

The Development of Geometric Design application

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บทคัดย่อ—วัตถุประสงค์ของงานวิจัย คือการพัฒนาแอปพลิเคชัน และการประเมินคุณภาพของแอปพลิเคชัน การทำงานของการออกแบบถนนตามหลักเรขาคณิต กรณีทางโค้งแนวราบ โดยการพัฒนาแอปพลิเคชันมาจากการศึกษาฟังก์ชัน และรวบรวมข้อเสนอแนะของผู้เชี่ยวชาญทาง ด้านวิศวกรรมสำรวจ จำนวน 5 ท่าน ด้วยเครื่องมือคือ แอปพลิเคชันที่สร้างขึ้น วิธีโอสอนการใช้งานแอปพลิเคชัน และแบบสอบถาม ผลการประเมินพบว่า โดยรวมมีคุณภาพอยู่ระดับสูงทั้ง 4 ด้านดังนี้ ด้านการออกแบบการนำเสนอ ในเรื่องลักษณะการออกแบบน่าสนใจ และความเหมาะสมของการใช้สี และตัวอักษร ด้านการประมวลผลในเรื่องความสะดวกในการป้อนข้อมูลค่า ด้านการแสดงผลมีความถูกต้อง และด้านการจัดการระบบจะเป็นเทคนิคการสื่อสาร กับผู้ใช้

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Abstract—The objectives of the research were to develop Geometric Design application and to explore the quality of this application. The development of the application was based on 5 experts' perception and their suggestions. Tools used in this project were: Video Tutorial, questionnaire and Geometric Design application. Finding were shown that the overall experts' considered on the quality was rated at high level covering the four areas i.e. 1. The presentation in term of interesting features, and the appropriateness of color and character, 2. The of processing input and 3. The accurate input management systems and 4. Systematical management for communicating techniques with users.

Keywords- Geometric Design; Application; Android

I. INTRODUCTION

Computer systems have been rapidly developed including engineering areas. The development of design and processing could lead to develop the computer system on a wireless device, including smart phones and tablets. So does network system. Network was associated with wire communication, such as telephone lines, Local area network to a wireless network, Wi-Fi and 4G, which can run anywhere the signal is available. The development of applications in this field is essential. To eliminate irrelevant working conditions could provide more efficient and faster work. Particularly, the road design, the work requires external storage capacity, such as the task of surveying. To measure results is needed to be processed and plotted picture. The results show that the error may exceed acceptable levels. This could lead to do resurvey as it caused of wastage and time consuming. It is necessary to develop such application immediately to carry on processing on both display screen and print out on a wireless printer, including backup over the network.

II. LITERATURE REVIEW

Road design is a form composition applies to the road safety principles. Road is the transportation related to Traffic Engineering from design determining the type of road, construction, quality control to Road Networks and Traffic Networks. The road will be constructed and develop to accommodate the travel of the vehicles. Construction of the road will be consulted with the Geometric Design that consists of Road Alignment Design, Curve Design, Sight Distance, and Intersection Design etc. Road Construction must be carefully considered the size, the weight, motion of the vehicles and the effects that will influence the movement of vehicles.[4]

A. Guidelines for Geometric Road Design

Geometric Road Design considers the following criteria.

- 1) The capacity to handle traffic volumes with various types and speed of vehicles.
- 2) Security and confidence to the drivers.
- 3) Avoid the immediate changes of road alignment; curves, slopes, slope distances and sight distance.
- 4) Relevant facilities and traffic control systems such as Signal Control Sign, etc.
- 5) Taking into account for the savings of construction and maintenance. In addition, the road design should also consider the aesthetics, the satisfaction of road users or people living nearby, society benefit and take into account about the pollution potential.[3]

B. Horizontal Curve Design

Horizontal Curve designs to have safety factor, the values that have to be consistent are; Speed design, Radius of Curve, Super elevation and Side Friction. These values must be balanced for speed design. Another important and necessary factor for safety design is Horizontal Sight Distance. It will be used to design curves that have lateral sight obstruction. The corresponding values are Radius of Curve, Offset Distance, Stopping Sight Distance and Length of Curve. Another important factor of Sight Distance for safety is Stopping Sight Distance and Passing Sight Distance. To design the safe route, at least, the prescribing of Stopping Sight Distance for stop points need to specify all along the route.[1]

Horizontal Curve consists of Circular Curve, Spiral Curve and Super elevation

1) Circular Curve

Circular Curve is divided into 2 types; Simple Circular Curve and Spiral Curve. For Spiral Curve commonly, is used for Alignment Design such as motorways and railways. Mostly, it is used for high speed alignment. The driver can control the turn easily with gradually radius changes with longer distance. Spiral Curve has longer length of the radius changes than the Simple Circular Curves. With a shorter radius, make the driver has to control the car to turn immediately. While turning, the car will have tremendous centrifugal force. If the car speeds exceed the design limited speed, it may cause an accident.[7]

2) Spiral Curve

To perform the curve design for high speed vehicles, designers commonly use spiral curve. This curve is a Horizontal Curve that can be connected to the other curves or connected to each other. In design, it is used from one curve connect to another type of curve. It's used for Sharp curve, Interchange, and Intersection. It will help the driver can easily control the car, help to balance the car while turning using the high speed.[7]

3) Super elevation

This is the way to have surface of the road on the curve having suitable slope angle toward the center of curve. While the car is moving toward the curve, with physics theory, there will be a force acting to the car which may cause the car to overturned or plowed out beyond the curve or very hard to control the car if the curve was not designed related to the speed of car. The force is the Centrifugal Force. This kind of force will occur to the car while running along the curve. Therefore, it is necessary to eliminate the centrifugal forces that arise by elevation method.[7]

III. METHODOLOGY

A. Development

Geometric Road Design Application. A case study of horizontal curve contain.

- 1) Java software used to create applications.
- 2) Wireless devices that are used to test application. Equipped with the operating system Android also includes Tablet or smart phone.
- 3) An application of images and text consisting information, the processing, the display, the transmission of data to social media. It could be an Email or Line etc. The data deletion and data copy are required.

B. Tools

The self-constructed of quality survey questionnaire with reliability 0.95, and Video Tutorial for Application, And GeometricDesign application.

C. Statistic techniques

Descriptive statistic i.e. Mean, Standard deviation were used to calculate the raw data.

D. Process

This project task was divided into two main process.

1) The researcher consulted with the 5 professional survey engineers and took their experiences and suggestions to develop GeometricDesign application. After that the GeometricDesign was returned to the 5 survey engineers experts for quality assessment. The 5 experts utilized the application in the work field and rated the quality of the application.

2) The researcher calculated the raw data from the 5 experts via descriptive statistic them.

In addition, the researcher conducted this project by gathering data from the department of Highways and 5 experts' activities

a) The two experts used this application by themselves on Rama II road in January.

b) The other 3 experts assigned the students of their classes to use the application at the field work in the semester of 1/2016.

In short, the all relevant data were gathered from 3 major sections from B - D.

IV. RESULTS

The result of the research shows that 2 parts include result of geometricDesign application and result of quality assessment as follows :

A. Results of GeometricDesign application

Results of GeometricDesign application showed as following :

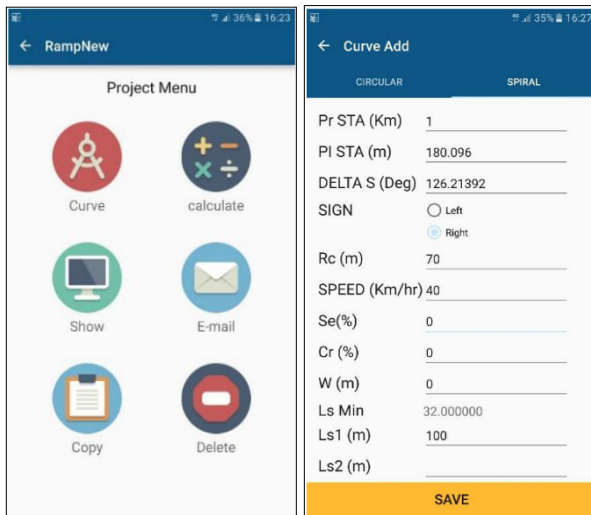


Figure 1 Project menu and Add menu

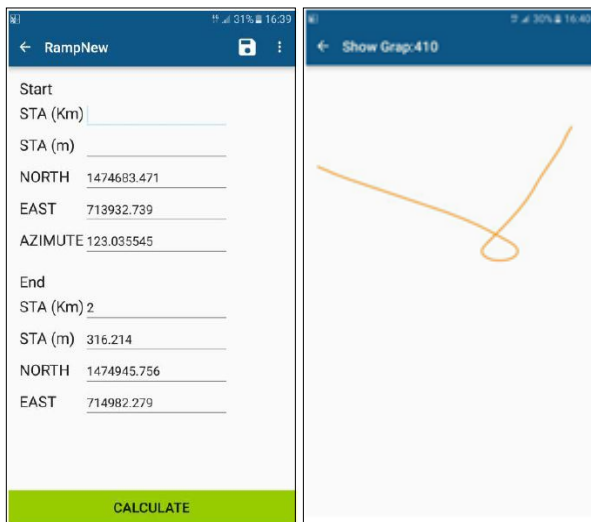


Figure 2 Calculate menu and Show menu

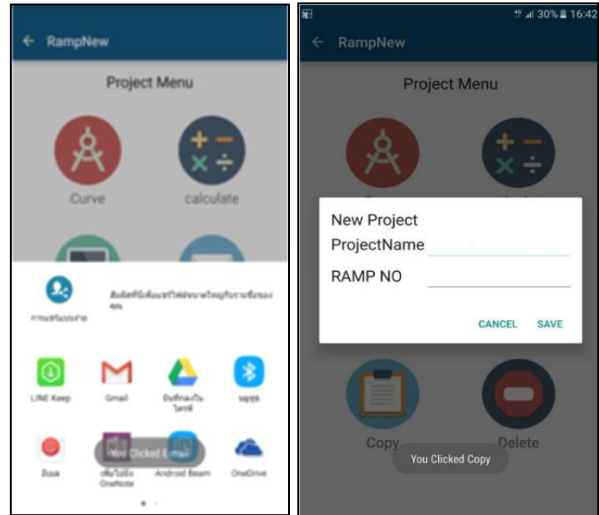


Figure 3 E-mail menu and Copy menu

B. Results of quality assessment

Results of quality assessment by 5 experts on GeometricDesign application showed as following :

Table 1 Results from the Evaluation of Design Presentation.

List assessment	\bar{X}	SD	Meaning
Side 1: Interesting features	4.40	0.55	Good
Side 2: The appropriateness of format	4.00	0.71	Good
Side 3: The appropriateness of color	4.40	0.55	Good
Side 4: The appropriateness of system	4.00	0.71	Good
Side 5: The appropriateness of character	4.40	0.89	Good
Side 6: The appropriateness of picture to convey	4.00	0.71	Good
Average	4.20	0.69	Good

Table 2 Results from the Evaluation of Processing.

List assessment	\bar{X}	SD	Meaning
Side 1: Accuracy of saving database	4.00	0.71	Good
Side 2: Accuracy of updating database	4.00	0.71	Good
Side 3: The ease of searching information	4.20	1.10	Good
Side 4: The ease of data input	4.60	0.55	Very Good
Side 5: Accuracy of displays on the screen	4.00	0.71	Good
Side 6: Accuracy of processing	4.40	0.55	Good
Side 7: Flexibility in providing information to the next	4.00	0.71	Good
Side 8: System reliability	4.00	0.71	Good
Average	4.15	0.72	Good

Table 3 Results from the Evaluation of Display.

List assessment	\bar{X}	SD	Meaning
Side 1 : Accuracy of displays	4.40	0.55	Good
Side 2: Fast displays	4.20	0.45	Good
Side 3: Appropriateness of display format	3.80	0.84	Good
Average	4.13	0.61	Good

Table 4 Results from the Evaluation of System management.

List assessment	\bar{X}	SD	Meaning
Side 1: Convenience and flexibility of usages	3.80	0.84	Good
Side 2: Convenience of menus utilization	4.00	0.71	Good
Side 3: Techniques of communication with users	4.60	0.55	Very Good
Side 4: Convenience of information utilization	3.80	0.84	Good
Average	4.05	0.73	Good

V. DISCUSSIONS AND CONCLUSIONS

This research was conducted to develop GeometricDesign application by using Java. The application was created and applied to Android. Design of the geometry of the interchange. A Horizontal curves was studied. Application can display the calculated length of the Horizontal curve is a circular curve or simple curve and Spiral curve. It can calculate the coordinates of the points. This reduce calculation time could as soon as the data was collected from the field and application could perform in the form of the images and report. In addition, the data obtained from the field could be returns via internet and select social media i.e. Line, Facebook, or email etc. This is used for decision making on the accuracy for further studies.

The overall quality perceived by 5 experts was found at high level covering 4 areas namely The Evaluation of Design presentation, The Evaluation of Processing, The Evaluation of Display and The Evaluation of Systematical management.

ACKNOWLEDGMENT

The researchers thank Rajamangala University of Technology Krungthep to support. Assistant Professor. Arthorn Juprang for his study.

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