Development of Digital Map System for Poor Population Distribution

Wahyu Yanuartha¹, Mohammad Fadli², Tina Tri Wulansari³, Abiratno⁴, Nariza Wanti Wulan Sari⁵ dan Martinus Robert Hutauruk⁶

¹ Departement of Information System, Mulia University, Samarinda, Indonesia
² Faculty of Economic and Business, Widyagama Mahakam University, Samarinda, Indonesia

wahyuyanuartha@universitasmulia.ac.id

Abstract. The implementation of this study aims to present information not only in the text/tabular form but also in the spatial/digital map form to support the poverty alleviation programs in East Kalimantan, especially in Samarinda and Balikpapan, hence information obtained can be more easily analyzed, identified in terms of the poor population distribution in the visualization form. It presented as a list an area, graph, detail data and geographical map integrated with Google Maps. This application was developed using PHP scripts, Apache Webservers, Codeigniter Framework, CCS Bootstrap, MySQL database, and google maps API. Poor data collected from the Central Bureau of Statistics and the results of the survey through questioner and interview respondents. The information presented in this system is the resident name, identification number, address, employment, income, education, residence status and photo of living conditions/person.

Keywords: Digital Map, Poor Population, Geographic Information System

1. Introduction

Currently, technology is required in all aspects of life because with the existence of information technology is expected to accelerate and simplify the process of delivering the information. One of the government programs is improving the welfare of the people in eradicating poverty in the regions, therefore to support the program, it is necessary to have fast, precise and accurate information support, and can present it in a visual form related to geographical conditions, especially in the East Kalimantan. East Kalimantan is divided into seven districts that are Berau, West Kutai, Kutai Kartanegara, East Kutai, Paser, North Penajam Paser, and Mahakam Ulu and three cities that are Bontang, Samarinda, and Balikpapan. The presence of computer system technology that continues to develop both in the form of hardware, the ability of users or user software is expected to facilitate the process of delivering the information. Digital Maps or commonly referred to as Geographic Information Systems (GIS) is one of the information systems that is currently a tool that is widely used in presenting information in geographical form, because with Digital Map, it is more efficient in terms of storing, manipulating, analyzing and displaying again geographical data with facilitate of spatial data and attribute data. Digital Maps is a data unit consisting of physical and logical data relating to objects on the earth’s surface [1]. The existence of a digital map system, the government can more easily visualize the conditions and distribution of the existing poor population, it can be used by the government to decisions support and determine the direction of improving the standard of living of the poor.
2. Literature Review

2.1. Poor Definition according to The Central Statistics Agency (BPS) 2005
1. The floor area of residential buildings is less than 8 m² per person
2. Type of floor of a residential building made of cheap soil/bamboo/wood.
3. Type of residential wall made of bamboo/thatch/low-quality wood/wall without plastered.
4. Do not have bowel facilities/together with other households.
5. Household lighting sources do not use electricity.
6. The source of drinking water comes from wells/unprotected springs/rivers/rainwater.
7. The fuel for daily cooking is firewood or charcoal or kerosene.
8. Only consume meat/milk/chicken once a week.
9. Only buy one new set of clothes in a year.
10. Only able to eat as much as one/two times a day.
11. Unable to pay for medical expenses at the polyclinic.
12. Sources of income of household heads are farmers with an area of land 0.5 ha. Farm laborers, fishermen, construction workers, plantation laborers, or other work with an income below IDR 600,000 per month.
13. Highest education head of household is not attending school/not completing elementary school/only elementary school.
14. Do not have savings/goods that are easily sold with a value of IDR 500,000, such as motorbikes (credit/non-credit), gold, livestock, motorboats, or other capital goods [2].

2.2. Geographical Information System
Geographic Information System is a system used to store and analyze objects and phenomena of geographical location. It is important or critical characteristic to be analyzed [3]. The main components of GIS are showing in Figure 1 below.

![Figure 1. GIS component](image)

1. Hardware. GIS is available for a variety of hardware platforms ranging from desktop PCs, workstations, to multiuser hosts that can be used by many people simultaneously on a large, capable computer network, has large storage space (hard disk) and has a large memory capacity.
2. Software. Some software is needed to support a better presentation of GIS, for example, ArcGIS, QGIS, Mapinfo. The choice of GIS software is very dependent on some factors that are the purpose of the application, the cost, and the user's ability to use the GIS software.
3. Data and Information. Geographic information systems can collect, process and store data and information needed either indirectly by importing it from other GIS software or supporting software or directly by entering its attribute data or by digitizing spatial data from maps which have been there before.
4. Management/Users. User or management function is to select the information needed, make an efficient updating schedule, plan applications and analyze the results issued by user needs, especially at the end-user level [4].

2.3. Google Maps Application Programming Interface (API)
Google Maps is an online map service provided by Google for free. The official Google Maps service can be accessed through the site http://maps.google.com. At this site, geographical information can be
seen on almost all the earth's surface. This service is made very interactive because in it the map can be shifted, change the zoom and change the map display by the wishes of the user. Google Maps has many facilities that can be used for example location search by entering keywords such as the name of a place, city or street. So that these keywords can be known as calculation of travel routes from one place to another [5].

API (Application Programming Interface) is a set of commands, functions, components, and protocols provided by the operating system or a specific programming language that can be used by programmers when building software. In the API there are functions or commands to replace the language used in system calls with languages that are more structured and easily understood by programmers [6].

Benefits of using the API:
1. Probability, the API can be used for any programming language or operating system as long as the API packages are installed.
2. Easier to understand, the API uses a language that is more structured and easy to understand, this is very important in terms of editing and development.
3. Easy to develop, makes it easy for programmers to develop a system.

2.4. Use the Google Maps API;
The process of writing the Google Map API program is as follows:
1. Incorporate the JavaScript API into our HTML.
2. Create a div element to display the map.
3. Create several literal objects to save properties on the map.
4. Writing JavaScript functions to create map objects.
5. Initiates maps in HTML body tags with the on-load event [7].

3. Method
In this research will be developed in the software form, that can be used to process data and present information in the visual geographic information systems form according to the institution requirement can be accessed through a web browser on the internet so that it can be accessed from anywhere and at any time. The data source used came from the Central Statistics Agency data as well as from the results of surveys and filling out questionnaires from each poor population with case studies in Samarinda and Balikpapan. The methodology used for system development uses a waterfall with stages starting from analysis, design, development, implementation, and testing as well as evaluation.

4. Result
4.1. System planning
The system that will be built run using a web browser that is in each user such as Mozilla Firefox, Google Chrome, Opera, Internet Explorer and others. The architectural description of this system is as follows:

![System architecture](image)

**Figure 2.** System architecture

Users communicate with the system through a web browser, if this website is opened, then the browser will display web content from sites that are on the web server. This web application will interact interactively with the user, if the user makes a command, then the execution will be processed in the browser or webservice, and if there is a request from the application to access the database, the database will be called into the program taken from the web server, then request the data requested by Google Maps server. The result is a map, as well as objects owned by Google Maps which will then be returned to the web browser in the form of a map display that has the location points requested in it.
This web application has four menus namely a menu displaying the location of the distribution of the poor in the form of the digital map, menu filling the master tables of provinces, districts and others, a menu for filling in a transaction of the poor, and the report menu both in the form of a list of poor people and the form of a bar graph per district. To model a system application using Context Diagrams to illustrate system data flows and entities.

4.2. Menu Navigation Design

Development of a digital map system distribution of poor people using the navigation menu as showing below.

Description of the menu above can be detailed as follows:
1. When opening the main page for guest users/guests can only access the distribution of poor people in the form of digital maps integrated with google maps and if the user wants to know detailed information of these residents can be clicked on the point in the map so that appear detailed information will appear from the population.
2. When the login menu is clicked, the username and password fields will appear to be able to update the data of the poor population.

If the login is entered into the application correctly the menu options will appear as follows:

   a. The Master Menu contains Province sub-menus to fill in the provincial master data, the Regency to fill the district master data by the province, the Kelurahan to fill the village master data according to the district and city to fill the city master data.
   b. The transaction menu contains filling/changing/erasing poor population data that will be input into the system.
   c. The Report Menu contains information reports in the form of lists or graphs of poor population per district.
4.3. Database Design

![Design database](image)

**Figure 5.** Design database

4.4. Analysis Results

In the main page that appears is a Kalimantan map display with its guest level, where the guest level can only display a map of the distribution points of the poor population and if desired can see the details of the poor population by clicking on the point as shown below.

![Main display guest](image)

**Figure 6.** Main display guest

To fill, update or delete data of the poor population must login first, the login menu display as shown below.

![Login access display](image)

**Figure 7.** Login access display

If the username and password are found then a menu display will appear as Figure 8 below. Where the menus that can be accessed are the Home menu to find out the distribution of the poor population at the guest level above, the master menu to fill in the master data of provinces, districts and cities, transaction menus to fill in the master data of the poor, report menus to display reports in the form of list and in graphic form of poor population.

![Main display admin](image)

**Figure 8.** Main display admin
5. Conclusion
The development of this digital map system can provide effective solutions for the government in taking steps for equitable economic growth and can also provide real time and informative information in presenting the distribution of the poor based on indicators imposed by the Central Statistics Agency. In addition, it can be used as a reference by local governments to develop poverty reduction program strategies.

The results of the digital map system need to be immediately implemented in the province of East Kalimantan in particular. Furthermore, to improve the research, it still needs to be developed further in order to be better

References
[1] A. Ekadinata, Sistem Informasi Geografis Untuk Pengolahan Bentang Lahan berbasis Sumber Daya Alam. Bandung: ICRAF, 2008.
[2] Badan Pusat Statistik, “Jumlah presentasi penduduk miskin.”
[3] E. Prahasta, Sistem Informasi Geografis: Membangun Aplikasi Web-based Geografis Information System Dengan Map Server. Informatika., 2007.
[4] Subaryono, Pengantar Sistem Informasi Geografis. Yogyakarta: Jurusan Teknik Geodesi Fakultas Teknik Universitas Gajah Mada Yogyakarta, 2005.
[5] “Membuat Aplikasi dengan Google Map API.” [Online]. Available: www.dijexi.com.
[6] M. R. Pratama, “api-applicationprogramming-interface,” 2012. [Online]. Available: http://mudafiqriyan.com/2012/03/.
[7] A. Shodiq, “Tutorial Dasar Pemrograman Google Map API,” 2011. [Online]. Available: http://ppsi.mercubuana.ac.id/downloadfile/Tutorial Google Maps API.pdf.
[8] M. d. Purvis, Beginning Google Maps Applications with PHP and Ajax. United States: Apress, 2006.