**CHAPTER 5**

**RESULT AND ANALYSIS**

This chapter provides the result and analysis on the output of this project. The result of this project includes the user interfaces (UI) of the map visualization system and the administration data entry system, the evaluation of this system and its deployment. The analysis of this project is the discussion about the problems that occurred during the development of this project and how this project solves or find some alternatives for these problems.

**5.1 User Interface**

The user interfaces (UI) of the map visualization system are categorized into three simple levels, which show different information in each level. The first level shows the main view of the system when the viewer loads the system. The second level shows the gender distribution when the viewer clicked on one of the states. The third level shows the election result and ethnic distribution information when the viewer clicks on each of the individual hexagon that represents each parliament.

**5.1.1 First Level of Information**

The first level information shows the title, popup board (left) and the map visualization (right). The popup board introduces the viewer about the system and the map shows the data visualization.

The map visualization shows Malaysia map in the hexagonal coordinated form and each state is labelled according to its name. The states are a group of hexagons that represent parliaments. Figure 5.1 shows the visualization of the first level of information.

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| **Figure 5.1** The first level of information |

**5.1.2 Second Level of Information**

The second level of information shows the demographic information for a single state. This level is triggered when the viewer clicks on one of the states. The map will be zoomed in to the selected state and all other states will be blurred out in the background. These effects will help the viewer to focus on a single state instead of focusing on multiple states. Moreover, the gender demographic information for the selected state will be shown in the popup board.

The hexagons that represent the parliaments will change the color to represent the winning party during the election in that parliament. A white line around each hexagon will acts as a border that helps the viewer to differentiate between parliaments. A tooltip will also be shown when the viewer hovers over each hexagon and it shows the parliament code together with its name. The viewer can leave the current view by clicking the “Back” button in the popup board to go back to the first level of information. Figure 5.2 shows the visualization for the second level of information.

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| **Figure 5.2** Second level of information |

**5.1.3 Third Level of Information**

The third level of information presents the election result for each parliament. This level of information can be accessed when the viewer clicks on one of the hexagons in the second level of information.

The popup board will show the election result that represents each parliament. The information includes the parliament code, parliament name, winning party and its candidate, the total votes for each political party and the ethnic demographic information of that parliament. All these information are stored in the “election.json” data file. Figure 5.3 shows the view of the third level of information.

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| **Figure 5.3** Third level of information |

**5.2 Data Entry by Administrator**

The administration data entry system is made to ease the process of entering data into JSON data file. Instead of changing the values in JSON data which is not user friendly and time consuming, the data entry system is developed to ease the process of entering the data for the administrator. The data entry system is divided into three parts, which are parliament, demography, and election data entry. Each part corresponds to different types of data according to their usage.

**5.2.1 Parliament Data Entry**

Parliament data entry involves the administrator to input the data that are related to the parliament settings. Those data are parliament name and its coordinate in the map. Each parliament is denoted as their parliament code and each form data are associated to that parliament. The submitted data will be stored into the “parliament.json” data file. The user interface (UI) for parliament data entry is shown in Figure 5.4.

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| **Figure 5.4** Sample of UI for parliament data entry |

**5.2.2 Demography Data Entry**

Demography data entry form allows the administrator to input the data that are related to the demographical data for the states and its parliament. The states demographical data consist of gender data, which are the number of male and female in the state and its UI is shown in Figure 5.5(a). The parliament demographical data includes the ethnical data that are the percentage of Malay, Chinese, Indians, Sabahan, Sarawakian and other ethnics in that parliament as shown in Figure 5.5(b). The submitted data will be stored into “demography.json” data file.

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| (a)    (b)  **Figure 5.5** Sample of UI for demography data entry |

**5.2.3 Election Data Entry**

Election data entry form allows the admin to input the actual election data for each parliament. The data involves the name of election candidates for each political party, parties votes, and the name of the winning political party for that particular parliament. The submitted data will be stored in the “election.json” data file. The UI is shown in Figure 5.6.

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| **Figure 5.6** Sample of UI for election data entry |

**5.4 Evaluation**

The evaluation of this system is done by validating the accuracy of the data visualization output with the actual election data input. This process involves determining whether the resulting output is the expected output from a given input. The input are the actual election dataset and some other dummy dataset to test the correctness of the visualization according to a changing data. The actual election data were taken from <https://election.thestar.com.my/>, which is a visualization prepared by The Star newspaper company. The evaluation process involves the actual election dataset to test the accuracy of the system.

Table 5.1 shows the result of the visualization when the actual election data and the dummy data were input into the system. The table will only show certain parliament as a sample output for the given input and parliaments in Perlis state were chosen as the sample visualization because it is the states that has the smallest number of parliaments in Malaysia, which is only three parliaments and to make the process of explaining the evaluation process easier. The table were arranged by parliament and the input column shows the content of JSON data file while the output column shows the actual output based on the data file content. Table 5.1 shows the comparison between input and output of the actual election dataset. Table 5.1 shows the input data file and its output in “parliament.json”, “demography.json” and “election.json”.

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| **Table 5.1** Sample input and output for actual election data   |  |  | | --- | --- | | **P001 – Padang Besar** | | | **Input** | **Output** | | parliament.json |  | | election.json |  | | demography.json |  |   (a)   |  |  | | --- | --- | | **P002 - Kangar** | | | **Input** | **Output** | | parliament.json |  | | election.json |  | | demography.json |  |   (b)   |  |  | | --- | --- | | **P003 - Arau** | | | **Input** | **Output** | | parliament.json |  | | election.json |  | | demography.json |  |   (c) |

Based on Table 5.1, the data for the parliament, its demographical data and actual election data are taken directly from The Star Newspaper online data visualization. The data consist of the actual parliament name and code, the name of the political party representatives, number of votes won by each parties and the winning party’s code. Figure 5.7 shows the screenshot of the actual data from the online newspaper. Based on the result shown in Table 5.1, it can be concluded that the data presented in the visualization is accurate because all of the data stated in the input file were correctly processed and populated to represent the output as shown.

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| **Figure 5.7** Screenshot of The Star Newspaper online data visualization  (Retrieved from The Star Online GE14, 2018) |

**5.5 Deployment**

The system is deployed on a personal hosted server with the URL of [*http://beta.seladanghijau.com/ge14*](http://beta.seladanghijau.com/ge14)*.* The server is a Linux hosted server with its main domain as [*http://seladanghijau.com*](http://seladanghijau.com)and this project use its sub-domains, which is [*http://beta.seladanghijau.com*](http://beta.seladanghijau.com)*.* Furthermore, this server uses cPanel as its main server control panel.

**5.5.1 Deployment for Malaysian Election Data Visualization Website**

There is no extra configuration needed for the server because this system is fully optimized for client-side scripting purely using Hypertext Markup Language (HTML), Cascading Stylesheet (CSS) and JavaScript (JS). Furthermore, the system does not use the server-side scripting language, and this will allow the system to be uploaded at any server without the extra configuration such as Database Management System (DBMS). There are several files and folders that needs to be uploaded into the server and those files are shown in Figure 5.8.

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| **Figure 5.8** File list for the data visualization system |

**5.5.2 Deployment for Administration Data Entry**

The administration data entry system is developed using Hypertext Programming (PHP), a server-side scripting language. Apache should be installed in the server first before the system can be installed. Then, the developer can copy and paste the related folder into the server. There are several files and folders that needs to be uploaded into the server and those files are shown in Figure 5.9.

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| **Figure 5.9** File list for the administration data entry system |

**5.6 Discussion**

This section discusses the reasoning behind the problems occurred during the development for a certain area mentioned in this report. The discussion includes what and how the problems occurred during the development.

Even though flat-top hexagon can still be achieved by using a transformation method (rotation), the coordinate system will not be the same and this will lead to a randomly generated hexagon even though the developer uses the same coordinate for each hexagon. For example, a pointy-top hexagon coordinate is at (0, 0), but when it is rotated 90°, the coordinate that were registered will still be the same which is (0, 0), but the actual coordinate that were shown by the browser is (-10, 10) which in this case is not the same as the expected output. The expected output is a rotated hexagon tile with the same coordinates.

Moreover, other problem that occurred during the development of this project is visualizing a border line between each state. This problem occurs in the first level of information and the expected result should be Malaysia map with states separated by its outlines. The states are separated from each other to differentiate the states rather than using colors to differentiate them.

Other than that, there are some problems regarding the labelling for pie charts. In the pie chart, each section should be labelled accordingly, and each label should be visible to help the viewer to interpret them. Unfortunately, if the data for that section is too low, then the section becomes very small and this leads to the label being overlapped with other labels. This is the common overlapping issue in pie chart that usually happen when the size of section is too small, and the labels tend to overlap. As a solution to this overlapping issue, this project uses callout style of labelling.

**5.7 Summary**

In summary, this chapter explains about the result of the development for this project. The result for this project includes the user interface (UI) representation of the system which is composed of two systems; one is the hexagon map election data visualization, and the other one is the administration system for data entry. The hexagon map data visualization has three levels of information and each level shows different type of information. For example, the first level of information shows the general idea of the system, which is the map itself and introductory word; the second level of information presents the distribution of parliaments on a certain state and this level is triggered when the viewer clicked on the state; and the last level shows the election result for a parliament and this level is triggered when the viewer clicked on one of the parliaments in second level of information.

Furthermore, this chapter also discusses about the evaluation result of the system and it is done by validating the accuracy of the output with the given input. The evaluation is done to test the accuracy of the information displayed in the system by comparing the value of the input files with the actual output and it is done by comparing 2 different datasets which is the dummy datasets and the actual election datasets. Lastly, this chapter also discusses about the limitation of the system, why it happens and how certain problems are overcome during the development. Most of the problems encountered during the development of this project were overcame by using other alternative methods. For example, the problem of visualizing border lines between the states are overcome by giving each state a unique color so that the viewer can distinguish between states.