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International Conference on Electrical, Electronics, Informatics, and Vocational Education

Emeritus Prof. Lance C.C Fung, Ph.D.
Murdoch University, Australia

Emeritus Professor. Lance Chun Che Fung commenced his service at Murdoch University on February 2003 and was appointed **Emeritus Professor** in the School of Engineering and Information Technology on October 2015. He worked as a Radio and Electronic Officer in merchant navy during the 70's then graduated with a **B.Sc. Degree with First Class Honours in Maritime Studies** and a **Master of Engineering Degree in System Test Technology**, from the University of Wales, in 1981 and 1982 respectively. **He received PhD Degree** from the University of Western Australia in 1994 with a thesis on the Application of Artificial Intelligence to problems in Electrical Power System Engineering. He taught at the Department of Electronics and Communication Engineering, Singapore Polytechnic (1982-1988), and at the School of Electrical and Computer Engineering, Curtin University (1989-2003). In September 2017, he was awarded an **Honorary PhD Degree in Information Technology** by Walailak University Thailand, in recognition of his contributions towards the development and advancement of their research and postrgraduate programs. His research interest is in the development and applications of innovative intelligent technologies and advanced techniques to solve practical problems. His passion is to nurture postgraduate research students and he continue dedicate his time to supervise postgraduate students locally and abroad. His motto is "學海無涯" which means "Learning has no boundary".

Speech Theme: Green Technology, Artificial Intelegent and Higher Education

Abstract: The insatiable demand by humans for resources, energy and water continues due to the ongoing increasing global population and change of life style. All lead to the detrimental consequences of greenhouse gas (GHG) emissions, climate change, rising sea levels and environmental degradation which cause major challenges for every nation, government and community[1]. Greentech aims to develop systems or products that will converse the environment, utilise minimal resources and have negative impact on human activities and quality of life. The four pillars that form Greentech Policy are Energy, Environment, Economy and Social. The objectives are to reduce the power consumption and improve efficiency; to enhance national economy with Greentech; to ensure sustainability and preserve the environment and to increase the public awareness through education and participation. [2]. There are already a range of industry involved with implementation of Greentech such as Energy Sector, Building Sector, Water and Waste Management, and Transport Sectors. However, there are obstacles that hinder the adoption of Greentech which are: cost; lack of information; lack of alternate materials, chemical or process; uncertainty of the performance and impacts; and the lack of skills and suitable personnel. [2] On the other hand,

Artificial Intelligence (AI) has matured from laboratories to practical everyday applications. The core AI technologies include: Data Science an analytics; Natural Language Processing (NLP), Speech recognition and speech synthesis; Machine Learning (ML), Deep Learning (DL) and Artificial Neural Networks (ANN); Machine decision making; Computer Vision; and, Robots and Sensors [3]. It is worth noting that a range of recent development of AI technologies has been placed on the "Hype Cycle for Education" report by Garner Research [4] while another report identified 10 business trends that will impact higher education [5]. It is hopeful that this will provide pointers to various consideration in Greentech, AI for education and industry.

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Prof. Herman Dwi Surjono, Ph.D.
Yogyakarta State University, Indonesia

Herman Dwi Surjono is a professor at the College of Engineering and the Graduate School of the Yogyakarta State University, Indonesia. He got his Master degree of Industrial Education from the Iowa State University in 1995. He received his Ph.D. in Multimedia and Information Technology from Southern Cross University Australia in 2006. He teaches both undergraduate and graduate students E-learning, multimedia learning, and digital media. His research area includes adaptive e-learning, interactive multimedia learning, online learning and blended learning. He has experiences in providing consulting and training and development of Moodle based e-learning and blended learning. He has published articles and books related to e-learning and multimedia. His goal is to empower teachers to optimize the use of e-learning in schools. Currently, he is a head of Instructional Technology Department at the Graduate School of YSU.

Speech Theme: The Use of ICT in Technical and Vocational Education

Abstract: The advances of information and communication technology (ICT) has driven globalization and made a new variety of occupations. Modern ICT innovations have drastically changed the way we live, learn, work, and think about jobs. These globalization and innovations certainly have an economic and social impact in our society. This will open up opportunities and new job challenges in the industry. Meanwhile, numerous employees have been dislocated and a significant number of young people are structurally unemployed. These changes have brought significant challenges to TVET. The use of ICTs in TVET innovation includes optimized teaching-learning process, adaptive learning, efficient supporting systems, flexible instructional delivery and tools, enhanced teacher productivity, and innovative learning media. Some of these innovations are expected to create a learning environment on TVET that is conducive to facing the era of the industrial revolution 4.0 where students must have the 21st century competencies.

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Assoc. Professor Thavatchai Tayjasanant, Ph.D. is Lecturer in Departmen of Electrical Engineering, Chulalongkorn University, Patumwan Bangkok, Thailand. He got his B.Eng same place as he teach now. He got Masters Degree in Electric Power Engineering (M.Sc), University of Manchester, UK. He received his Ph.D in Electrical Engineering, University of Alberta, Edmonton, Canada. In 1994 he started his carier as Design Engineer in Phelps Dodge Co.Ltd. In 1996 he begins to research as research assistant at Energy Research Institute. He begin to lecture in Chulalongkorn University in Oct. 1998 and got his Assoc Prof. in Nov. 2014. His research interest is in Power Quality Impacts of Distributed Generation and Smart Grid, Road Lighting and Horticultural Lighting and Railway Electrification and Electric Vehicle.

Speech Theme: Green Technology Applications in Power Systems

Abstract: It is clear that global warming, environmental awareness and energy conservation are getting more attention nowadays. Renewable Energy (RE) plays an important role and is considered to be an energy source of the future due to its sustainability and eco-friendly. This talk will focus on green technology applications in power systems. Due to the higher energy utilization, new energy sources are sought after. After the accident of Fukushima Daiichi nuclear power plant in Japan, many countries turned to renewable energy sources. Renewable energy sources such as solar, hydro, biomass and wind are popular for clean energy production. ASEAN countries should utilize abundant solar energy effectively. Solar power technologies can help to maximize produced solar energy. Examples of such technologies are solar cell technologies, maximum power point tracking (MPPT), and inverter technologies. Sometimes, power produced from renewable energy sources can be too much for the load in a system can utilize. As a result, technologies and control techniques for Energy Storage System (ESS) such as batteries in a power system are also critical in order to accommodate the surplus of energy produced from renewable energy sources connected to power systems. Another application of green technology in power systems in this talk is application of LED lamps for smart street lighting. With the assistance of Internet of Things (IoT) platform, cloud-based technologies and network technologies in communication such as Long Range (LoRA) and Narrowband IoT (NB-IoT), LED lamps can be controlled and communicated with lighting control centres efficiently. Energy saving, mobile performance and reduced maintenance costs can be achieved. Moreover, it makes streets brighter and safer.

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Nearest Excellent Potential Location Using Distance Algorithm

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Abstract. This study aims to find the proper distance calculation method that will be applied to the Sidoarjo on Hands (SoH) application. This study was conducted by comparing three distance algorithms namely Euclidean Distance, Manhattan Distance, and Haversine Formula. The results showed that the Euclidean Distance method was the proper method because this method had has the smallest Mean Absolute Deviation (MAD) with 1.71 in amount.

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Nearest Excellent Potential Location Using Distance Algorithm

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Abstract. This study aims to find the proper distance calculation method that will be applied to the Sidoarjo on Hands (SoH) application. This study was conducted by comparing three distance algorithms namely Euclidean Distance, Manhattan Distance, and Haversine Formula. The results showed that the Euclidean Distance method was the proper method because this method had has the smallest Mean Absolute Deviation (MAD) with 1.71 in amount.

1. Introduction

Sidoarjo on Hands (SoH) is a mobile-based application which is intended to support Sidoarjo district promotion [1]. This application provides information about excellent potentials in Sidoarjo regency [2]. The SoH application was developed in two stages. The initial stage only displays potential data of Sidoarjo Regency. The second stage is equipped with features of recommended potentials of Sidoarjo Regency which is built by SoH. Furthermore, this stage matches with user's interest [3] and nearest location [4].

These two considerations are critical for users' fulfilling needs. Thus, adding an accurate location calculation relating to the potential displays is necessary.

Nowadays, various algorithms are offered to calculate distance estimation. However, in this paper, we focus on the comparison [5] of three main methods named Euclidean Distance, Manhattan Distance, and Haversine Formula. Then, we can recommend the best method to be implemented in the SoH application based on the smallest difference [6] between the calculation results and the actual distance.

2. Euclidean distance method

The Euclidean Distance method is a calculation between two points in the Euclidean space [7]. Euclidean space was introduced by Euclid, a mathematician from Greece around 300 B.C which focus on a relationship study between angles and distances. This Euclidean connects with Pythagorean Theorem and is applied in 1,2 and 3 dimensions. The formula of Euclidean Distance [8] is as follow:

$$d(x,y) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \quad (1)$$

where x and y are latitude and longitude. The results of this calculation is still in degree units whereas we need km as a distance unit. Thus, we have to adjust the result by multiplying with 111.319 km due to one degree of earth equal to 111.319 km.

3. Manhattan Distance Method

The principle of Manhattan Distance [9] replaces squares in the previous formula by adding the absolute differences from the variables. This procedure is called an absolute block or as known as city block distance.

$$d(x,y) = L_p = i(x,y) = \sum_i^n |x_i - y_i| \quad (2)$$

4. Haversine Formula

We use the Haversine method [10] to calculate the distance between two points angles on the earth's surface using latitude and longitude as input variables. Assuming that the earth is perfectly round with radius R 6371 km, and address of 2 points in the coordinate of the ball (latitude and longitude) are lat1 lon1, and lat2 lon2, then the Haversine formula is written using this equation:

$$d = 2R\sin^{-1}\sqrt{sin^2\left(\frac{\phi_2-\phi_1}{2}\right) + \cos(\phi_1)\cos(\phi_2)\,sin^2\left(\frac{\psi_2-\psi_1}{2}\right)} \quad (3)$$

where d is the distance between two points with latitude and longitude (ϕ,ψ) and R is the radius of the Earth. The Haversine formula is an important equation in navigation [11][12][13].

5. Result and Discussion

This research was conducted in the following stages:

(1) Collecting data by defining the user's starting point to 15 different destination locations
(2) Each starting point and a destination point will be recorded what the value of the coordinates are
(3) Measure the actual distance from the origin point to the destination point
(4) Measure the distance from the starting point to each destination using the Euclidean distance method, Manhattan distance method, and also the Haversine method
(5) Calculate the difference of each algorithm by comparing the actual distance value and the calculated value of the algorithms
(6) Calculating the absolute value of each error of the three methods
(7) Define the finest algorithm based on the smallest value in the calculation error

For comparing the accuracy of calculation between three methods, a user was in Sidoarjo town square with coordinates (-7.446061,112.717707), was given 15 different locations in Sidoarjo regency:

- Location A is Indah Bordir Sidoarjo (-7.444184, 112.720208) with the actual distance from the user's location is 2.4 km
- Location B is Intako Tanggulangin (-7.505345, 112.694379) with the actual distance from the user's location as far as 9.7 km
- Location C is East Java Province Cooperative and MSME Office (-7.381197, 112.741744) with the actual distance from the user's location as far as 11 km
- Location D is Ecco Leather (-7.473713, 112.714597) with the actual distance from the user's location as far as 3.8 km
- Location E is Mitra Jaya (-7.497852, 112.696946) with the actual distance from the user's location as far as 8.2 km
- Location F is Fitrah Jaya (-7.499064, 112.69749) with the actual distance from the user's location as far as 8 km
- Location G is UD Diya Aini Jaya (-7,501568, 112.705614) with the actual distance from the user's location as far as 7 km
- Location H is Gugum Leather Jacket (-7.499108, 112.700124) with the actual distance from the user's location as far as 7.7 km
- Location I is Yokohama Sandal (-7.352664, 112.748203) with the actual distance from the user's location as far as 12.8 km

- Location J is Hasta Indah Bordir (-7.502453, 112.707734) with the actual distance from the user's location as far as 6.8 km
- Location K is Permata Tanggulangin Collection (-7.50287, 112.703678) with the actual distance from the user's location as far as 8 km
- Location L is Maju Makmur (-7.498908, 112.697412) with the actual distance from the user's location as far as 8 km
- Location M is Teratai Indah Bordir (-7.494357, 112.687915) with the actual distance from the user's location as far as 9.6 km
- Location N is Yan Kurin Collection (-7.486597, 112.710988) with the actual distance from the user's location as far as 5.1 km
- Location O is UD New Paulo (-7.404576, 112.723424) with the actual distance from the user's location as far as 6.5 km

5.1. First iteration

For the first destination location, we used Euclidean Distance method, and the result as shown:

$d(start, A) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
$= \sqrt{(-7.446061 - -7.444184)^2 + (112.717707 - 112.720208)^2}$
= 0,35 km

Table 1 depicted the result of 15 locations using Euclidean Distance method

Table 1. Euclidean distance result

Origin	Destination	Actual Distance	Euclidean Distance Result
Start (Sidoarjo town square)	A (Indah Bordir Sidoarjo)	2.4 km	0.35 km
	B (Intako Tanggulangin)	9.7 km	7.08 km
	C (East Java Province Cooperative and MSME Office)	11 km	7.71 km
	D (Ecco Leather)	3.8 km	3.09 km
	E (Mitra Jaya)	8.2 km	6.2 km
	F (Fitrah Jaya)	8 km	6.31 km
	G (UD Diya Aini Jaya)	7 km	6.32 km
	H (Gugum Leather Jacket)	7.7 km	6.21 km
	I (Yokohama Sandal)	12.8 km	10.95 km
	J (Hasta Indah Bordir)	6.8 km	6.37 km
	K (Permata Tanggulangin Collection)	8 km	6.5 km
	L (Maju Makmur)	8 km	6.29 km
	M (Teratai Indah Bordir)	9.6 km	6.31 km
	N (Yan Kurin Collection)	5.1 km	4.56 km
	O (UD New Paulo)	6.5 km	4.67 km

5.2. Second iteration

We calculated using Manhattan Distance method and the result as below. More detail, table 2 showed the measurement of 15 locations

$d(start, A) = \sum_i^n |x_i - y_i|$
$=|-7.446061 - -7.444184| + |112.717707 - 112.720208|$
= 0.5 km

Table 2. Manhattan distance result

Origin	Destination	Actual Distance	Manhattan Distance Result
Start (Sidoarjo town square)	A (Indah Bordir Sidoarjo)	2.4 km	0.5 km
	B (Intako Tanggulangin)	9.7 km	9.19 km
	C (East Java Province Cooperative and MSME Office)	11 km	9.91 km
	D (Ecco Leather)	3.8 km	3,42 km
	E (Mitra Jaya)	8.2 km	8,07 km
	F (Fitrah Jaya)	8 km	8.14 km
	G (UD Diya Aini Jaya)	7 km	7.52 km
	H (Gugum Leather Jacket)	7.7 km	7.85 km
	I (Yokohama Sandal)	12.8 km	13.8 km
	J (Hasta Indah Bordir)	6.8 km	7.38 km
	K (Permata Tanggulangin Collection)	8 km	7.88 km
	L (Maju Makmur)	8 km	8.13 km
	M (Teratai Indah Bordir)	9.6 km	8.68 km
	N (Yan Kurin Collection)	5.1 km	5.25 km
	O (UD New Paulo)	6.5 km	5.26 km

5.3. Third iteration

For the first destination, when we measured using the Haversine Formula (3) method, the result was 0.35 km. Thus, for all destination, if measured using the Haversine Formula method, the calculation results are follows:

Table 3. Haversine Formula Result

Origin	Destination	Actual Distance	Haversine Formula Result
Start (Sidoarjo town square)	A (Indah Bordir Sidoarjo)	2.4 km	0.35 km
	B (Intako Tanggulangin)	9.7 km	7.01 km
	C (East Java Province Cooperative and MSME Office)	11 km	7.70 km
	D (Ecco Leather)	3.8 km	3.08 km
	E (Mitra Jaya)	8.2 km	6.19 km
	F (Fitrah Jaya)	8 km	6.29 km
	G (UD Diya Aini Jaya)	7 km	6.31 km
	H (Gugum Leather Jacket)	7.7 km	6.2 km
	I (Yokohama Sandal)	12.8 km	10.92 km
	J (Hasta Indah Bordir)	6.8 km	6.36 km
	K (Permata Tanggulangin Collection)	8 km	6.49 km
	L (Maju Makmur)	8 km	6.28 km
	M (Teratai Indah Bordir)	9.6 km	6.29 km
	N (Yan Kurin Collection)	5.1 km	4.56 km
	O (UD New Paulo)	6.5 km	4.66 km

5.4. Final result determination

The finest algorithm will be determined using the Mean Absolute Deviation (MAD) method [14]. MAD is a procedure for measuring the accuracy of the results of calculations with an average error (absolute value of each error) [15]. The formula for calculating MAD values below:

$$MAD = \frac{\sum_{i=1}^{n} |x_i - d_i|}{n} \quad (4)$$

where x is the actual distance data and d is the distance data obtained from the calculation results. The results of distance computation errors with the MAD method are as follows:

Table 4. MAD calculation

Origin	Destination	Actual Distance	Error in Computation Results: Euclidean Distance	Manhattan Distance	Haversine Formula
Start (Sidoarjo town square)	A (Indah Bordir Sidoarjo)	2.4 km	-2.05	-1.90	-2.05
	B (Intako Tanggulangin)	9.7 km	-2.62	-18.89	-2.63
	C (East Java Province Cooperative and MSME Office)	11 km	-3.29	-1.09	-3.31
	D (Ecco Leather)	3.8 km	-0,71	-7,22	-0,72
	E (Mitra Jaya)	8.2 km	-2,00	-16,27	-2,01
	F (Fitrah Jaya)	8 km	-1,69	-16,14	-1,71
	G (UD Diya Aini Jaya)	7 km	-0,68	-14,52	-0,69
	H (Gugum Leather Jacket)	7.7 km	-1,49	-15,55	-1,50
	I (Yokohama Sandal)	12.8 km	-1,85	1,00	-1,88
	J (Hasta Indah Bordir)	6.8 km	-0,43	-14,18	-0,44
	K (Permata Tanggulangin Collection)	8 km	-1,49	-15,88	-1,51
	L (Maju Makmur)	8 km	-1,71	-16,13	-1,72
	M (Teratai Indah Bordir)	9.6 km	-3,29	-18,28	-3,31
	N (Yan Kurin Collection)	5.1 km	-0,54	-10,35	-0,54
	O (UD New Paulo)	6.5 km	-1,83	-1,24	-1,84
	Mean Absolute Deviation (MAD)		1,71	11.11	1.72

According to Table 4, Euclidean Distance method has the smallest MAD value when it is compared to Manhattan Distance and Haversine Formula. Euclidean Distance method has an average error (difference) 1.71. It can be concluded that the Euclidean Distance method is more appropriate for SoH application.

6. Conclusion

The Sidoarjo on Hands (SoH) application is a mobile-based application intended to support the promotion of the Sidoarjo Regency. This application was developed in stages. In the final development phase, will be added a feature to display information about the distance from the current location of the SoH users to the location of the potential of the intended area. This study tries to find the most appropriate distance calculation method by comparing the three distance algorithms, namely Euclidean Distance, Manhattan Distance, and Haversine Formula method. The results show that the Euclidean Distance method is the proper method to be applied in SoH application. The most noticeable reason because this method has the smallest value in the calculation error of the distance obtained compared to the actual distance value.

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