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Geographic Information System for Mapping the Spread of COVID-19 in the city of Salatiga

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Abstract

The city of Salatiga, located in the province of Central Java, is one of the cities affected by the spread of COVID-19 in Indonesia. The first COVID-19 case in the city of Salatiga was confirmed on 31 March 2020 until now it has reached more than eighty people. The increasing number of cases and the lack of information on the spread of COVID-19 and the information provided are static. This information, this research aims to build and utilize the WebGIS application as one of the information for the spread of COVID-19 in Salatiga. Mapping the area in this application uses a shapefile file and is converted to a GeoJSON file. It uses Blogspot as web hosting and javascript leaflets to display GIS maps and designs and uses the Exponential Smoothing method to forecast COVID-19 cases and use the web equal 4.0 method for website testing. The results of this study to provide information about the spread of COVID-19 in the city of Salatiga. Interactive map and forecasts of COVID-19 cases in the city of Salatiga. In this study, the single exponential smoothing has the smallest MAPE value, namely 35.2360. It results in a prediction on July 20 to 26, 2020, which has decreased to 1 positive case consisting of the lowest number in this forecasting is -2. The highest number shows four positive cases. And the website testing using the webqual 4.0 standard, respondents agreed with the website's usability and information quality, and it was sufficient for website service interaction.

Keywords: Web GIS, Leaflet, Exponential Smoothing, GeoJSON, Webqual 4.0

1. Introduction

Coronavirus is a large family of viruses that cause disease in humans and animals. In humans, it usually causes respiratory tract infections, from the common cold to severe illnesses such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). Coronavirus, a new type of virus that was discovered in humans since the extraordinary incident that emerged in December 2019, in Wuhan, China, was then named Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-COV2) and caused Coronavirus Disease-2019 (COVID-19) (RI, 2019). COVID-19 is a new disease that has become a pandemic. This disease must be watched out because it is transmitted relatively fast and has a mortality rate that cannot be ignored, and there is no definitive therapy. The process of spreading the Covid-19 coronavirus has spread throughout the world, including in Indonesia, its spread is so fast. It was initially confirmed by the government of the Republic of Indonesia on March 2, 2020. And until now, the Corona COVID-19 outbreak has been determined by the World Health Organization (WHO) as a world pandemic (Susilo et al., 2020). Victims affected by the Corona COVID-19 virus to date in July 2020 for the whole world have reached eleven million positive cases of COVID-19, and for Indonesia. It has reached more than sixty-four thousand positive cases of Corona COVID-19 (BNPB, 2020). For the city of Salatiga itself, the spread of the Corona Covid-19 virus has reached more than eighty positive cases (Salatiga Tanggap, 2020).

The city of Salatiga is located in the province of Central Java, which is in a basin area, at the foot of Mount Merbabu between small mountains, among others: Gajah Mungkur, Telomoyo, and

Payung Semarang, the City of Salatiga borders the Semarang regency, Salatiga City is located at an altitude between 450 - 825 asl (above sea level). The city of Salatiga consists of four districts and twenty-three urban villages (Salatiga, 2019).

The city of Salatiga itself is currently a red zone for the spread of cases of the COVID-19. Therefore information about the distance of Corona cases in the city of Salatiga is needed by the public. With the use of technology, information about the Coronavirus spread can be accessed easily and quickly, only by requiring a smartphone and computer connected to the internet—however, the problem faced by the community of internet users regarding the spread of the Coronavirus. Especially on the other side is the lack of information about areas exposed to the Coronavirus in the city of Salatiga.

This research aims to design and build a Website-based Geographical Information System regarding the zoning for the spread of the Corona COVID-19 virus in Salatiga and to use the exponential smoothing method in estimating COVID-19 cases in the city of Salatiga. With this research, we can provide information about the spread of the Corona COVID-19 virus, which can be used by the public or internet users in Salatiga, even outside the city of Salatiga.

2. Literature Studies

Several previous studies have been carried out and related to the Geographical Information System for mapping the spread of COVID-19 in Salatiga. Research in previous journals that produced a landslide hazard map in the Boyolali district. The map is displayed in a WebGIS application built with a bootstrap framework, using google maps technology. This application shows a landslide hazard map of the Boyolali district, equipped with a Boyolali district administration plan. This WebGIS has been uploaded to the web hosting to be accessed using an internet browser on a desktop or smartphone (Sholikhan et al., 2019).

Another research is the design of geographic information systems for mapping exam rooms using bootstrap and Leaflet.js. This research produces a GIS design map for room mapping and contains various information in each exam room. Making room mapping uses the QGIS application to digitize maps and generate geoJSON files as well as bootstrap frameworks and javascript leaflets to display maps and GIS designs **(Wardana & Jazman, 2017).**

The next research in identifying COVID-19 cases in Indonesia with the Double Exponential Smoothing method, this study resulted in gaps in the resulting distribution patterns. An increase has not matched the number of positive cases in the number of recovered patients and a decrease in the number of patients who died. This study uses the Minitab application in calculating the Double Exponential Smoothing method **(Harini, 2020)**.

Subsequent research is about the comparison of the single exponential smoothing method and the exponential smoothing method that is adjusted to the trend in forecasting sales. The results achieved from this study are the available exponential smoothing method, which is more appropriate because of the presentation error for the difference between the actual data and the forecast value and the MAD. The process for calculating the forecast error obtained from the single exponential smoothing method is smaller than the exponential smoothing method adjusted for trends (Hartono et al., 2012).

These researches have similarities with this research, namely the use of WebGIS as a geographic information space and the calculation using the Exponential Smoothing method. However, this research has a difference with this research, namely, the case study research conducted in this study is in Salatiga.

Geographical Information Systems (GIS)

The geographical information system is a system consisting of hardware, software, people, and methods used in managing, displaying, capturing, storing, and analyzing geographically (Apata et al., 2019)

The concept of a geographic information system is as follows:

- Geographical information is information about the place on the surface of the earth.
- Geographical information technology includes a Global Positioning System (GPS), remote sensing, and geographic information systems.
- Geographical information systems are computer systems and software.
- The geographical information system is used for a wide variety of applications.
- Geographical Information Science is the science behind the Geographical Information System technology (Irwansyah, 2013)

Web GIS

WebGIS is a development of the Geospatial Information System or better known as the Geographical Information System, available on the website. There is an exchange of information between the server and the client. The server is a Geospatial Information System, and the client is a web browser, phone application, and a desktop application. The server has a unique Uniform Resource Locator (URL) to be found by clients via a website connected to the internet. WebGIS is a development of the Geospatial Information System or better known as the Geographical Information System, available on the website. There is an exchange of information between the server and the client. The server is a Geospatial Information System, and the client is a web browser, phone application, and a desktop application. The server has a unique Uniform Resource Locator (URL) to be found by clients via a website connected to the internet. (Vizexperts, 2020)

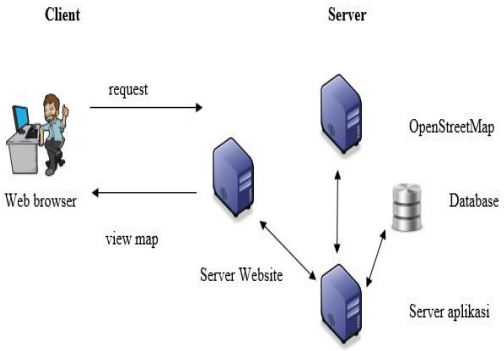


Fig 1. The Web GIS process on the website (Tanaamah & Wardoyo, 2010)

WebGIS is based on mapping based on geographic information systems that use the internet as a medium for mapping (Tanaamah & Wardoyo, 2010). In Figure 1, the process of running WebGIS on the website. The client requests to view GIS information via a web browser to a website server. The application server will access the map on the OpenStreetMap server. The map and other geographic information will be displayed to the web browser. OpenStreetMap (OSM) is a web-based project to create a free and open map of the entire world, built entirely by volunteers by conducting surveys using GPS, digitizing satellite imagery, and collecting publicly available geographic data. OpenStreetMap follows Wikipedia's peer-to-peer production model. Its goal is to create a map set that is free to use, editable, and licensed under the new copyright scheme. OpenStreetMap, made at University College London (UCL) in July 2004, was founded by Steve Coast. As of May 2008, OpenStreetMap has more than 33,000 registered users (Haklay & Weber, 2008).

Webqual 4.0

Webqual is a method of measuring the quality of a website based on the end-user (Sastika, 2016). The web equal 4.0 method consists of three categories: usability, information quality, and service interaction. Usability is the quality of the site design, and information quality is the quality of the content contained on the site. Service interaction is the quality of service interactions experienced by users when users investigate the area more deeply.(Diana & Veronika, 2018)

Exponential Smoothing

The single exponential smoothing method is a method that shows the weighting decreases exponentially with the older observed value. That is, the newer value is given relatively greater weight than the older observed value. This method provides an exponential weighting of the moving average of all previously observed values. This method is not influenced by trends or seasons. Predict the value of this method's period; data from the previous period is needed (Hartono et al., 2012). The formula used for implementing Single Exponential Smoothing is :

$$\hat{Y}\tau + 1 = \alpha Y\tau + (1-\alpha)\hat{Y}\tau \quad (1)$$

Where:

$\hat{Y}\tau + 1$ = forecast value for the next period

$Y\tau$ = demand for period τ

$\hat{Y}\tau$ = forecast value for the period τ

α = the weight factor of smoothing $(0 < a < 1)$

The Double Exponential Smoothing method is a model proposed by Brown. This method is used for data that has an estimated trend pattern of growth in each period (Makridakis et al., 2003). The formula used for implementing Double Exponential Smoothing is :

$$L\tau = \alpha Y\tau + (1-\alpha)(L\tau - 1 + T - 1) \quad (2)$$

$$Tt = \beta(L\tau - L\tau - 1) + (1-\beta)Tt - 1 \quad (3)$$

$$\hat{Y}\tau + \rho = Lt + \rho T \quad (4)$$

Where :

$L\tau$ = level estimate

$Y1$ = demand in period τ

Tt = trend estimate for the period τ

$\hat{Y}\tau + \rho$ = forecast for period ρ in the future

ρ = number of periods for the forecast in the future

α = the smoothing weight factor for the level $(0 < a < 1)$

β = trend smoothing weight factor $(0 < \beta < 1)$

After calculating the Exponential Smoothing method, this method uses MAPE (Mean Absolute Percentage Error) to measure the accuracy of forecasting. Where the smaller the MAPE value, the smaller the forecast error value in this method. The calculation is:

$$\text{MAPE} = (\frac{100}{n}) \sum \frac{n}{t=1} | \frac{Yt - \hat{Y}}{Y\tau} | \quad (5)$$

Leaflet

A leaflet is the leading open-source JavaScript for interactive map development that supports convenience and ease of access via smartphone. At only 38 kb in size, the leaflet has all the mapping features a developer needs. Leaflets are designed tobe simple, performant, and user-friendly. Leaflets run efficiently on all desktop and mobile platforms, expandable with a variety of additional

features, easy to use, and easy to read source code (Leaflet, 2019).

```
var map = L.map('map').setView([51.505, -0.09], 13);
L.tileLayer('https://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png', {
    attribution: '&copy; <a href="https://www.openstreetmap.org/copyright">OpenStreetMap</a> contributors'
}).addTo(map);
```

Fig 2. Leaflet JavaScript code to create a map (Leaflet, 2019)

3. Method

Location of Study Area

The study area in this research is in the city of Salatiga, this is a city in central java province, Indonesia. Located between the cities of semarang and solo.

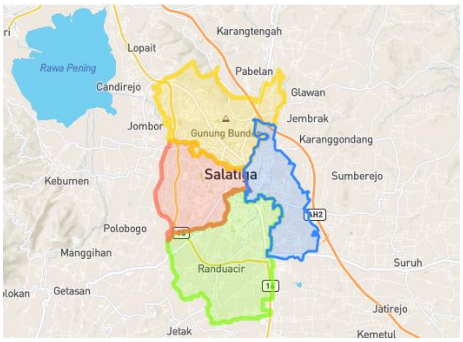


Fig 3. Showing the city of Salatiga as the Study area

The flow chart in this study can be seen in figure 4.

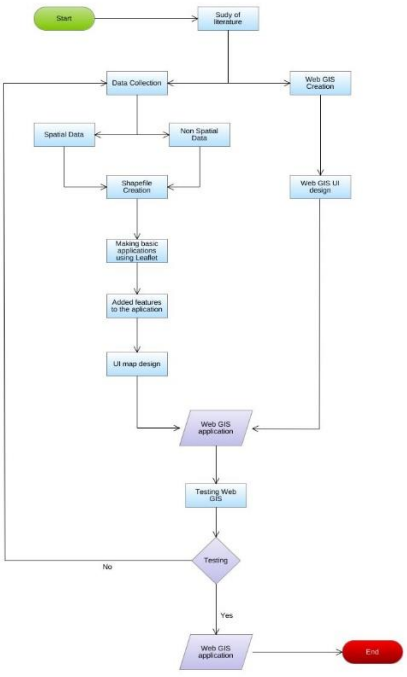


Fig 4. Stages of Research

The literature study in this research is to seek information and data about this research. The reference data and information about this research are searched through books, journals, and websites. Reference data and information about this research contains:

- Coronavirus COVID-19
- The number of the spread of COVID-19
- Information about the city of Salatiga as a case study site
- Utilization of the website as a Geographical Information System
- Leaflet javascript and OpenStreetMap

The purpose of this literature study is as a theoretical basis and to become the basis for researching the use of WebGIS for zoning for the spread of COVID-19 in the city of Salatiga.

The process of collecting data in this study is to look for spatial data and non-partial data. The spatial data contains a map of the research location, namely in the city of Salatiga, and non-partial data that contains the number of cases of COVID-19 and regional information in the city of Salatiga.

To digitize the area in the city of Salatiga, researchers took the SHP (Shapefile) data for the city of Salatiga via the GADM.org website. GADM stands for the Database of Global Administrative Areas, a site that provides SHP data used for GIS applications. To be used on the GIS website, the SHP data of the research location, namely the city of Salatiga, are converted to Geojson data. GeoJSON is a javascript-based coding format for geographic data. GeoJSON can be used for geometric data types such as Point, LineString, Polygon, MultiPoint, MultiLineString, and MultiPolygon.

In the process of making GIS basic applications using the js leaflet. The js leaflet is used to create a GIS website mapping application, by first creating an HTML file and then inserting the tile layer as the base map from OpenStreetMap, which is used for GIS applications so that they can be modified by themselves. For making the WebGIS application itself, it uses the HTML, CSS, and JavaScript programming languages. And to make a GIS application, a User Interface design that focuses on making it easier for users to access GIS applications is required.

Testing was conducted to determine the feasibility of using the WebGIS application regarding the COVID-19 spread zone in Salatiga. They are using the web equal 4.0 method to test the website. Testing using a questionnaire for data collection and statements in the questionnaire refers to the web equal 4.0 standard, namely usability, information quality, and service interaction website with five answer level scales: strongly disagree, disagree, satisfactory, quite strongly agree. The steps used in processing the website statement data are to conduct a descriptive analysis of the respondent's assessment and classify the respondent's estimate using the interval class formula.

The tools used to conduct this research were laptop, mouse, Ms. Word, Sublime Text 3, Minitab, and SPSS. The data used in this study is data on cases of the spread of COVID-19 cases in the city of Salatiga.

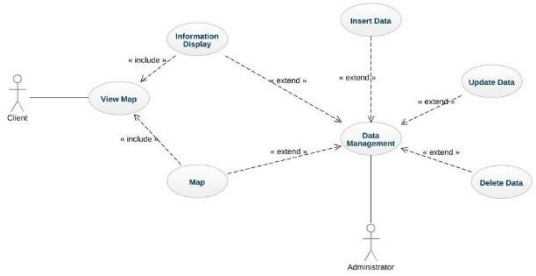
4. Result and Discussion

System Planning

The flow of data and information from the WebGIS application for zoning for the spread of COVID-19 in the city of Salatiga is divided into two parts as follows:

- Clients, as users of the WebGIS application for zoning for the spread of COVID-19 in the city of Salatiga, access the SIG application website to be able to access information about the spread of COVID-19 locations in the city of Salatiga.
- The server as a WebGIS application displays information about the spread of COVID-19 cases in every location in the city of Salatiga.

Use Case Diagram is used to describe an interaction made by the client and the system. In this WebGIS Use Case Diagram, there are two actors, namely the Client as the user and the Administrator



as the information manager in this WebGIS application.

Fig 5. Use Case Diagram for the WebGIS spread of COVID-19 in the city of Salatiga

In the Use Case Diagram, Figure 5 shows that each actor has their activity, namely, the client in this application can see a map containing information about the spread of COVID-19 cases in Salatiga. Administrators manage information regarding the space of COVID-19 cases. Administrator actors can add, change, and delete information data related to the spread of COVID-19 cases on this WebGIS application.

Activity diagrams are used to describe a visual form of workflow that contains activities. In this study, there are two activity diagrams used for the use of WebGIS for the zoning of the spread of COVID-19 in the city of Salatiga, these activities, namely the client as an application user to view information and maps of the spread of COVID-19 on the WebGIS application website and the administrator as the manager of the WebGIS application. add, modify, and delete data in this WebGIS application.

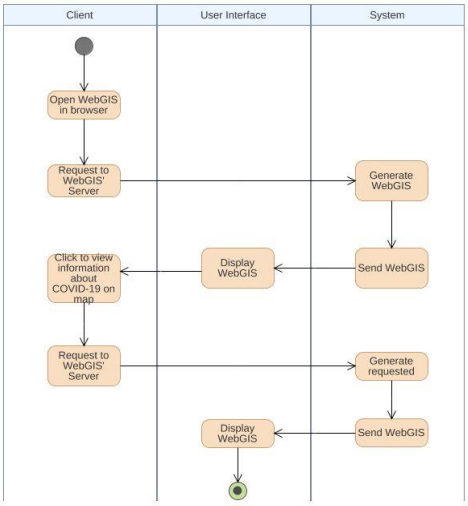


Fig 6. Activity diagram to see information on the spread of COVID-19

Figure 6 shows the flow of client activities to see information on the spread of COVID-19 in the city of Salatiga. The diagram consists of three partitions: the Client as the application user. The User Interface has interaction between the Client and the WebGIS application, and the System as the server for the WebGIS application. The Client must open a browser connected to the internet to spread the WebGIS application and enter its WebGIS site. The System will process the Client's requests, in this case, via the browser as a connecting tool between the Client and the System. The System processes the request. The System displays the WebGIS application page via the client user interface and shows an interactive map of the spread of the COVID-19 case in Salatiga. The next step for the Client to see information on the spread of COVID-19 by clicking on the Salatiga area map that you want to see, then the System will process the same as before

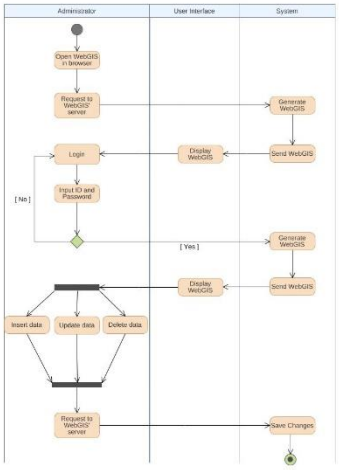


Fig 7. Activity diagram for managing WebGIS data for the spread of COVID-19

The activity diagram in Figure 7 shows three partitions, namely the administrator as the admin or

manager of the WebGIS application. The User Interface as the interaction between the client and the WebGIS application. The System as a server for the WebGIS application for the Spread of Covid-19 in Salatiga. To manage the WebGIS application, the administrator must log in to the WebGIS application with an existing id and password. Then based on the diagram, it explains that administrators can add, change, delete data in the WebGIS application. The managed data is then stored on the server as a system for this WebGIS application.

Class diagrams are used to describe the classes in a system and their relationship to one another. The class diagram of the Geographical Information System of the Distribution of Covid-19 in the city of Salatiga can be seen in Figure 8.

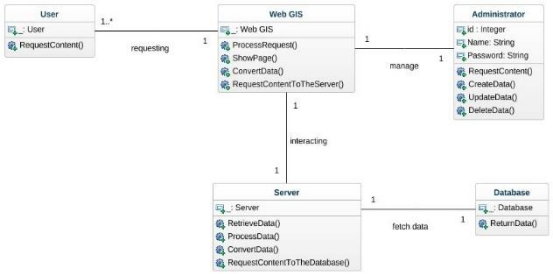


Fig 8. Class Diagram of the Geographical Information System for the Distribution of Covid-19 in the city of Salatiga

Entity User and Entity Web GIS are associated with each other, where one or many users access one web GIS, and one Web GIS is accessed by one or many users. Then the Entity Administrator and the Web GIS entity are associated with each other, where one administrator manages one Web GIS, and one administrator manages the Web GIS. Entity Web GIS and entity Server have an association, where one Web GIS interacts with one server, and one server interacts with the Web GIS. The entity server and database entity are then associated with each other, where one server gets data from one database, and one database retrieves data from one server. Entity users can only view the information in Web GIS, and administrators can create, modify, and delete data in Web GIS.

Recapitulation of data on the spread of COVID-19 in the city of Salatiga

The city of Salatiga consists of four sub-districts and twenty-three urban villages. In each of these areas, there are cases of COVID-19 which can be seen in the table below.

Sidomukti sub-district				
URBAN VILLAGE	OTG	ODP	PDP	POS
Kecandran	0 case	7 cases	0 case	0 case
Mangunsari	18 cases	6 cases	2 cases	2 cases
Dukkuh	11 cases	2 cases	0 case	3 cases
Kalicacing	0 case	1 case	0 case	1 case
Sidoarjo sub-district				
Salatiga	0 case	3 cases	0 case	0 case
Kauman kidul	0 case	3 cases	1 case	0 case
Bugel	0 case	0 case	0 case	2 cases
Blotongan	1 case	5 cases	1 case	0 case
Pulutan	0 case	3 cases	0 case	0 case
Sidoarjo lor	0 case	2 case	0 case	2 cases
Argomulyo sub-district				
Noborejo	0 case	0 case	0 case	0 case
Ledok	1 case	0 case	1 case	0 case
Cobongan	1 case	0 case	0 case	0 case
Randuacir	0 case	0 case	0 case	0 case
Kumpulrejo	0 case	0 case	0 case	0 case
Tegalrejo	8 cases	2 cases	0 case	1 case
Tingkir sub-district				
Tingkir tengah	1 case	3 cases	0 case	3 cases
Tingkir lor	6 cases	0 case	0 case	4 cases
Kalibening	0 case	0 case	0 case	0 case
Kutowinangun lor	0 case	1 case	0 case	0 case
Kutowinangun kidul	0 case	0 case	0 case	1 case
Gendongan	0 case	1 case	0 case	0 case
Sidorejo kidul	2 cases	0 case	0 case	0 case

Table 1. data on the spread of COVID-19 on 14 July 2020 (Salatiga Tanggap, 2020)

Information:

- OTG: Asymptomatic People, who are in close contact with COVID-19 positive patients.
- ODP: The person in Follow-up, a person with symptoms of fever greater than 38 ° C or a history of fever, and a history of travel to the affected country or local transmission in the last fourteen days before symptoms developed.
- PDP: Patient under surveillance, a person under surveillance, a person with symptoms of fever greater than 38 ° C and who has had direct contact with a person who has tested positive for COVID-19 in the past fourteen days.
- POS: Patients who are declared infected with COVID-19 through a PCR lab

examination. (Kementerian Kesehatan RI, 2020)

WebGIS User Interface for the spread of COVID-19 in the city of Salatiga

User Interface Design for the WebGIS application for the spread of COVID-19 in the city of Salatiga, based on the system design that has been made can be seen in Figure 7. The WebGIS website address for the zoning for the spread of COVID-19 in the city of Salatiga can be seen at https://salatiga-19.blogspot.com/.

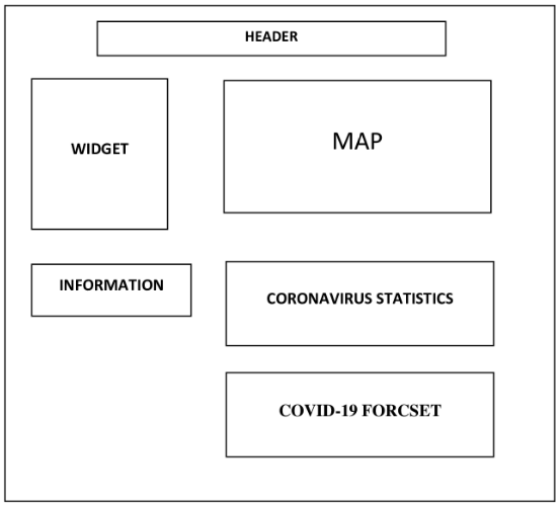


Figure 9, WebGIS User Interface for the spread of COVID-19 in the city of Salatiga

Figure 9 shows that the WebGIS application consists of various parts in designing the WebGIS user interface, including:

- Header, writing about the identity of this WebGIS application
- Map contains an interactive map of the city of Salatiga and containing information on the number of cases of the spread of COVID-19 in each area of the city of Salatiga
- Widget contains a collection of excerpts of information published by the Ministry of Communication and Informatics Salatiga in real-time via social media twitter. The information contained in the development of cases of the spread of COVID-19 cases in Salatiga and various information about the city of Salatiga.
- Information, a collection of information about the number of COVID-19 cases containing the number of cases from People Under Monitoring (ODP), People Without Symptoms (OTG), Patients Under Supervision (PDP), and Positive COVID-19.
- Coronavirus Statistics contains information on the number of cases, deaths, and recoveries in real-time from World Health Information (WHO) for COVID-19 cases around the world and in Indonesia.
- Covid-19 Forecast contains graphic info on the COVDI-19 forecast in the city of Salatiga on July 20-26, 2020.

Home Page Visualization, this page is the page that opens when the client visits this WebGIS site. On this page, there is all the information needed by visitors. The Home Page page can be seen in Figure 10.

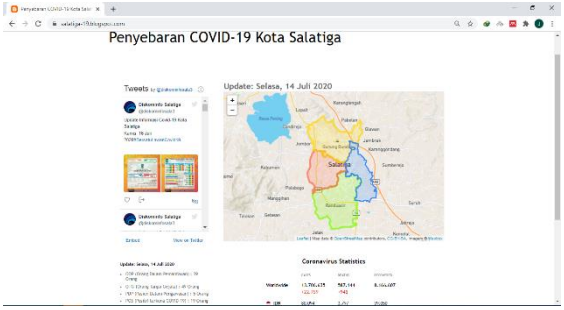


Fig 10. Visualization of the WebGIS Home Page of the spread of COVID-19 in the city of Salatiga

Figure 11 describes the features of this WebGIS application. This feature is to find out information on the spread of COVID-19 by selecting the area of Salatiga. Information about the COVID-19 case will appear as a sign containing the text of collecting cases exposed to COVID-19 in each chosen area. Clients can use the Zoom in-out feature found in the symbol in the upper left corner and can use the mouse scroll to zoom to the desired location.

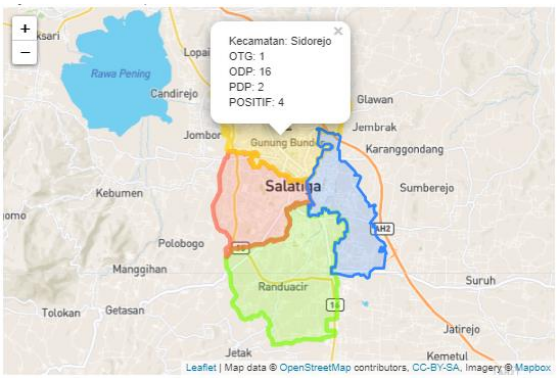


Fig 11. Visualization of the WebGIS Map of the spread of COVID-19 in the city of Salatiga

TESTING THE EXPONENTIAL SMOOTHING METHOD

In this study, forecasting was carried out using two exponential smoothing methods, namely single exponential smoothing, and double exponential smoothing, to estimate cases exposed to COVID-19 in the city of Salatiga. The use of this method is based on actual data on the number of COVID-19 in the city of Salaiga, which has an increasing and decreasing trend. This prediction uses recorded data that is infected with COVID-19 on July 1 - 19, 2020. (Salatiga Tanggap, 2020)

Date	Positive	Date	Positive
1	**5**	11	**3**

2	**2**	12	**0**
3	**0**	13	**0**
4	**3**	14	**1**
5	**2**	15	**0**
6	**0**	16	**0**
7	**0**	17	**0**
8	**0**	18	**4**
9	**0**	19	**1**
10	**0**		

Table 2. Data history of positive cases of COVID-19 in the city of Salatiga

In testing the single exponential smoothing method using the parameter α (alpha), the α test uses a value of 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9. The test α is a parameter to determine whether or not it affects the single exponential smoothing method's predictive calculation. In determining the value of parameter α, a trial and error model is used to determine the correct use of the parameter value parameter. In testing the single exponential smoothing method, the MAPE test was carried out. MAPE is done by comparing the difference between the predicted value and the actual value. The results of the MAPE single exponential smoothing test can be seen in table 3.

Parameter (α)	MAPE
0.1	35.2360
0.2	42.2108
0.3	51.9320
0.4	60.9377
0.5	70.0255
0.6	79.5661
0.7	89.5691
0.8	99.8464
0.9	110.107

Table 3. MAPE single exponential smoothing

The MAPE test that has been done shows that, the smallest MAPE for the single exponential smoothing method is obtained at parameter α = 0.1 with MAPE of 35.2360 and the largest MAPE is parameter α = 0.9 at 110.107. Thus the use of the correct parameter in the single exponential smoothing method is parameter α = 0.1 with a MAPE of 35.2360. The results of testing the single exponential smoothing method using the parameter α = 0.1 can be seen in Figure 12.

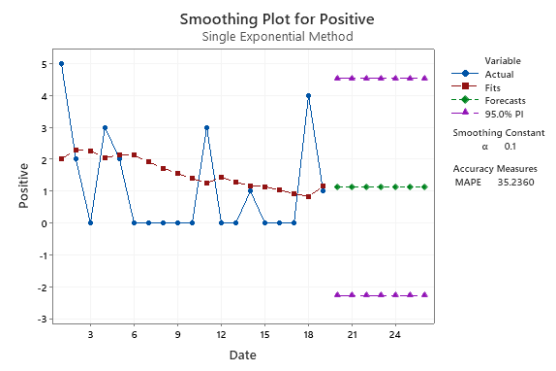


Fig 12 Single exponential smoothing

Based on testing the single exponential smoothing method for forecasting positive cases of COVID-19 in a short time is shown in table 4

Date	Forecast	Lower	Upper
20	1.13428	-2.26947	4.53803
21	1.13428	-2.26947	4.53803
22	1.13428	-2.26947	4.53803
23	1.13428	-2.26947	4.53803
24	1.13428	-2.26947	4.53803
25	1.13428	-2.26947	4.53803
26	1.13428	-2.26947	4.53803

Table 4. Prediction of positive cases using the single exponential smoothing method

Based on the calculation of the estimated number of positive cases of COVID-19 in the city of Salatiga on July 20-26 2020 using the single exponential smoothing method, cases infected with COVID-19 in the city of Salatiga have decreased to 1 positive case which consists of the lowest number in this forecast is -2 and the highest is 4 positive cases.

In testing the double exponential smoothing method, the value of using the parameter α (alpha) is 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9. Test α as a parameter to determine whether or not it affects the predictive calculation of the double exponential smoothing method. In determining the value of parameter α, a trial and error model is used to determine the correct use of the parameter value parameter. Testing parameter α in the double exponential smoothing method can be seen in table 4.

Parameter (α)	MAPE
0.1	51.3813
0.2	57.7158
0.3	65.0309
0.4	72.7320
0.5	85.7633
0.6	108.857
0.7	135.873
0.8	168.458
0.9	199.266

Table 4. MAPE double exponential smoothing

Based on the double exponential smoothing MAPE test, it shows that the smallest MAPE for the double exponential smoothing method is obtained at parameter α = 0.1 with MAPE of 51.3813 and the largest MAPE is parameter α = 0.9 of 199.266. Thus the use of the correct parameter for the double exponential smoothing method is parameter α = 0.1 with a MAPE of 51.3813. The results of testing the double exponential smoothing method using the parameter α = 0.1 can be seen in Figure 13.

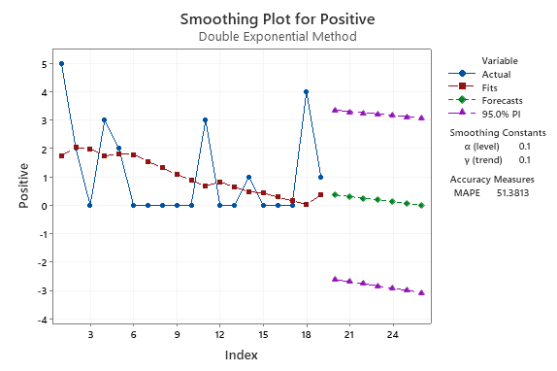


Fig 13. Double exponential smoothing

Based on testing the double exponential smoothing method for forecasting positive cases of COVID-19 in a short time is shown in Table 5.

Date	Forecast	Lower	Upper
20	0.365075	-2.61780	3.34795
21	0.304806	-2.69333	3.30294
22	0.244536	-2.76954	3.25861
23	0.184267	-2.84641	3.21495
24	0.123998	-2.92395	3.17194
25	0.063729	-3.00213	3.12959
26	0.003459	-3.08095	3.08786

Table 5, Prediction of positive cases using the double exponential smoothing method

Table 5 shows that the calculation of estimated positive cases in the city of Salatiga for a short time, starting from July 20-26, 2020, has decreased to 0 positive cases. An estimate of the smallest number is -3 cases and the highest is 3 positive cases.

Testing the System

In the process of making the WebGIS application, the website for the spread of Covid-19 in the city of Salatiga was tested using the Webqual 4.0 method with eleven respondents in the city of Salatiga and even outside the city. In conducting the test, questionnaires were distributed with a total of thirteen statements, which were divided into three parts according to the website testing with Webqual 4.0 standards.

To make it easier to test the website in analyzing the descriptive results, the interval class length formula is used (Sudjana, 2002) so that the category of respondents' assessment of the quality of the website can be found in table 6.

$$\text{Interval length} = \frac{range}{classes} \quad (6)$$

Interval	Information
1.00-1.79	Strongly disagree
1.80-2.59	Disagree
2.60-3.39	Satisfactory
3.40-4.19	Agree
4.20-5.00	Strongly agree

Table 6, Categories of respondents' assessment

The assessment of the usability of the website in this study consists of five statements regarding the site design. The results of this study indicate that the website usability interval is 4.03. The result is included in the category of agreeing to the Covid-19 distribution website's usability in Salatiga.

Based on the analysis carried out on the information quality website with a total of five statements. The study results indicate that the website information quality interval is 3.89 and is included in the agreed category.

The service interaction website in this research consists of three statements. Based on the results of the descriptive analysis in this study, it shows that the website service interaction interval is 2.25 and is included in the sufficient category.

5. Conclusion

Based on the research that has been done, several conclusions obtained; namely, the WebGIS application can provide information about the spread of COVID-19 in the city of Salatiga and information about conditions throughout the world and Indonesia. And there is a zoom in out feature, to find out information on the spread of COVID-19 by selecting the area of Salatiga.

This WebGIS application is made using the HTML, CSS, and JavaScript programming languages and accessed via the https://salatiga-19.blogspot.com/ site. In this study, forecasting positive cases of COVID-19 in the city of Salatiga was carried out using two types of exponential smoothing methods. The single exponential smoothing and double exponential smoothing determine the appropriate method for estimating positive cases of Covid-19 based on the smallest MAPE value between the two methods tested. The single exponential smoothing has the smallest MAPE value, namely 35.2360. It results in a prediction on July 20 to 26, 2020, which has decreased to 1 positive case consisting of the lowest number in this forecasting is -2. The highest number shows four positive cases.

Based on the website testing using the webqual 4.0 standard, respondents agreed with the website's usability and information quality, and it was sufficient for website service interaction.

This research is still not perfect. Therefore there are some suggestions for the WebGIS application for the spread of COVID-19 in Salatiga, which can be useful for further study, namely adding features to the WebGIS application, making it easier for clients or visitors to the WebGIS application to get information. And adding methods for forecasting the spread of COVID-19.

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