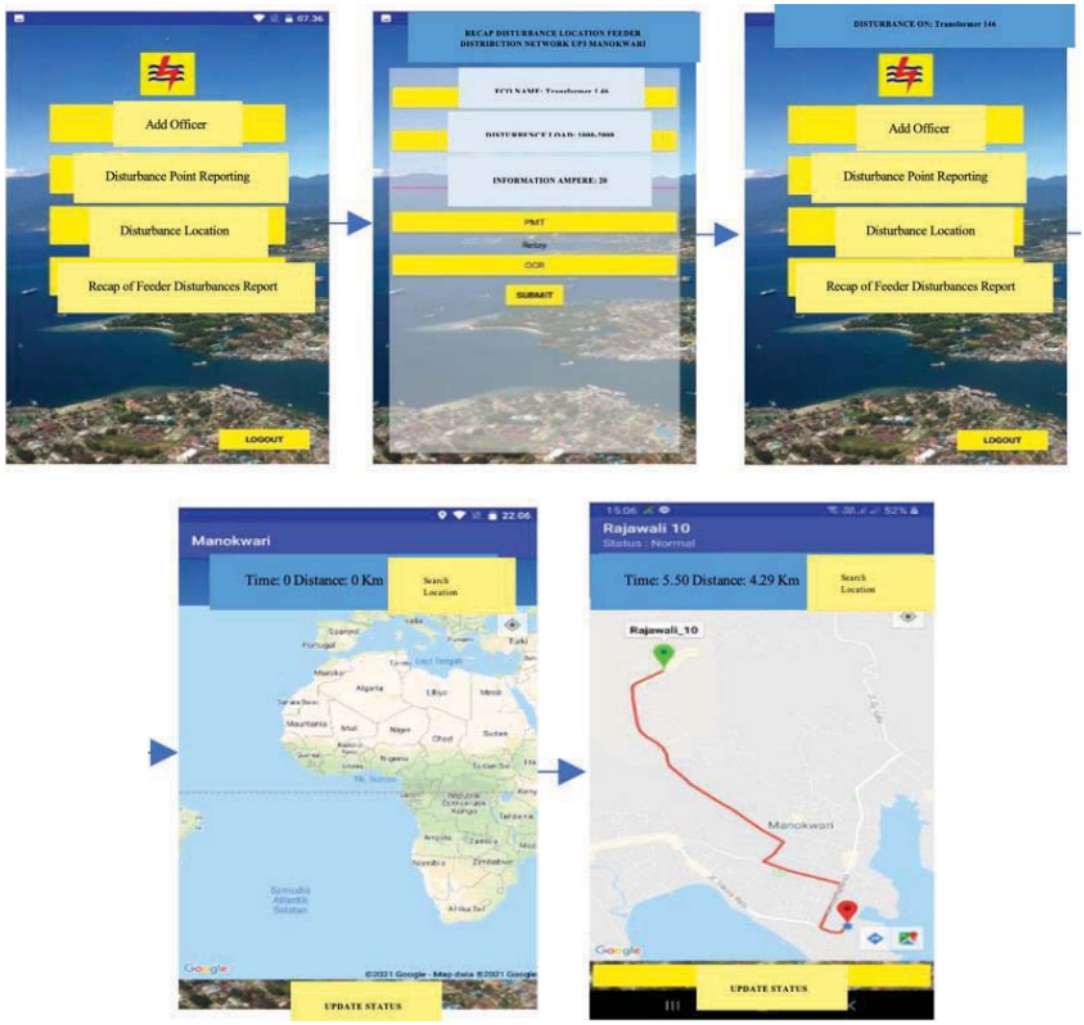

FIGURE 5. Supplier Disruption Route Determination System

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	No	Disruption Date	FCO Code	FCO Name	Normal Date	Damage	Disturbance	Reason	Weather	FGTM	Disturbance Load	Load	Trip	Relay
2	1	6/2/21 1:37	KS32	Trafo 150	6/2/21 1:38	Broken arrester	Foreign object	Natural disaster/disaster	Strong winds	JTM Equipment	>200	20	PMT	OCR
3	2	6/2/21 7:32	MB34	Trafo 146	6/2/21 7:40	Broken arrester	Foreign object	Natural disaster/disaster	Sunny	JTM Equipment	100-200	20	PMT	OCR
4	3	6/2/21 7:37	MB34	Trafo 146	6/2/21 7:40	Broken arrester	Foreign object	Natural disaster/disaster	Sunny	JTM Equipment	100-200	20	PMT	OCR

FIGURE 6. Recap of the Disruption Report

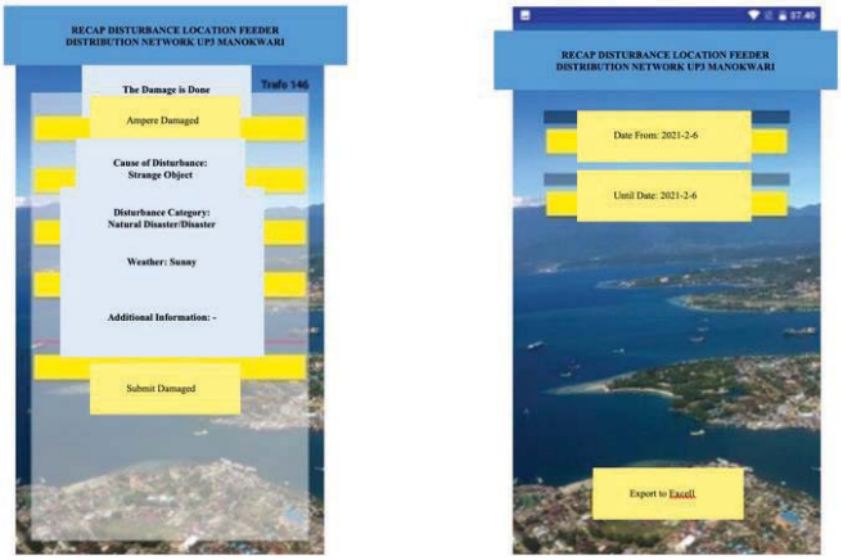

FIGURE 7. Update Status

CONCLUSION

Based on the results of research and discussions that have been conducted can be drawn several conclusions, among others:

1. Location Determination System and Sub Location Disruption of Electric Power Distribution Network assists yantek officers in obtaining information on the exact path and point of location of the refiner and distribution transformer point that is experiencing disruption on the distribution network of refiners that have a length of 5 meters to 10 km.
2. A-Star's algorithm for determining the nearest path to the destination. The process of searching the route by specifying nodes and assigning *graph* values on each node, it is possible to calculate *graph* values that carry *latitude* and *longitude* values. The value of the stored *graph* will be used to be then calculated using the A-Star algorithm.

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