

# The Development of Facility Database for FKAAB Building Using GIS Application

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**Abstract:** Geographic Information System (GIS) is a digital design that function to overcome the problem on the lack of data information about the location of building and facilities. The Development of database for Fakulti Kejuruteraan Awan dan Alam Bina (FKAAB) building by using GIS application. This database development is the way to overcome the hard time that FKAAB occupants faces in order to orientate themselves and find the exact locations that they needed. QGIS were used as an GIS software for developing the database. The method on developing the database consist of two phases which is phase 1 (database design) and phase 2 (database development). Three-software used in developing the database which is Excel for collecting data (attribute data), AutoCAD for editing the drawing (spatial data) and QGIS for developing the database. This research focus on the laboratories at FKAAB building to find or search the information provided such as department, cluster, name of laboratory, room no, name of lab assistant, phone and office number, email and also photo. From the questionnaire conducted most of the FKAAB occupants (60.8%) agree that making finding will be easier by using the map with the photo provided. The development of database for laboratories very useful which directly show the direction of the laboratory were located with the help of the information. This database really useful for FKAAB in order to improve the laboratories management.

**Keywords:** Database Development, Building Facilities, GIS

## 1. Introduction

In this new modernisation era, Malaysia was born to be a developed country that have complete of technologies, stable politics and stable in economic issue. Malaysia have too much development include of complex infrastructure to fulfil the need of society and also the modern lifestyle. A complex infrastructure is mean to a university campus [1]. There are too many new developments such as more facilities and building were build in the campus due to the accurrences of population increase and the

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rapid development to make the objective of the campus which is to achieve the higher education standards including consideration of student's satisfaction. Student either lecturer or staff might have a hard time to orienting themselves and finding place, [2]. To overcome this problem, construct a technologies with direction and show off the locations to the place needed might help and solve the problem. Web application called as Geographic Information System (GIS) was designed to overcome the problem on the lack of data information about the location of building and facilities. GIS will allow users to visualize, analyze and manage spatial data that is geographically referenced by developing a computer and network software and hardware, [3]. By comparing with Waze and GIS, Waze is a remote sensing that will functionally update the traffic conditions for other users, while GPS information is about the speed of the vehicle and the geographic data where is updated and corrected via community input on their application which is more on navigations and road displays but for the GIS, it might provide a geographical data with more accurate information [4]. In this study, it will focus on development of facility database in FKAAB building by using GIS application. QGIS as a GIS application were used as a medium for database development in order to make the system is functionally and efficiently. FKAAB building contains many types of building such as laboratory, seminar room and lecture room. By developing the database using QGIS will help the user make finding for get the accurate location with the complete information.

Objective for this project is to develop the laboratory database for FKAAB building, to design the database into GIS application, to make finding on infrastructure location information. This study required several data collection to develop a database of FKAAB facilities. These data were including the laboratories, lecture room, classroom and its capacity could occupy. Rather than that, manual inspections also conducted to get other information of upcoming facilities or infrastructure.

## 2. Literature Review

A literature review is a comprehensive summary of the previous research on a topic by doing a survey on scholarly articles, books, and other sources that relevant to an area of research. This chapter will explain in detail about the FKAAB building facilities. This section also focuses on the introduction of the GIS application and also QGIS as an GIS application.

### 2.1 Geographic Information System (GIS)

Through the modernization era with the complex building and the increasing in development of building and infrastructure, GIS were used to analyze the physical locations as a specialized information system and used in a wide range for academic and applied fields that will simply put where it allows to combine the tabular data with a geographic boundary. A GIS is a digital technology that integrates hardware and software in order to analyze, store and map spatial data [5]. GIS as a career where it needs three stages of specialist on development of GIS. The three stage is tool user, tool maker and the more expertise is GIS Scientist. Specialist is needed in order to make the GIS system work functionally [6].

### 2.2 QGIS as an GIS application software

Quantum GIS (QGIS) is a commercial and the most popular GIS software options where it is an open source platform for geographic information system (GIS) that supports geospatial vector, raster file and database formats [7]. It also supports on viewing, editing and analysis. QGIS were able to support both raster for pictures and vector layers. PostGIS, GRASS GIS and mapServer is an open source of GIS package that QGIS could be integrate with. Somehow QGIS can also integrate with a range of BIM software and procedures, allowing for seamless integration of GIS, CAD, and other data sets [8]. Using QGIS it will also support shapefiles, coverages, personal geodatabases, dxf (data from excel format), Mapinfo and might import from different file format including KML.

### 3. Materials and Methods

In the main, QGIS is a commercial GIS software options where it is an open-source platform for GIS which support viewing, editing and analysis of geospatial data. This part will discuss about the methodology that used to provide the guidance and direction to ensure the workflow system development process. The detailed information will be provided about the method and the procedure of this application. To ensure a systematic workflow, a framework has been developed as shown in figure 3.1. There are five phases of work in the application development process which in each stage is explained in detail.

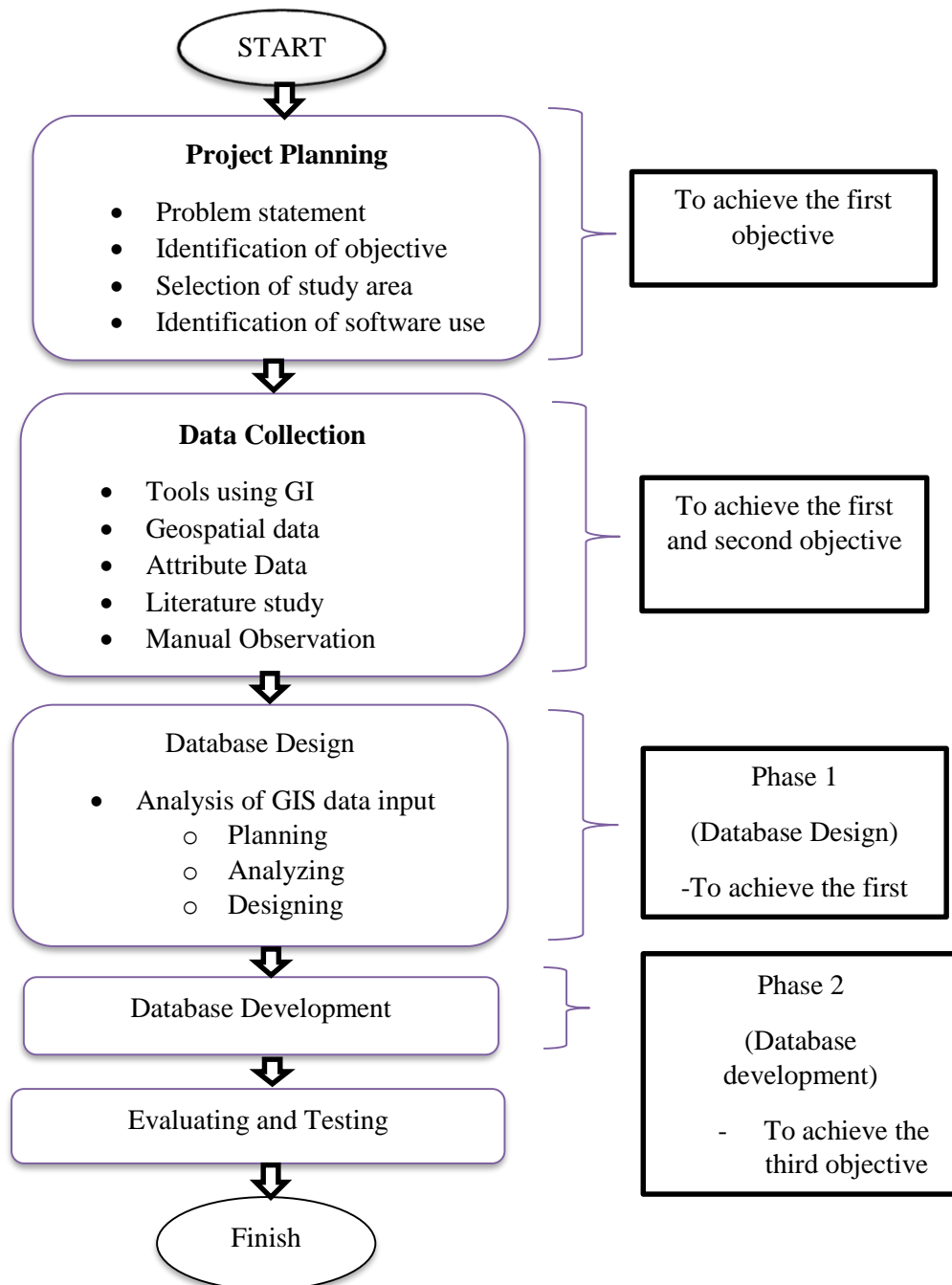


Figure 3.1: Methodology workflow

### 3.1 Phase 1 (Database Design)

In this phase, it defines the design of the database that directly requires the data to perform suitable information about the FKAAB building. There is several software were used in developing the database such as Excel, AutoCAD and QGIS.

#### 3.1.2 Attribute Data

As a first step on developing the database is collecting data. Google sheet were chosen for one of the methods of collecting data as a spreadsheet. The google sheets is a simple way and flexible for the target to filled in the form. It spread to the person in charge (lab assistant) in every laboratory in FKAAB building in order for getting the information of the laboratories. Google sheet can easily exchange the data into csv file and it will use a less time on working it. There are several of data should be fill in such as department, cluster, name of laboratory, room number, name of lab assistant, phone and office number, email and also picture for make the users easily make a finding of the laboratory they need. In order to develop the database, csv file is needed to add as a vector layer in QGIS. CSV file is a simple text file that you can open in a wide variety of programs. A CSV file typically separates the information using commas as a way to exchange structured information, like the contents of a spreadsheet, among programs that can not necessarily talk to one another directly. As long as two programs can both open a CSV file, it can exchange data such as save some information from Microsoft Excel as a CSV file, and import it into the QGIS as a delaminated text layer. The data will be shown by clicking on the laboratory drawing plan.

#### 3.1.3 Spatial data

In this phase, AutoCAD are used as a medium for editing the FKAAB plan drawing. AutoCAD can work with two common type of file which is DWG and DXF file. In this work, the plan should be saved as DXF file as a requirement for using on QGIS to be add as a vector layer. This is because of the wide popularity of the software has ed the development of other tool s to visualize and even open native AutoCAD files through an information exchange system. In QGIS for adding a vector layer the file format must be in DXF file to make it exchange the system without effect the drawing. The FKAAB building drawing should be edit to be a plan drawing. In this development, it focuses on the facilities in the FKAAB building which is more to the various type of laboratory under four department. Before the drawing imported into QGIS, it should be edit by doing new line by using polyline only for laboratory in order to make it in polygon while it transferred into QGIS.

### 3.2 Phase 2 (Database Development)

In the development of database for FKAAB building facilities, it is importance to give the functional design, minimalist design and user-friendly design to help the user make a finding easily and need less time. In order to make it user friendly and more efficient every single aspect was planned carefully.

#### 3.2.1 Interaction Design

The interface design is the part where it makes connection between the user and the computer. In this phase of development, it will use a QGIS software version 3.10. This version is more stable and more effective to be use for this development phase. The drawing from AutoCAD file will be add into vector layer which is in the DXF file format. DXF file will make it exchange system easily without bring any effect to the drawing.

The vector layer should be shapefile format in order to make it in polygon which it is easier and can do the editing by clicking on toggle editing. The shapefile will come out with the attribute table. Put an ID to every laboratory as their id to be link to the data where the id can be in numbers or alphabeted. The lab ID in followed by the total number of laboratories such as the total laboratory is twenty, the come out will be laboratory number one, two, three until twenty.

To make sure the drawing is link to the data from the csv file, the ID must be same as in QGIS for the vector layer of drawing plan. The csv file must be provided with ID including the other data that needed for the laboratory information. This development does not need other database as a medium for connecting the map, it just only one software called QGIS for connecting data and map, it will also be using a OpenStreetMap for getting the name of road and others if developing a building locator. QGIS is more efficient for making this development of database FKAAB building. Import the data from the csv file format as a delaminated text layer. In order to make it link and connected to the drawing open the properties of the plan and joints the attribute table by using the ID and then check with the attribute table. The attribute table will successfully link and it will completely show the information for the laboratory selected. This database is more focus on laboratory only and it will only view all the laboratory in FKAAB building. Since the QGIS is a dynamic software, the drawing can zoom in and zoom out easily.

#### 4. Results and Discussion

As a part from obtaining the result, it should be done by having a questionnaire and the testing of the database but for this development of Database for FKAAB building only focus on laboratory and it could not be testing yet. The database was not fully completed as well. The testing will be shows about the laboratory information only. The Questionnaire was spread by using WhatsApp group and targeting for having 50 responses. In this chapter will be explained about Developing Facility database for FKAAB building by taking into account of the result from the questionnaire.

##### 4.1 Database for FKAAB building facility testing

In this phase, the testing must be done to make sure the database can give the correct information about the laboratory. By select on the laboratory needed the database will show the location of the laboratory and the information about the laboratory. The figure 4.1 shows when it click to the laboratory number three it will show the link of image located. By clicking the link the image will appear on the screen.

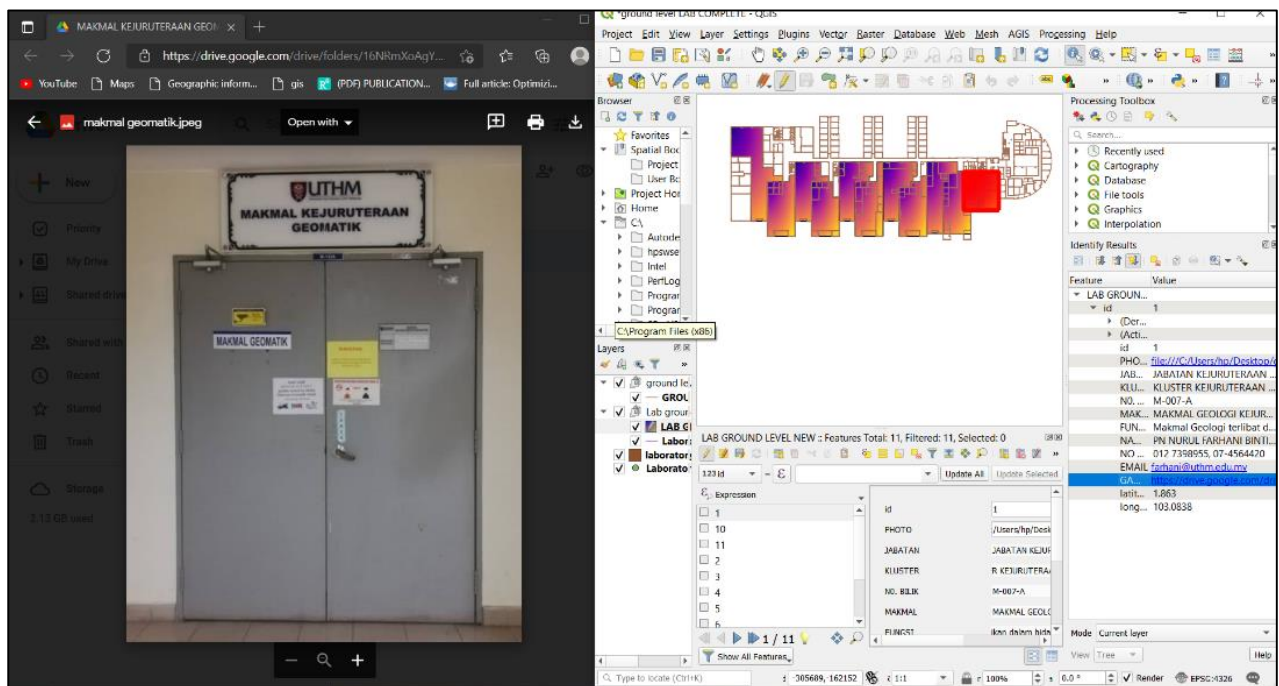


Figure 4.1: Laboratory 1 with the view of image

Next, as shown in figure 4.2 when it click for laboratory ID number three, the detail information about the laboratory will be appear. The result appeared on the map with the marker pointing to the selected location. The information provide in “DEPARTMENT”, “CLUSTER”, “LABOURATORY NAME”, “LAB. ASSISTANT NAME”, “FUNCTION OF THE LAB”, ”PHONE AND OFFICE NUMBER”, “EMAIL” AND “PHOTO”.

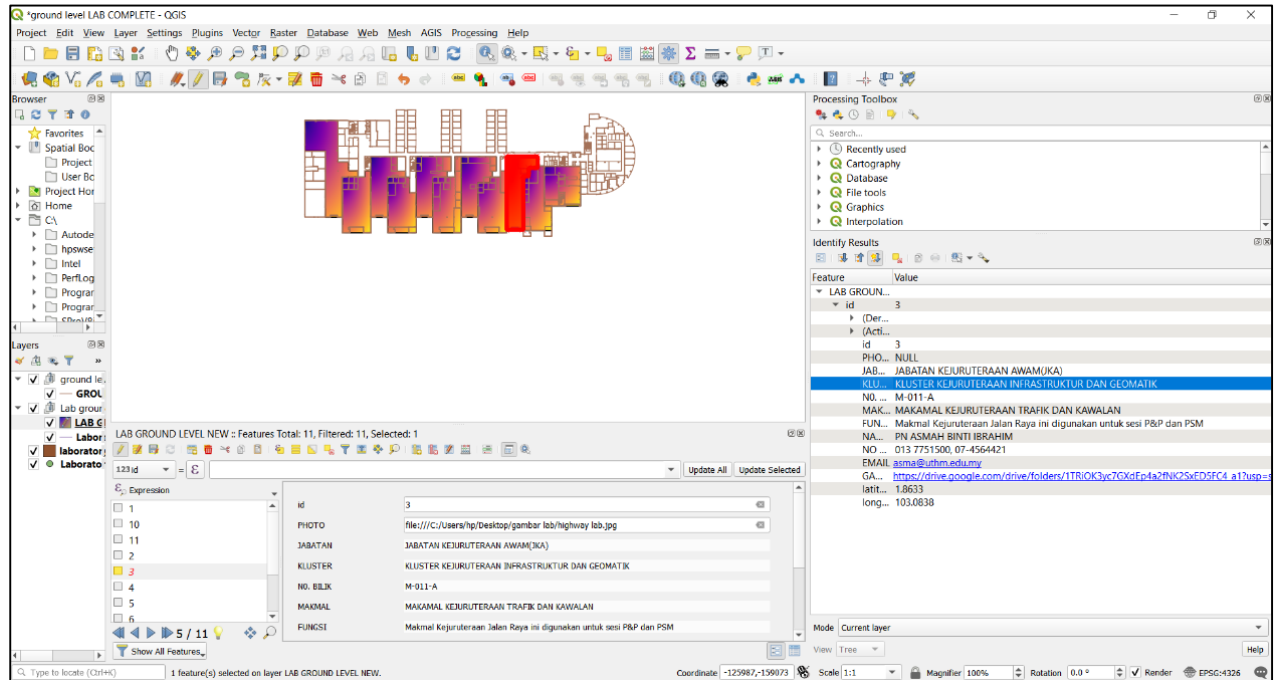


Figure 4.2: Selection of Laboratory 3

From the figure 4.3 below the spatial data shows as a drawing plan, where the laboratory were located. It show laboratory with ID number three were located at between laboratory ID number two and four and it is at the left side if the occupants were come from the FKAAB office and it will be at the right side if the occupant were come from the nort east tower. The spatial data will help the occupants in order the direction of the laboratory from where they are standing. The occupants can imagine were the laboratory exactly located.

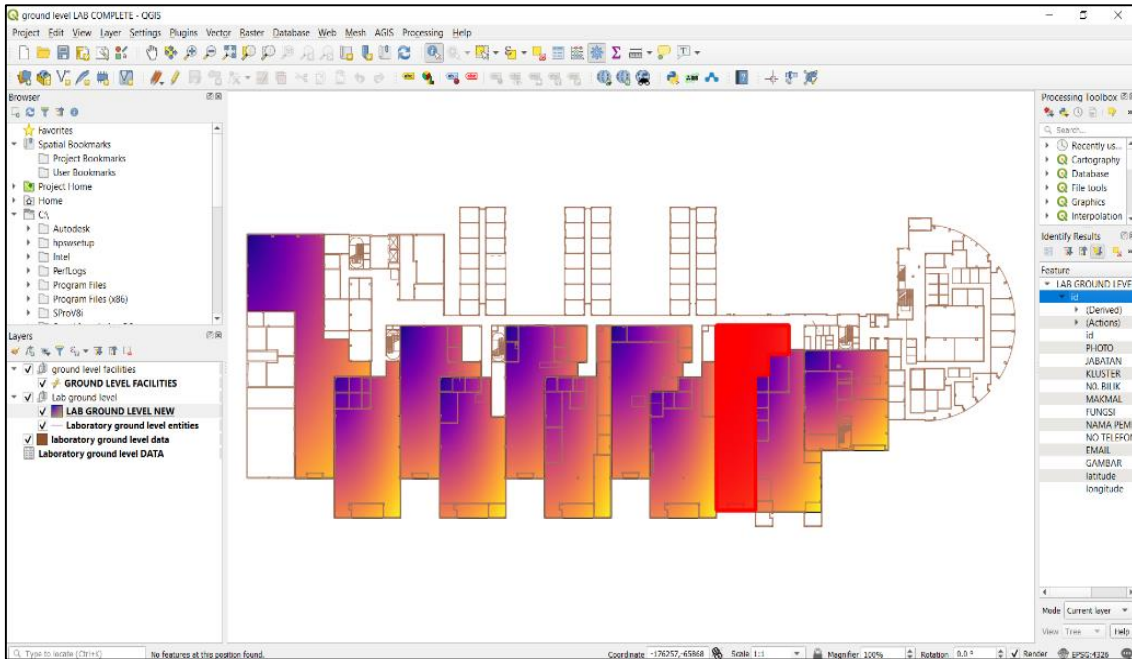


Figure 4.3: The plan of the facility for FKAAB building

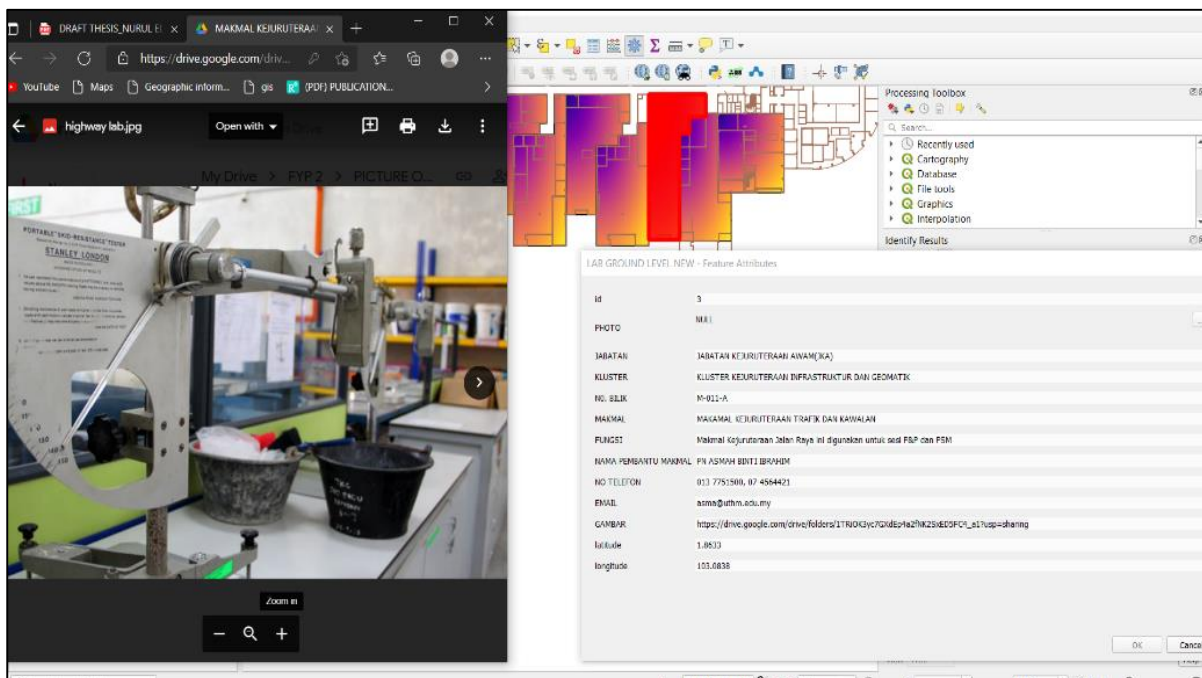


Figure 4.4: The information of the laboratory

As shows in figure 4.4, the information needed will pop up after clicking the laboratory. The information is a attribute data the have been inserted as a delaminated layer before as a attribute table that link to the plan using an ID. The information given for laboratory three shows, it is a “MAKMAL KEJURUTERAAN TRAFIK DAN KAWALAN” under of Civil Engineering department. The room number for laboratory with an ID number three is M-011-A. By clicking the link provided for photo of the laboratory part, the image inside the laboratory and infront of the laboratory will pop up. It will help the occupants view the image and make the finding accurately beside with the help of the room number and the direction from where they are stand. From the help of spatial combine with the attribute it will really help the occupants to orienting themselves and make a finding with the short time without having a hard time.

## 5. Conclusion

The aim of this study was to develop a facility database by using GIS application which helps the students, lecture and guest who occupants and visit in FKAAB building to find their locations of the facilities. A database was created in order to achieve the aim of this study as already mention in methodology in chapter 3. The Data was obtained from many sources such as attribute data from spreadsheet and PPH website that already put in appendix, manual inspection to capture the image of the laboratory and literature research.

This database will help the users with the information provide such as room number, phone number of lab assistant for student place a call for asking if it available for reservation or for making a appointment for using laboratory. In future for, it will help users by developing an application of facilities locator for FKAAB building after this system fully completed. This system could not be fully completed due to the pandemic covid-19 that limit and complicating the matters of data collection.

The development of database for facility of FKAAB building is very help the student on making their finding and very useful which it can use less time, and can reach the location on time without doing a building tour that is because the database will directly show the direction of the laboratory were located with the help of the information provided. By using the QGIS as GIS application, the future developments can be updated time by time and could be easily use. The QGIS is also user friendly with with more complete tool rather than other GIS application. This study will expose the capabilities of GIS application and could encourage others for using QGIS for geographic work.

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