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GEOGRAPHIC INFORMATION SYSTEM FOR ZONATION MAPPING OF STATE JUNIOR HIGH SCHOOL, SURABAYA CITY

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Article Info	Abstract
	The zoning is a New Student Acceptance System (PPDB) which is enforced by determining the zone radius by the respective regional government, and schools are required to accept a prospective student who is domiciled in the closest radius zone with a certain percentage of the total number of student to be accepted. To create an equal distribution of quality education in all schools in Indonesia. To find out the zoning of schools in the area, you can use the Geographic Information System (GIS) in the zoning mapping process, especially at (SMPN) in Surabaya City to find out the zoning area easily and accurately, whichever is closest to their domicile. By utilizing GIS, it is hoped that will facilitate the presentation of information, especially those related to school zoning. To find the maximum zoning distance for SMPN Surabaya, the author uses buffering method. Implementation of the GIS program for zoning mapping for SMPN Surabaya in the form is running well. This system can display information and location regarding the Negen Middle School in Surabaya using the buffering method, in addition, this system can also display the display in kilometres and the location of the prospective student to the destination Negen Middle School. The result of testing the system through the black box shows that the zoning information system at SMPN is feasible to use.

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INTRODUCTION

According to Prasetiyo, currently, there are technological developments that allow it to be used by many people [1]. Current technology advancements have both beneficial and harmful consequences for people's lives[2], especially for information systems in education and school.

The quota system began to be implemented for new teaching in 2018. The new student admission quota policy is regulated in the minister of Education and Culture regulation (Permendikbud) Number 14 of 2018 replacing Permendikbud number 17 of 2017 concerning New Student Admissions (PPDB). Chapter 16 said that schools run by local governments states must accept students who live in the local school area or more than 90 per cent of the approved number of students [3].

The direct area radius is determined by the local government on the availability of school children in the area and the number of available capacity for study groups in each school. Public Middle School in the City of Surabaya Implement the system. The district system is a new student admission system implemented by the government of each district radius, especially in the city of Surabaya and schools that accept a student who lives within the local radius and their percentage[4].

Number of students admitted and all schools in Indonesia with the advancement and the widespread use in society, the internet is increasingly becoming a part of life every day. Online media can be used by geologists and geographers to express their ideas and geographic information system on the internet[5]. Even though online presentations hs a broader purpose compared to traditional

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methods such as seminars, books and other forms of presentations because they can be done by anyone, anywhere, as long as they are connected to the internet.[6]

In the City of Surabaya many new students who doest know which school is already in their location specifically in State Junior High School (SMPN) in the City Of Surabaya, for knowing limits schools in that location you should use the geographic information system (SIG) it's easy and of course accurately for us to find a limit location[7]. Presentation of data about the district in the form of a website (SIG) will help in giving information to the junior high school closest to home. Using a Geographic Information System (SIG) its easy to the organization of information, especially concerning school fees.

The following research aims to design and build a web-based Geographic Information System to make it easier to present information and users, especially new students to obtain accessible school, zoning locations and school profile information[8].

The State City of Surabaya is the target of the research object. In this way, data will be obtained regarding the location points of the Surabaya City Public Middle School. As well as literary studies by collecting data, information and knowledge obtained from the book, journals, and sites on the internet regarding the theory concerned in making an application, Second, the application development stages use a waterfall research flow, which includes the process of creating a junior high school that is being targeted.

Research Flow

The stages of work, the zoning application process for SMPN City of Surabaya Can be seen in figure 1 below [9].

Figure 1. Research Plot

Analysis Stage

The analyse of the current system regarding the information of SMP NEGERI of Surabaya City to the public is as described in the use case figure 2.2

Figure 2. Use Case System

Definition of Actor and use case about running system what users do are bellow :

A. Definition of actor, Description a definition of a running system actor regarding the notification of Surabaya City Public Middle School Information carried out by the users in the City of Surabaya is shown in Table 2.1

Table 1. Actor and Description of User

NO	ACTOR	DESCRIPTION
1	*User*	User party who want to find a public middle school according to zoning.

B. Definition of Use Case, the descriptions of the use case of the running system regarding notification of information on Junior High School Negen City of Surabaya carried out by the users is as in table 2.2

Table 2. Actor and Description of User

| NO	ACTIVITY	DESCRIPTION
1	Information about SMP NEGERI of Surabaya	The users look for information about the nearest state junior high school or zonation through the existing direction, ask the public who also looking for a platform
2	To the Location	After getting the information, the user goes to the location at SMP NEGERI where they want

From the system analysis which is still running, then the problem faced by the community regarding information notification at SMP NEGERI City of Surabaya is to asking face by face or discussion with the public, to looking for guidance on the internet or billboard or less information or long distances according to the zoning area contained in the City of Surabaya, can be said still insufficient coz lack of knowledge for SMP NEGERI area nearest from their homes, then the school of interest will be very few, which their trouble from running system analysis, then it is proposed that a geographic information system for zoning mapping of public junior high school in the city of Surabaya that can overcome this problem.

Design Stages

Is the process of making a system design by designing input or output that will be used in the system in the proposed system like a form of use case diagram.

Use Case Diagram

Use case diagram to describe an interaction by one or more actors with an information system will be made. The Proposed Use Case Diagram Design of a Geographic Information System for Zoning Mapping state Junior High School in the City of Surabaya based on WEB proposed as shown in Figure 2.3
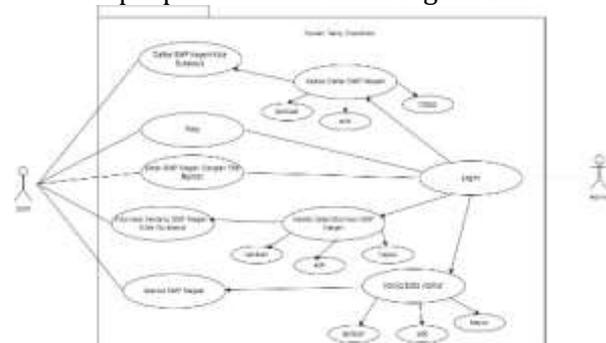
Figure 3. Use Case Diagram System proposed by

The definition of actors and use cases regarding the proposed system in the Geographic Information System for Zoning Mapping state Junior High School in the City of Surabaya are as follows :

a. Actor Definition, actor definition description regarding the proposed system in the Geographic Information System for Zoning Mapping state Junior High School is as shown in Table 2.3

Table 3. Description of User and Admin

No	Actor	Description
1	User	Visitors or parties will look for SMP Negeri According to the Zoning
2	Admin	The person who manages the existing data on the system

b. Use Case Definition, actor definition description regarding the proposed system in the Geographic Information System for Zoning Mapping state Junior High School is as shown in Table 2.4

Table 4. Description of the Use Case Definition of the Proposed System

No	Use Case	Description
1	Login Admin	A process where the admin performs a verification process

No			
			may log in to the system to be able to use it and manage the system
2	Lists SMP Negeri City Of Surabaya		The process where the user can see the list of SMP Negeri where ever in the City of Surabaya
3	Map		A process where the user can see the location of SMP Negeri
4	Distance SMP Negeri City of Surabaya		The process where the user knows which state SMP Negeri are entered on their zoning
5	District SMP Negeri		The process where the user can find out the address of SMP Negeri on their wants
6	Manage Lists SMP Negeri		The process where admin manages a list of City of Surabaya Public middle School Information in the form of adding data, editing data and deleting data
7	Manage Data of Information		The process where admin managing data from City of Surabaya Public middle School Information in the form of adding data, editing data and deleting data
8	Manage Addresses SMP Negeri		The process where the admin manages the address City of Surabaya, if there are changes in the address as adding data, editing data, deleting data.

Coding Stage

After the analysis phase as well design, the researcher began to code the program. The programming language used in making this system is PHP using the Visual Studio Code Application with a MySQL database using google database API tools.

Implementation Stages

Testing this stage leads to the installation of the built application. Making a geographic information system for zoning mapping of the Surabaya City Junior high school

which was built on a web basis. The testing method used is black box testing is used to determine whether the software can function properly. Black box testing is a method of designing test data based on software specifications. The test data is generated and executed on the software and then the output from the software is checked whether it is as expected.[10]

Table 5. Testing Using Black Box Testing

No	Testing of Component System	Variable Testing	Kind of Testing
1	*Login* Admin	Login Verification	*Black box*
		Password Verification	
2	Input Data SMP Negeri	Adding Data	*Black box*
		Changing Data	
		Deleting Data	
3	Input Information of SMP Negeri	Adding Data	*Black box*
		Changing Data	
		Deleting Data	
4	Input Address of SMP Negeri	Adding Data	*Black box*
		Changing Data	
		Deleting Data	
		Adding Data	
		Deleting Data	

Maintenance

The final stage of system testing using the System Usability Scale (SUS) method is carried out after black box testing and is carried out after the user uses the system to determine the usability of the system, the SUS method is a scale of 1-5 with a score 0-4 for each question the calculation book is divided into several questions and answers[11]. The score for the odd-numbered question is (scale 1). Currently, for even-numbered questions the score (is 5 scale). The next step is to add up each odd and even score multiplied by 2.5 to get the score for each respondent. The SUS score is obtained by adding up the scores of all respondents divided by the number of respondents. There are 3 classifications of SUS acceptable. With a range of values a sound in figure 3.5.
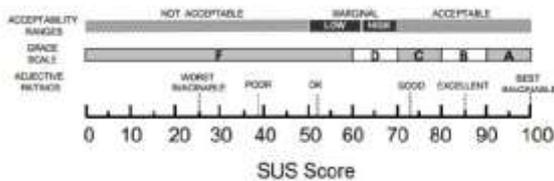
Figure 5. Range of System Usability Scale

RESULT AND DISCUSSION

This section will explain the implementation of the geographic information system program for zoning mapping state junior high school in form of a web which will show the zoning results for Surabaya state junior high school using the buffering method.

Register Wizard

Registration or registration page for users so that users can log in. On the program. On registration. Second, the users enter personal data and the current address of residence. On this page are Laravel libraries and frameworks.

Figure 6. Register Page

Source Code Register

```
public function studentRegistration(Request $request)
{
$v = Validator::make($request->all(), [
'email' => 'required|unique:users',
'password' => 'required|confirmed|min:6',
'first_name' => 'required',
'last_name' => 'required',
'mother_name' => 'required',
'father_name' => 'required',
'last_school_name' => 'required',
'address' => 'required',
'latitude' => 'required',
'longitude' => 'required'
],$this->customMessages,$this->customeAttr);
if ($v->fails())
{
$errorString = implode(", ",$v->messages()->all());
return redirect()->back()->withInput()
```

```
>withError($errorString);
}
$user = $request->only('email', 'password');
$profile = $request->only('first_name', 'last_name'
'mother_name', 'father_name', 'last_school_name'
'address', 'latitude', 'longitude');
try {
$user['type'] = 'student';
$user['password']=
Hash::make($user['password']);
$createUser = User::create($user);
if ($createUser) {
$profile['user_id'] = $createUser->id;
$storeProfile =
StudentProfile::create($profile);
}
} catch(\Exception $e) {
return redirect()->back()->withInput(
>withError('terjadi                error,'.$e-
>getMessage());
}
return redirect()->route('login')
>withSuccess('Selamat  pendaftaran  anda
telah
berhasil!');
}
```

In the code above AuthenticationController.php the variable $v = Validator variable functions as data validation before processing, and then the $user and profile variables are useful for retrieving request data. *User*::create() Functions to store data in the database after successfully saving the user then StudentProfile::create()
Function to store user profile data in the student profile table if all processes are successful then it will be directed to log in with success status.

Login

After registering, the user can log in using the email and password that was registered.

Figure 7. Login Page

Source Code Login

The coding above is public function login(Request $request)
{
$check = *User*::where('email', $request->email)->first();
if(!$check) {
return   back()->with('error-validation', 'Akun telah dihapus/tidak didaftarkan')->withInput();
}
$credentials = [
'email' => $request->email,
'password' => $request->password,
];
if (\Auth::attempt($credentials)) {
$request->session()->regenerate();
if (\Auth::*user*()->type == 'admin') {
return redirect()->route('admin.home');
} else {
return redirect()->route('student.home');
}
}
return   back()->with('error-validation', 'email / password salah')->withInput();
}

AuthenticationController.php variable $check Directed to check whether the entered email data exists in the database if not will be returned to the login with an error status message account has been deleted/note registered then the $credentials variable aims to prepare data to generate authentication tokens   authentication Auth::attemp($creadentials)
Function to login to *laravel* and if the return is true then the token is generated by running $request->session()->regenerate();   then checked whether the status of the admin user if the admin eats will be directed to the admin page.

Dashboard View
The dashboard pages pr maintenance functions to display the zoning area using the buffering method so that the user can see which SMP Negeri zoning is closest to the user's home point as a reference.
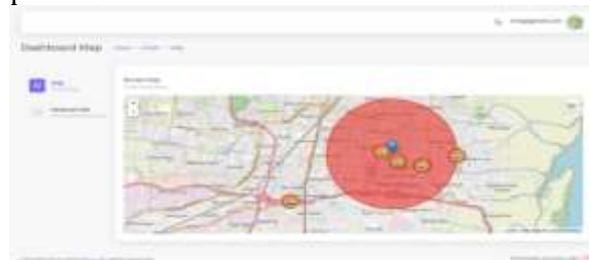

Figure 8. Dashboard View

Source Code Dashboard View

layout-without-menu.blade.php
if ($('#map').length) {
var schoolIcon = L.icon({
iconUrl:
'https://upload.wikimedia.org/wikipedia/commons/thumb/4/4
0/Round_Landmark_School_Icon_-_Transparent.svg/1200px-Round_Landmark_School_Icon_
_Transparent.svg.png',
icon size: [50, 50]
});
var *user* = L.marker([{{ $profile->latitude }},
{{
$profile->longitude }}]).bindPopup(
`{{ $profile->first_name . ' ' . $profile->last_name
}}`),
@foreach ($schools as $school)
@if ($loop->last)
school{{ $school->id }} = L.marker([{{ $school->latitude }}, {{ $school->longitude
}}], {
icon: schoolIcon
}).bindPopup(`{{ $school->name }}`);
@else
school{{ $school->id }} = L.marker([{{ $school->latitude }}, {{ $school->longitude
}}], {
icon: schoolIcon
}).bindPopup(`{{ $school->name }}`),
@endif
@endforeach
var cities = L.layerGroup([
user,
@foreach ($schools as $school)

```
school{{ $school->id }},
@endforeach
]);
var street =
L.tileLayer('https://{s}.tile.osm.org/{z}/{x}/
{y}.png', {
attribution: 'Map data &copy; <a
href="https://www.openstreetmap.org/">O
penStreetMap<
/a>',
maxZoom: 20
}),
watercolor =
L.tileLayer('http://tile.stamen.com/waterco
lor/{z}/{
x}/{y}.jpg',
attribution: 'Map data &copy; <a
href="https://www.openstreetmap.org/">O
penStreetMap<
/a>',
maxZoom: 18
});
var layerControl = L.map('map', {
center: [{{ $profile->latitude }}, {{ $profile-
>longitude }}],
zoom: 18,
layers: [street, cities]
});
var baseMaps = {
Street: street,
Watercolor: watercolor
};
var overlayMaps = {
Cities: cities
};
L.control.layers(baseMaps,
overlayMaps).addTo(layerControl);
L.tileLayer('https://c.tile.osm.org/{z}/{x}/{
y}.png'
, {
attribution: 'Map data &copy; <a
href="https://www.openstreetmap.org/">O
penStreetMap<
/a>',
maxZoom: 18
}).addTo(layerControl);
var circle = L.circle([{{ $profile->latitude }},
{{
$profile->longitude }}], 3000, {
colour: 'red',
fillColor: '#f03',
fillOpacity: 0.5
}).addTo(layerControl);
}
```

The code above is $('#map').lenght function to check whether the map has just been initialized, then the school variable and the loop below it function as initialization of the school marker data on the map and the cities variable is used to set map the map, the same as the later level control:

```
L.tileLayer('https://c.tile.osm.org/{z}/{x}/{
y}.png', {
attribution: 'Map data &copy; <a
href="https://www.openstreetmap.org/">O
penStreetMap</a>',
maxZoom: 18
}).addTo(layerControl);
```

The source code above is useful for initializing the map with the option of taking it from the layer controller variable and finally the article variable is useful for creating a radius on the marker.
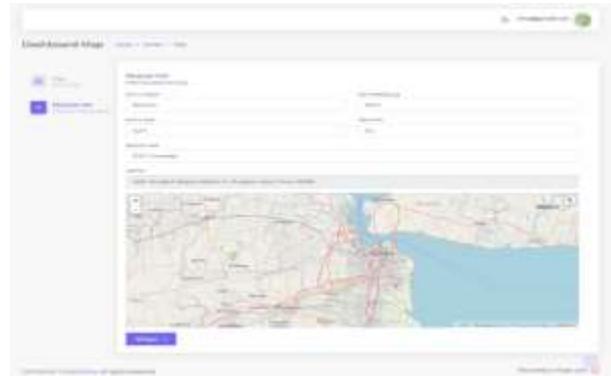
Figure 9. Map Page

Source Code Dashboard Page 2

```
Siswa/StudentController.php
public function update(Request $request)
{
$v = Validator::make($request->all(), [
'first_name' => 'required',
'last_name' => 'required',
'mother_name' => 'required',
'father_name' => 'required',
'last_school_name' => 'required',
'address' => 'required',
'latitude' => 'required',
'longitude' => 'required'
],$this->customMessages,$this-
>customeAttr);
if ($v->fails())
{
$errorString = implode(", ",$v->messages()-
>all());
return redirect()->back()->withInput()-
```

```
>withError($errorString);
}
$profile    =    $request->only('first_name',
'last_name',
'mother_name',                'father_name',
'last_school_name',
'address', 'latitude', 'longitude');
try {
StudentProfile::where('user_id', Auth::user()-
>id)-
>update($profile);
} catch(\Exception $e) {
return redirect()->back()->withInput()-
>withError('terjadi              error,'.$e-
>getMessage());
}
return                    redirect()->back()-
>withSuccess('Data
berhasil diubah');
}
```

The source code above explains that the $v variable is useful as a data validator before processing, if validation fails it will be returned to the previous page with an error message status. The $profile variable is intended to retrieve request data from user input. Then StudentProfile::where('user_id', Auth::user()->id)->update($profile); useful for looking for profile data in the student profile table with the id that has been obtained from the parameters then the data is updated according to user input.

Admin Dashboard Display

On the admin dashboard display or main page, the admin can find out the number of students who have entered State Junior Schools in Surabaya.
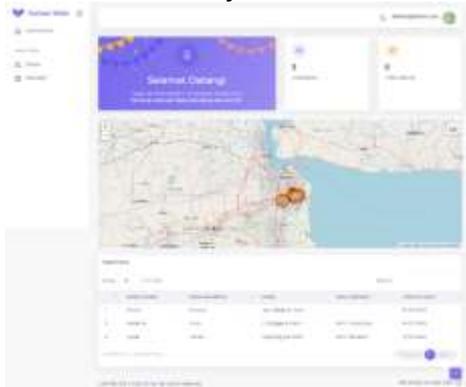

Figure 10. Admin Page

Source Code Admin Page

```
Admin/DashboardController.php
public function index()
```

```
{
$pageConfigs = ['pageHeader' => false];
$totalStudent      =      User::where('type',
'student')->count();
$totalSchool = School::count();
$students = User::where('type', 'student')-
>with('profile')->get();
$schools = School::all();
return  view('content.dashboard.dashboard-
analytics', [
'pageConfigs' => $pageConfigs,
'totalStudent' => $totalStudent,
'totalSchool' => $totalSchool,
'students' => $students,
'schools' => $schools
]);
}
```

The source code above explains that the $pageConfig variable aims to set the display layout, the $totalStudent variable is useful for retrieving data on the total students registered on the system, the total school is for retrieving data on the system, the student variable is for retrieving data on all students, and the school variable is useful for fetches data of all schools in the system.

3.5 Data Input Display
On the data input page, there is a Surabaya State Middle School data entry form which functions to add school data that will appear in the student map. There are several entries of filling fields to be filled out by admin namely adding addresses, adding information about the school, and adding photos.
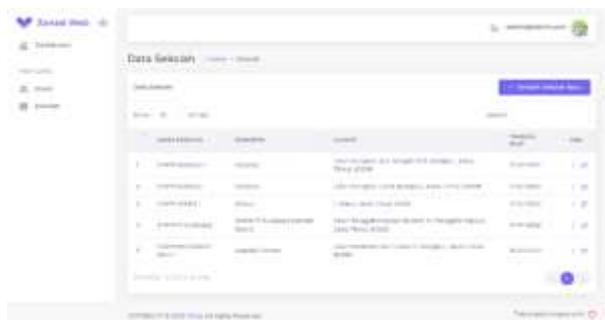

Figure 11. Input Data View

Source Code Input Data View

```
Admin/SchoolController.php
public function index()
{
$breadcrumbs = [['link' => "/", 'name' =>
"Home"],
```

```
['name' => "Sekolah"]];
$schools    =    School::orderBy('created_at',
'DESC')->get();
$schools->map(function($school) {
$thumbnail                                    =
SchoolImage::where('school_id', $school-
>id)->where('is_thumbnail', true)->first();
$foto    =    SchoolImage::where('school_id',
$school->id)-
>where('is_thumbnail', false)->first();
if ($thumbnail) {
$school->thumbnail = $thumbnail->path;
} else {
$school->thumbnail = null;
}
if ($foto) {
$school->foto = $foto->path;
} else {
$school->foto = null;
}
});
return view('content.school.index', [
'breadcrumbs' => $breadcrumbs,
'schools' => $schools
]);
}
```

The source data above explains that the $bradcrumbs variable retrieves school data from the system, then $school->map() functions to perform repetition and in it initializes thumbnail and photo data, and then the data is returned to the school index.
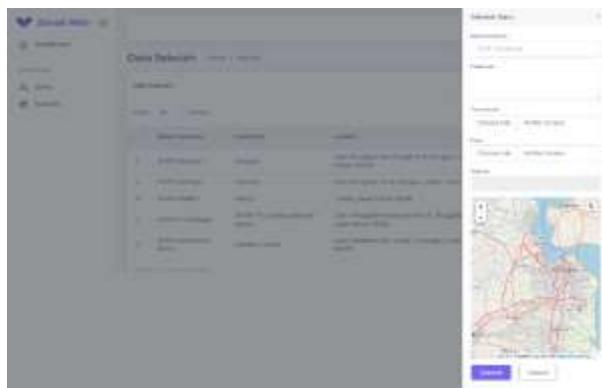

Figure 12. Input Data View 2

Source Code Input Data View 2

```
Admin/SchoolController.php
public function store(Request $request)
{
$v = Validator::make($request->all(), [
'name' => 'required',
'address' => 'required',
'latitude' => 'required',
```

```
'longitude' => 'required',
'thumbnail'                                    =>
'required|mimes:jpg,jpeg,png,bmp,tiff
|max:4096',
'foto'                                        =>
'required|mimes:jpg,jpeg,png,bmp,tiff
|max:4096',
],$this->customMessages,$this-
>customeAttr);
if ($v->fails())
{
$errorString = implode(", ",$v->messages()-
>all());
return redirect()->back()->withInput()-
>withError($errorString);
}
$school        =        $request->only('name',
'description',
'address', 'latitude', 'longitude');
try {
$createSchool = School::create($school);
if ($createSchool) {
if($request->file('thumbnail')){
$file= $request->file('thumbnail');
$filename= date('YmdHi').$file
getClientOriginalName();
$file-
>move(public_path('public/thumbnail'),
$filename);
$thumbnail['school_id'] = $createSchool->id;
$thumbnail['path']    =    'public/thumbnail/'.
$filename;
$thumbnail['is_thumbnail'] = true;
SchoolImage::create($thumbnail);
}
if($request->file('foto')){
$file= $request->file('foto');
$filename= date('YmdHi').$file-
>getClientOriginalName();
$file->move(public_path('public/foto'),
$filename);
$foto['school_id'] = $createSchool->id;
$foto['path'] = 'public/foto/'. $filename;
$foto['is_thumbnail'] = false;
SchoolImage::create($foto);
}
}
} catch(\Exception $e) {
return redirect()->back()->withInput()-
>withError('terjadi                    error,'.$e-
>getMessage());
}
return                        redirect()->back()-
>withSuccess('Berhasil
```

menambah sekolah baru');
}

The source code above explains that the $v variable serves to validate data before processing, the $school variable functions to retrieve school request data, and the $createSchool variable functions to save data save is successful if it succeeds in requesting an image capture file and saving it to the local folder and the path of the image saved to the database.
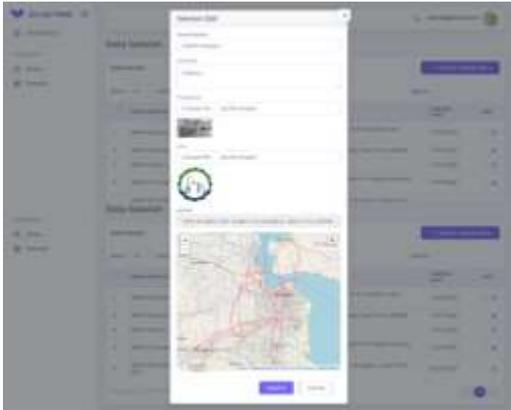

Figure 13. Input Data View 3

Source Code Input Data View 3

```
Admin/SchoolController.php
public function update(Request $request, $id)
{
$v = Validator::make($request->all(), [
'name' => 'required',
'address' => 'required',
'latitude' => 'required',
'longitude' => 'required',
'thumbnail' => 'mimes:jpg,jpeg,png,bmp,tiff|max:4096',
'foto' => 'mimes:jpg,jpeg,png,bmp,tiff|max:4096',
],$this->customMessages,$this->customeAttr);
if ($v->fails())
{
$errorString = implode(", ",$v->messages()->all());
return redirect()->back()->withInput()->withError($errorString);
}
$school = $request->only('name', 'description',
'address', 'latitude', 'longitude');
try {
School::where('id', $id)->update($school);
```

```
if($request->file('thumbnail')){
$file= $request->file('thumbnail');
$filename= date('YmdHi').$file->getClientOriginalName();
$file->move(public_path('public/thumbnail'), $filename);
$thumbnail['school_id'] = $id;
$thumbnail['path'] = 'public/thumbnail/'.$filename;
$thumbnail['is_thumbnail'] = true;
SchoolImage::create($thumbnail);
}
if($request->file('foto')){
$file= $request->file('foto');
$filename= date('YmdHi').$file->getClientOriginalName();
$file->move(public_path('public/foto'), $filename);
$foto['school_id'] = $id;
$foto['path'] = 'public/foto/'. $filename;
$foto['is_thumbnail'] = false;
SchoolImage::create($foto);
}
} catch(\Exception $e) {
return redirect()->back()->withInput()->withError('terjadi error,'.$e->getMessage());
}
return redirect()->back()->withSuccess('Berhasil mengubah sekolah');
}
```

The source above explains variable $v retrieves the validator data, and then variable
$school retrieves request user data, and after that, it updates the school data, according to the data taken from the school id parameter.

Testing
On the testing stage for the Geographic Information System web application for zoning mapping of Surabaya State Junior High Schools using user testing, namely using the black box method. This test is carried out to find out whether the data entered and processed is expected or not.

Tabel 6. Register Testing

Case and test result *Register*	
Input Data	*user*name: - ; *Password*: - ; repeat *Password:* -
Hoping Result	Users can log *in*
Output	Register success

Description	Completed

Tabel 7. Login Testing

Case and test Result *LoginUser*	
Input Data	*user*name: - ; *Password*: -
Hoping Result	Can indicate the main page or dashboard page
Output	Indicate the main page and dashboard page
Description	Completed

Tabel 8. Dashboard Testing

Activity	Expected Result	*Actual result (output)*	Description
Dashboard Page	Can indicate the *map*	Can indicate the *map*	Completed
Address	Can look for what they want	*Users* can determine the address	Completed
Zonation of SMP Negeri	Appear the zoning if the address has been inputted	Appear the zoning for the closest SMP NEGERI	Completed

Table 9. Dashboard Admin Testing

Case and test Result on the Admin page	
delete	
Input Data	Click the delete button in the data school column
Hoping Result	Can delete school data desired
Output	Delete all selected and reduce the total number of schools then a notification appears that the data was successfully deleted
Description	Completed
Adding	
Input Data	Click add data school button
Hoping Result	Can input desired data
Output	Data of school desired and has inputted
Description	Completed
Edit	
Input Data	Click the *button* edit at column date of school
Hoping Result	To edit school data what they want
Output	To edit school data which is chosen then change a piece of

	information and address what they want
Description	Completed

CONCLUSION

The conclusion that is drawn in this Geographic Information System web application for zoning mapping of Surabaya State Junior High Schools; this system can display information and location regarding the state junior high school in Surabaya; this system can show the method of limiting and blocking SMP Negeri of Surabaya and the system also can display the distance the model from location to the coordinates of the state junior high school in kilometres. The result of system testing with black boxes shows that the zoning information system for SMP Negeri Surabaya can be used suggestions for system development are when displaying a map, the system cannot display the distance from the student's home location to the SMPN address in the form of lines. In the future, the Information System web application for zoning mapping of State Junior High Schools can be rebuilt into an Android Application so students do not have to open a laptop or PC.

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