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LOCADOR: COVID-19 Isolation and Hospital Locator Website using Google Map API

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Abstract

COVID-19 has been a significant impact on society, not only locally but also all over the world. One of the biggest problems of having COVID-19 is unable to find an isolation facility or having difficulty looking for a hospital to seek medical attention. Lacking resources to find a hospital can lead to serious medical issues, such as difficulty breathing, persistent pain or pressure in the chest, bluish lips or face, and new confusion or inability to arouse. In times like this, people need to find a hospital in their area to cure and isolate themselves from COVID-19. To find one is to track and locate the hospital using this locator. On this locator, users can see the available hospital and people who are COVID-19 positive. Users can also contact the hospital open for receiving COVID-19 patients through their contact number, which they can see on the hospital information on Google Maps. Reserving a room for isolation in the hospital is also available on this website, so users do not have to go to the hospital and ask if there is an open for COVID-19 patients. This web application is created so people can locate the hospital in their area and know if it is available for COVID-19-positive patients.

Keywords: Web Application, Google Map, Locator, COVID-19

CHAPTER I

INTRODUCTION

In the past, they were locating hospitals and understanding their COVID-19 protocols required manually searching various websites and contacting hospitals individually. This was a time-consuming and inefficient process. This outdated process often led to delays and confusion, wasting valuable time during emergencies. Additionally, booking an isolation facility involved time-consuming phone calls and paperwork, causing unnecessary stress for patients and their families.

However, the researcher created a website called LOCADOR and presented a novel strategy that simplified the entire procedure. The researcher provides a simple and user-friendly interface that utilizes Google Maps' capabilities to offer healthcare services at your fingertips.

The platform goes above and beyond by incorporating a hassle-free booking system for isolation facilities, helping users find hospitals, and learning about COVID-19 patient approval. After using the map interface to choose a suitable hospital, users may click on the hospital marker to access the booking option. Thanks to this simplified procedure, users may quickly find a secure and comfortable isolation facility that eliminates the need for manual calls, paperwork, and the stress accompanying it.

Project Context

In today's rapidly evolving healthcare landscape, timely access to medical services and accurate information regarding COVID-19 protocols have become paramount. Navigating the healthcare system, particularly during emergencies, can be challenging and time-consuming. To address these issues, the researcher presents a groundbreaking project for developing a website that leverages Google Maps to locate the shortest path to hospitals in a specific area, determines if users accept COVID-19 patients, and provides a seamless booking system for isolation facilities.

The project aims to revolutionize how individuals find and access healthcare services, particularly in times of crisis. By utilizing the powerful capabilities of Google Maps, the website will calculate the most efficient route to the nearest hospital based on the user's current location. This eliminates manual searches and significantly reduces the time needed to reach medical assistance.

To enhance user convenience, the website featured an interactive map interface. Users can click on available hospitals on the map for more detailed information about their COVID-19 protocols and services. Additionally, the website will enable users to conveniently book isolation facilities directly from the map interface, eliminating the need for complex and time-consuming manual processes.

By providing a comprehensive solution that combines the shortest path to hospitals, up-to-date information on COVID-19 protocols, and a streamlined booking system for isolation facilities, this project simplified and enhanced the overall healthcare experience for users. It will enable individuals to make informed decisions about where to seek medical care during emergencies and provide a convenient way to secure isolation facilities if needed.

Purpose and Description

This website's functions include giving users a simple and effective way to find hospitals nearby, determine if they take COVID-19 patients, and provide a handy way to reserve isolation facilities. The website seeks to make it easier for people to find medical treatment during emergencies and to give them accurate, up-to-date information by harnessing the power of Google Maps.

The website is intended to be an all-in-one platform that makes it easy to get healthcare services. Using Google Maps, users can quickly find the closest hospitals based on location. The website calculates the shortest route to the chosen hospital using sophisticated algorithms and the robust routing capabilities of Google Maps, doing away with the necessity for tiresome human searches.

The website aims to act as a one-stop shop that makes it simple to obtain healthcare services. Using Google Maps, users may instantly locate the closest hospitals based on location. Instead of requiring time-consuming human searches, the website calculates the shortest route to the chosen hospital using sophisticated algorithms and Google Maps' robust routing capabilities. In addition to locating hospitals, the website is crucial to determining whether a hospital accepts patients. It offers continuously updated real-time data so users can access the most recent information. Particularly in light of the continuing pandemic, this function enables people to decide where to seek medical care with knowledge.

The website provided an interactive map interface to increase user convenience. Users can get comprehensive information on the COVID-19 protocols and services of any hospitals shown on the map by clicking on them. The website also incorporates a simple booking process for isolation facilities. Users can use the booking option by clicking the hospital's marker on the map, streamlining the reservation process for a secure isolation facility.

The website aims to revolutionize how people find local healthcare services. It offers a complete solution for finding hospitals, ascertaining their COVID-19 patient acceptance status, and reserving isolation facilities using real-time data. People can swiftly get the orthopedical treatment they require because of the website's functional

features and user-friendly interface, which encourages timely and well-informed decision-making in crises and difficult situations.

Objectives

A website that locates the nearest Hospitals of Zamboanga City within 3 km from the user's current position through GPS and tracks the Hospital and Isolation facilities available for Covid-19 patientst or not.

Specific Objective (web-based system)

- To optimize temporal efficiency and identify the most expeditious route to the hospital.
- To minimize the burden on individuals in identifying the closest hospital through a web-based platform.
- To facilitate direct communication between users and the designated hospital or isolation facility to arrange isolation arrangements.
- To monitor and document the health status and isolation progress of patients' recovery treatment in a hospital or designated isolation facilities.
- To provide robust data protection measures to ensure the privacy and confidentiality of patient information.

Scope and Limitations

The web application will be used by Zamboanga City Disaster Risk Reduction Management Office located at the Legionnaire Street Zone IV, Zamboanga City:

The functions of the user in the developed system are:

- Access and will only locate available Hospital and Isolation facility and in their area
- Sign-up and log-in are required to access these services. Without an account, the user cannot view or locate facilities
- Allow users to contact Hospital or Isolation Facility through the given contact number on the website

The functions of the administrator of the developed system are:

- Adding a hospital or Isolation Facility
- Manage occupant
- Manage the Hospital or Isolation Facility's availability
- Manage Room requests for isolation
- Manage the System's dashboard

The functions of the administrator of the added Hospital or Isolation Facility to the developed system are:

- Adding available room for isolation
- Manage occupant
- Manage Room requests for isolation

The developed system is limited to the following scenario:

- Alter the website's graphical user interface
- Inaccessible due to power interruption and lost internet connection
- Adding a hospital or isolation facility outside of Zamboanga City
- Adding a hospital or isolation facility as an admin of the hospital
- Adding a hospital or isolation facility as an occupant
- Deleting hospital/isolation as an admin of the hospital
- Deleting hospital/isolation as an occupant
- Deleting the occupant as an admin of the hospital

Significance of the Study

The research will contribute to the following:

Occupant: With the help of this website, it will help reduce the effort of the occupant to locate available hospitals COVID-19 patients.

Hospitals: With the help of this website, hospitals can be located quickly by using this website.

Future researchers: This will be useful for reference to the researcher who would like to continue this study and guide them for better results.

CHAPTER II

Review of Related Literature

Global Positioning System –

The Global Positioning System is a space-based satellite navigation system that gives location and time information in all weather conditions. It uses radio waves between satellites and receivers inside your phone to provide location and time information to any software that needs to use[1].

The goal of GPS is to locate the position of an object. The basic principle on which the technology of GPS works is based on estimating the distance between each satellite and the user. This is called satellite positioning. For this purpose, the satellite transmits a low-power radio signal to the receiver. The receiver determines the time it takes for the signal to travel from the satellite to the receiver. Now the receiver determines the distance using the following formula:-[2]

$$A = b \times (t_f - t_i)$$

Where

A = distance between the satellite and the receiver,

b = speed of light

t_f = time at which the signal reaches the receiver

t_i = time at which the call originates from the satellite

Google Map –

Google Maps is a web mapping platform and consumer application offered by Google. It provides satellite imagery, aerial photography, and street maps[2].

In an Iranian study by Leila Gholamhosseini, Farahnaz Sadoughi, and Aliasghar Safaei, it is noted that the importance of the location of people and objects in health centers has increased dramatically in recent years. On the other hand, one of the main problems in times of crisis is that the number of injured patients requiring emergency care increases. Under such conditions, hospitals may face various constraints, such as a shortage of resources, hospital beds, and health workers.[4].

A case study found that the location of health facilities can be critical for developing countries because they have scarce resources, and most of their populations live in rural areas. The low population density in these regions makes providing services challenging. In this context, site allocation models can, therefore successfully used to plan networks of health facilities. One of the earliest applications can be traced back to Gould and Leinbach (1966), who was concerned with hospitals' siting and determining their capacity in western Guatemala. For a detailed review of such applications, see Rahman and Smith (2000); for a review of health facility siting problems, see Daskin and Dean (2004)[5].

A Pakistani study by Muhammad Wasim Munir, Syed Muhammad Omair, and M. Zeeshan Ul Haque states that information and communication technologies (ICTs) are widely used in healthcare facilities worldwide [6]. Several types of healthcare applications designed for Android smartphones help patients, and their caregivers save time and money [6]. In this research, an application is developed that locates the nearest hospital within a five-kilometer radius with the desired specialist. The closest location closest hospitals are calculated using a built-in Global Positioning System (GPS) feature in smartphones and find the route from their current location through Google Map Application Program Interfaces (API)[6].

An informative survey is conducted on various hospitals in Karachi to get an accurate list of doctors available in each hospital. With the help of this application, a patient can find the nearest hospital according to the availability of specialist doctors. A comprehensive profile of the doctor and hospital is available in the application n including the website, postal address, and contact numbers [6].

In 2017, Bo Zhang, Jin Peng, and Shengguo Li conducted research. They focus on a location-based issue for emergency services such as Fire and ambulance service status and the unpredictability principles to identify these emergency services in a hazard-filled setting. Their study tries to determine the best spots for emergencies [3].

In 2014, Rajib Chandra Das and Tauhidul Alam conducted research. They are utilizing the Haversine method and OpenStreetMap in the medical system of support. They use a centralized database for collecting specific details on healthcare facilities [4].

Synthesis

Similar Applications

A. Hospital Finder App

- Hospital Finder is an app that helps you find a hospital near your current location to help you in emergencies. You can search for a hospital by State, City, and Hospital Name. It shows you the direction to reach the hospital in a minimum time[5].

B. Any Finder

- Our free hospital finder is part of the universal POI search and location app AnyFinder, which helps you find millions of interesting places near or anywhere in the world[6].

C. MyLVAD app

- MyLVAD has developed a mobile app that allows you to access everything MyLVAD has to offer from the convenience of your mobile device. It includes the hospital finder and features such as the new community locator and access to the most relevant information available [7].

D. MedLoco: Find Hospitals Near You

- MedLoco is a handy app that helps you find hospitals or doctors near you in a medical emergency. It uses your device's GPS to pinpoint your location and show you relevant hospitals near you[8].

E. Nearby Hospital Finder

Nearby Hospital Finder is a must-install program that can assist you in the event of an emergency hospital requirement, particularly one involving a virus attack. It is a detailed map showing the locations of particular government hospitals in Malaysia [9].

Table 1: Similar applications

Application	Map	Hospital Locator	Hospital monitoring	Patient Monitoring	Shortest path proving	Isolation reservation
LOCADOR: COVID-19 Isolation and Hospital Locator website using Google Map API	✓	✓	✓	✓	✓	✓
MyIvad app	✓	✓	X	X	X	X
MedLoco: Find a hospital near you	✓	✓	X	X	X	X
Hospital Finder app	✓	✓	X	X	X	X
Any Finder	✓	✓	X	X	X	X
Nearby Hospital Finder	✓	✓	X	X	X	X

The table above shows that LOCADOR has the most functional features among the other applications above; the most similar functions they all have is having a Map and hospital locator, which is the most critical function for a hospital locator, on the other hand,

CHAPTER III

METHODOLOGY

Research Design

The researcher used an applied research design. Data can be collected using the applied research design from a variety of sources, such as surveys, interviews, and observations.

The research method gives citizens of Zamboanga City knowledge about the pathing route of Hospitals in the said city. They will also be given knowledge about its details and availability for Isolation.

The researcher conducted an alpha test on the respondents (Online random students and other civilians) to evaluate the researcher's system; afterward, during the beta testing, the respondents were given pre-test and post-test to conclude if the researcher's web app effectively gave knowledge about routes of Hospital and Isolation facility here in Zamboanga City.

Shortest Path Calculation

- **Dijkstra's algorithm** – Enables the calculation of the shortest path between a node and any other node in the graph [10]; it is also known as the single source shortest path algorithm. It is applied only to positive weights. The Global Positioning System is used to add new functionality. This is used to retrieve the current position at any point. This current position can determine the distance from one node to another. The shortest path can also find out using this distance[11]
- Dijkstra's algorithm is used to find the shortest path for the user to the hospital; the algorithm initializes the distance between the user and the hospital, then selects the minimum length and calculates the distance between the user and the hospital[12].

Applied Research Design

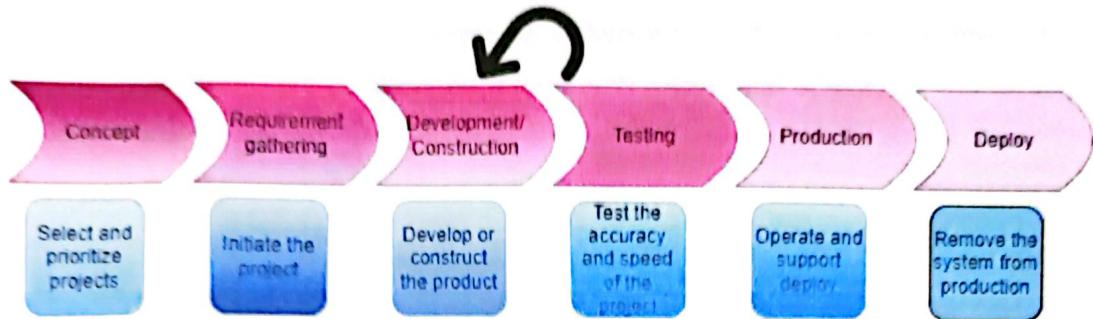


Figure 2: Agile methodology

The research study used agile methodology to make the work easier and faster by breaking.

Agile Methodology:

A step-by-step approach to building the software is taken, breaking the program cycle into smaller parts, which helps minimize overall risk, allows the project to adapt quickly to changes, and does not require that requirements be frozen upfront. This approach refers to the iterative and incremental strategy where self-organizing and cross-functional teams work together to create software[13].

- **Scrum-** A framework within which people can address complex adaptive problems while productively and creatively delivering products of the highest possible value[14].

Agile Methodology Phases

- **Requirements Analysis:** In this phase, the project scope will be analyzed on the possible solutions and the software I will use.
- **Planning:** Initial requirements are discussed by me, and my adviser has the vision on what are the possible solutions for the project.
- **Design:** Starting to work on prototyping for the design of web applications.
- **Implementation:** Starting code, training, and documentation are beginning to process.

- **Testing:** Continues to create, troubleshoot, and support software production as it progresses. For testing, I will, based on the project's given schedule, test it repeatedly to see if bugs will occur.
- **Deployment:** The project is delivered to the client for them to use. Client migrations are considered, along with end-of-life activities.

Respondents

The target respondents of the study are the people of Zamboanga City. All of these respondents are selected through an online survey method. It is a method where the respondents are given a structured questionnaire and complete it over the Internet, generally by filling out a form. Since all the respondents and community members have an equal chance of becoming research respondents, this is the most efficient online survey method. The researcher defined the population first, and the survey was given online. The respondents are random, willing, and open to experiencing the new and more advanced technological way of locating the two structures, the Hospital and Isolation Facility. Inclusion criteria were applied for individual respondents; they must be 18 or older. However, the researcher opted for an average online survey method due to time constraints.

Data Gathering Instruments, Techniques, and Procedures

A request letter was given to the Medical Officer IV from the City Health Office handling Covid-19 cases in Zamboanga City and the head of OPCEN-CHO in Zamboanga City Disasters Risk Reduction and Management Office who's in charge of delivering Covid-19-positive patients to their Isolation Facility. Upon approval of the request, the online survey method questionnaires were made. The respondents were allowed to answer the survey on the same day. The researcher then uses the survey results to develop the system modules and flow, then the system's implementation is also handled by the researcher.

Technical Tools

A. Device Architecture

A radio navigation system will be used to track a hospital.

- **Global Positioning System(GPS)-** Used to determine the location of the Hospitals.

B. System Architecture

- **Web application** - This is where we can access the hospital locator website and receive user data.
- **Database** – This will be the storage of data from users.
- **Computer Desktop** – This is used to access the website from the internet

Software Process Model

The system will use the following:

- **Laravel** – This software is used for building a framework
- **Vuetify** - This software is used for building a UI framework.
- **Visual Studio Code** – Used to develop computer programs.
- **XAMPP**- This software is designed to handle the management of the database using a graphical user interface

CHAPTER IV

RESULTS AND DISCUSSION

The researcher will provide an overview of the web application's alpha and beta testing results in this chapter. The testers were colleagues at the operation center and individuals who participated in an online random survey in Zamboanga City. To collect feedback about the web application, the researchers employed the Likert Scale.

Alpha Testing Result

Table 4: Five-point Likert Scale

Rating/Weight	Range	Interpretation
5	4.3 – 5.0	Outstanding
4	3.5 – 4.2	Good
3	2.7 – 3.4	Satisfactory
2	1.9 – 2.6	Poor
1	1 – 1.8	Unsatisfactory

The table above shows Alpha Testing's range, interpretation, and rating.

Before deploying the web application to the testers, the researcher completed the alpha testing. The testers for this application include Contact Tracers from the City Health Office and Data Managers—the testing phase results.

Weighted Mean of Alpha Test Content

Table 5: Five-point Likert Scale

Alpha Test Deployment	Contact Tracers from the City Health Office and Data Managers	
	Mean	Interpretation
I learned to use the web app quickly	3.6	Good
I quickly navigated through the web app, and it was easy to locate hospitals	4.0	Good
The labels are easily understood	4.0	Good
The time of locating hospitals and isolation facilities is lessened	4.4	Outstanding
Can this web app lessen your problem if you are new in your area?	4.8	Outstanding
Does the application give you the exact location of the Hospital and isolation facility near your area?	3.6	Good
Overall Mean	4.0	Good

Legend:

4.3 – 5.0 Outstanding

3.5 – 4.2 Good

2.7 – 3.4 Satisfactory

1.9 – 2.6 Poor

1 – 1.8 Unsatisfactory

The table above shows the weighted mean for the Instructional Content. For the “I learned to use the web app quickly,” it had a mean of **3.6**, which had a rating of **Good**. For the “I easily navigated through the web app, and it was easy to locate hospitals,” it had a mean of **4.0**, with a rating of **Good**. For the “Labels are easily understood,” it had a mean of **4.0**, which has a rating of **Good**. For the “The time of locating hospitals and isolation facility is lessened,” it had a mean of **4.4** with a rating of **Outstanding**. The “Do you think using this web app can lessen your problem in case you are new to your area?” had a mean of **4.**, with a rating of **Outstanding**. The “Does the application give you the exact location of the Hospital and isolation facility near your area?” had a mean of **3.6** with a rating of **Good**. The overall standard is **4.0**, which indicates that the **Alpha Test deployment** of the web app is **Good**.

The least given score by the testers was for the UI, which got a mark of **3** (**Satisfactory**) provided by 2 out of 10 testers, these two testers were not techy, but they were guided, and soon enough, they got it already and said that the UI needs to be improved and changed.

8 out of 10 testers said that the accuracy of the location of the hospital and isolation facility was good. The path given to them by the application was also good, and they gave a score of **5** (**Outstanding**) in rating.

Beta Testing

The beta testing was conducted on December 23 2022, after the Alpha test; the beta testers were from the online survey, which consisted of students, employees, and ordinary citizens of Zamboanga Ci; after the test, they were given a post-test determine the effectivity of the web-app.

Table 6: Five-point Likert Scale

Beta Test	Online random survey	
Deployment	Mean	Interpretation
I learned to use the web-app quickly	4.25	Outstanding
I quickly navigated through the web app and it was easy to locate hospitals	4.2	Good
The labels are easily understood	4.05	Good
The time of locating hospitals and isolation facilities is lessen	4.4	Outstanding
Can this web app lessen your problem if you are new in your area?	4.3	Outstanding
Does the application give you the exact location of the Hospital and isolation facility near your area?	4.2	Good
Overall Mean	4.2	Good

Legend:

4.3 – 5.0 Outstanding

3.5 – 4.2 Good

2.7 – 3.4 Satisfactory

1.9 – 2.6 Poor

1 – 1.8 Unsatisfactory

The table above shows the weighted mean for the Instructional Content. For the “I learned to use the web app quickly,” it had a mean of 4.25, which had a rating of Outstanding.

For the “I easily navigated through the web app, and it was easy to locate a hospital,” it had a mean of **4.2**, which has a rating of **Good**. For the “Labels are easily understood,” it had a mean of **4.05**, which has a rating of **Good**. For the “The time of locating hospitals and isolation facility is lessened,” it had a mean of **4.4** with a rating of **Outstanding**. For the “Do you think using this web app can lessen your problem in case you are new to your area?”, it had a mean of **4.3** which has a rating of **Outstanding**. The “Does the application give you the exact location of the Hospital and isolation facility near your area?” had a mean of **4.2** which has a rating of **Good**. The overall mean is **4.0**, which indicates that the **Beta Test Deployment** of the web app is **Good**.

The least given score by the end-user was the UI, which got a mark of 3 (satisfactory) rated by 6 out of 20 users, who said that the UI needs to be improved and changed, but they were guided to use the app, so that they can explore the website.

18 out of 20 testers said that the accuracy of the location of the hospital and isolation facility was good, and the path given to them by the application was also good and gave a score of 5 (Outstanding).

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

Conclusion

LOCADOR, a website that locates hospitals' shortest path in your area using Google Maps, determines COVID-19 patient acceptance and provides the ability to book isolation facilities. It is a valuable tool for navigating healthcare services during emergencies during the pandemic. By leveraging the power of Google Maps, real-time data, and a user-friendly interface, the website streamlines finding the nearest hospital, accessing vital information, and securing a safe isolation facility.

Implementing algorithms and Google Maps' routing functionality ensures accurate and efficient path calculations, eliminating the need for manual searches and reducing response time during emergencies. As shown in Chapter 4, the results yielded excellent results in knowing the locations of the Hospitals and Isolation facilities here in Zamboanga City after using the Locator by the online random end users. The respondents have also enjoyed exploring Hospitals or Isolation facilities far from their area.

The researcher concluded that the LOCADOR: COVID-19 Isolation and Hospital Locator Website Using Google Map API had helped most citizens from Zamboanga City, especially those unfamiliar with the route or path going to that specific hospital.

Recommendations

The researcher provided recommendations for the web application in this section, which will guide and inspire future researchers to continue and enhance this study.

The recommendations include a display of every hospital's emergency room capacity, the price range for room admission, and contact numbers for admitting sections while ensuring that the services offered by each hospital are prominently displayed for users' convenience.

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