# A LOCALIZED BASED APPLICATION FOR AUTOMOBILE MECHANICS LOCATION-AWARE SYSTEM

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## ABSTRACT

The mobile application for car mechanics detecting system is a mobile application that automates the different vehicle services required by a vehicle user. Car maintenance and mechanic detector system is a method taken to reduce stress in the society. It is a continuous process and activity in our communities, national and other countries, and this application will be of immense benefit to all vehicle/car owners or users in our communities and Delta States large. The proposed system consists of wireless sensor networks, GPS tracking devices, and cloud computing. In the course of this research work, the Rapid Application Development (RAD) software development methodology is applied. RAD is an approach for building computer systems that combines Computer Assisted Software Engineering (CASE) tools and with prototyping techniques to accelerate software system development providing it with reliable formula for top-notch quality and productivity. The proposed system is built on the operations of tracking or locating automobile mechanics electronically, there is central database system where automobile mechanics data can be properly recorded/registered, there is interactive application where automobile mechanics details can be uploaded because of the effective centralized database, very easy in searching for automobile mechanics information and location because of centralized database system and automobile mechanics can be contacted easily when needed because of the interactive mobile application for car mechanics detecting system. Based on the research nature, it was recommended amongst others that, a centralized database system for storing details of automobile mechanics were developed and functional.

**Keywords:**    Mechanics, Application, Automobile, Localized Based, Location-Aware System

## INTRODUCTION

In Nigeria, visitors and drivers who are caught in a position where their car breaks down turn to the locals for recommendations of any mechanics or electricians who might be able to fix it without putting them in jeopardy. Also, drivers frequently call a technician or electrician they know, who may be located far from the scene of the breakdown. Most of the time, access to qualified auto mechanics and other

associated services is restricted, which is made worse by issues including communication difficulties and location uncertainty.

The goal of maintenance and services system is to keep track of and collect important data for vehicle-related services and maintenance, as well as to address new difficulties. Breakdowns and malfunctioning components that could happen while the automobile is driving and leave the driver stranded, such as worn tires, brake pads, tie rods, and sharp items. The suggested approach will provide stranded individuals with a resource to turn to in order to receive prompt assistance. In resolving these problems, both mechanics and car users face tremendous challenges, with vehicle users carrying a substantial share of these challenges. Currently, the cost of spare parts is outrageously raised by both mechanics and those who sell them, and automobile owners are ultimately responsible for this cost (Ghazal and Al-Khalil, 2016). The localized based application for automobile mechanics location-aware system will provide an interface for buying these parts at the precise retail price in addition to providing repair estimates.

The use of cars has become increasingly important to human existence over time, reducing lengthy travel times from days to hours. From the invention of the automobile, all produced vehicles have required routine maintenance. This maintenance is essential to ensuring their safety and a longer lifespan. The engine oil and filter are changed as part of this routine maintenance. Each vehicle's manufacturer suggests a different maintenance schedule based on variables like miles traveled, intervals between appointments, and weather conditions (Siau and Shen, 2003). In addition to routine maintenance, breakdown, defective parts, and motor accidents result in the need for repairs.

The creation of mobile applications has swiftly gained importance in daily life as a result of improvements in mobile phone technology. Also, it is utilized in business, leisure, communication, and wellness. Because they are portable and user-friendly, people of today frequently choose mobile applications to websites. As we can see, many companies are using mobile applications today to boost their profitability (Islam & Mazumder, 2010). Based on the research nature; the following limitations were observed that; several mobile application development websites refused to grant access to their private data on mobile

application development; using GPS locator and geolocation features, this paper is restricted to all data related to car mechanics; and not all GPS locator and geolocation functions were sourced for this study project due to time constraints (McDuffie, 2020).

Based on this; the significance of this research is to make sure that the application can effectively maintain records of customer information and services rendered. The user will also benefit from this program, especially the frequent user who will use it to service their vehicle. With its built-in geolocation feature, this software can effectively connect the mechanic and the customer.

The acceptance of this project would have significant positive effects on Nigerian society as a whole. By lowering the growing lack of professionalism in dealing with mechanics, this study will help. It will be simpler for auto owners to locate qualified mechanics to work on their vehicles, eliminating the risk of shoddy maintenance and improper fitting of essential equipment. Nigerian society nowadays blames many auto accidents on badly maintained vehicles that are therefore unsafe to drive (Kriening, 2019). Our understanding of the relative effects of prior computer-related experience

on car maintenance and services will improve as a result of this study. This project will promote additional research and provide space for it.

The goal of this paper is to develop a localized based application for automobile mechanics location-aware system. The study paper's specific objectives are to; develop a centralized database system for storing details of automobile mechanics; develop localized web based application interface for locating automobile mechanics, and conduct Alpha testing on the functionalities of the proposed model in other to validate its performance.

The goal of maintenance and services system is to keep track of and collect important data for vehicle-related services and maintenance, as well as to address new difficulties. Breakdowns and malfunctioning components that could happen while the automobile is driving and leave the driver stranded, such as worn tires, brake pads, tie rods, and sharp items. The suggested approach will provide stranded individuals with a resource to turn to in order to receive prompt assistance. In resolving these problems, both mechanics and car users face tremendous challenges, with vehicle users carrying a substantial share of these challenges. Currently, the cost

of spare parts is outrageously raised by both mechanics and those who sell them, and automobile owners are ultimately responsible for this cost. The localized based application for automobile mechanics location-aware system will provide an interface for buying these parts at the precise retail price in addition to providing repair estimates.

The project's goal is to develop a localized based application for automobile mechanics location-aware system, and to develop a centralized database system for storing details of automobile mechanics, to develop localized web based application interface for locating automobile mechanics and also to conduct Alpha testing on the functionalities of the proposed model in other to validate its performance.

The significance of this project is to make sure that the application can effectively maintain records of customer information and services rendered. The user will also benefit from this program, especially the frequent user who will use it to service their vehicle. With its built-in geolocation feature, this software can effectively connect the mechanic and the customer.

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The research only focuses on developing a localized based application for automobile mechanics' location-aware system that allow mechanics to register with their databases and create modules for them to enter information about their shop or company, including the name of the business, the name of the mechanic working there, their location (address), and their contact information (Independent Newspapers Nigeria, 2020). The system updates information about already-existing mechanics; updates include the registration of new mechanics and information searches for mechanics.

An application software type known as a mobile application, more commonly referred to as "an app," was developed expressly to run on mobile devices like smartphones and tablets. Consumers frequently have access to services through mobile applications that are similar to those used on PCs. Apps are frequently distinct, tiny software units with limited capabilities (Mukherjee; Prakash and Kumar, 2015). The App Store, where this use of app software initially gained prominence, offers thousands of programs for the iPhone, iPad, and iPod Touch. Mobile applications are moving away from the integrated software systems frequently seen on PCs. Instead, only a few limited and isolated features—such as a game, a calculator, or mobile web browsing—are offered by each app (Holla and Katti, 2012). Applications may have avoided multitasking due to the early mobile devices' constrained hardware capabilities, but now that consumers may choose what their devices are capable of, their specialization is part of what makes them desirable.

**Primary Application Categories**

The two primary categories of apps are web applications and native apps. Native apps are developed specifically for a particular mobile operating system, often iOS or Android. Before being released, native apps often go through a far more rigorous development and quality testing procedure, which results in better performance and a more streamlined user interface (UI). Due to the fact that they are executed through a browser, web apps employ HTML5 or CSS and consume the least amount of RAM on the device. The user is sent to a specific web page, and all data is saved on a server-based database. To use web applications, a stable connection is required. (Berisha-shaqiri, 2015). There are several types of apps currently available:

- **Apps for lifestyle and entertainment:** These are becoming more and more popular, and they cover a wide range of personal lifestyle and socialization activities, including dating, interacting on social media, and sharing (and watching) movies. This category includes some of the most well-known apps, like Netflix, Facebook, and TikTok.
- **Gaming apps:** The equivalent of computer video games, they are among the most popular types of apps. They account for one-third of all app downloads and three-fourths of all consumer spending.

- **Productivity apps:** These focus on improving business efficiency by easing various tasks such as sending emails, tracking work progress, booking hotels, and much more.

**Types of Mobile Apps by Technology:**
There are three basic types of mobile apps if we categorize them by the technology used to code them:

- **Native apps** are created for one specific platform or operating system.
- **Web apps** are responsive versions of websites that can work on any mobile device or OS because they're delivered using a mobile browser.
- **Hybrid apps** are combinations of both native and web apps, but wrapped within a native app, giving it the ability to have its own icon or be downloaded from an app store.

**Native Apps**

Native apps are designed specifically for the operating system (OS) of a mobile device. As a result, in addition to all of the other platforms and devices, you can have native Android or native iOS mobile apps. You cannot use a Blackberry app on an Android phone or an iOS app on a Windows phone since they are only developed for one platform

**Technology Used**: Native apps are coded using a variety of programming languages. Some examples include: Java, Kotlin, Python, Swift, Objective-C, C++, and React.

**Pros**: Because of their singular focus, native apps have the advantage of being faster and more reliable in terms of performance. They're generally more efficient with the device's resources than other types of mobile apps. Native apps utilize the native device UI, giving users a more optimized customer experience.

**Cons**: However, the problem with native apps lies in the fact that if you start developing them, you have to duplicate efforts for each of the different platforms. The code you create for one platform cannot be reused on another. And then, every time there's an update to the app, the user has to download the new file and reinstall it. This also means that native apps do take up precious space in the device's storage.

- **Android:** Programming languages include Kotlin and Java
- **Windows Phone:** Programming languages include C# and .NET
- **iOS:** Programming languages include Swift, Python, and Objective-C

Native app design is a common strategy for gaming apps. Gamers can anticipate quicker access times to device systems and cameras by developing these kinds of mobile apps in a native manner for iOS or Android. Additionally, native gaming apps have the advantage of improved security and compliance, a consistent and enjoyable user experience, and the chance to scale and increase ROI quickly.

**Web Apps**

Web applications work in the same way as native apps, but are accessed via your mobile device's web browser. They are not independent programs in the sense that you must download and install code onto your device (Davies; Beresford and Hopper, 2006). These are responsive websites, which adapt their user interface depending on the device being used by the visitor. In reality, clicking the "install" button for a web app usually only bookmarks the website's URL on your device. One sort of web app is the progressive web app (PWA), which is effectively a native software running within a browser.

**Technology Used**: Web apps are designed using HTML5, CSS, JavaScript, Ruby, and similar programming languages used for web work.

**Pros**: Because it's web-based, there is no need to customize to a platform or OS. This cuts down on development costs. Plus, there's nothing to download. They won't take up space on your device memory like a native app, making maintenance easier – just push the update live over the web. Users don't need to download the update at the app store.

**Cons**: But, this is also important to note: web apps are totally dependent on the device's browser. There will be features that are available in one browser but not in another, which could result in different user experiences. They also won't fully function offline because they are only shells for websites. The device will still require an internet connection even if it has an offline mode in order to back up the data on your device, provide any new data, or update what is displayed on the screen.

**Hybrid Apps**

Then there are hybrid applications. These are online apps that have the appearance and feel of native apps. They may have a home screen app icon, responsive design, great performance, and even the ability to run offline, but they are actually web apps disguised as native apps.

**Technology Used**: Hybrid apps use a mixture of web technologies and native APIs. They're developed using: Ionic, Objective C, Swift, HTML5, and others.

**Pros**: Building a hybrid app is much quicker and more economical than a native app. As such, a hybrid app can be the minimum viable product – a way to prove the viability of building a native app (Moore, 2017). They also load rapidly, are ideal for usage in countries with slower internet connections, and give users a consistent user experience. Finally, because they use a single code base, there is much less code to maintain.

**Cons**: The power and speed that differentiate native apps from hybrid apps may be absent in hybrid apps. A hybrid app is one of the numerous types of mobile apps that combines a native app and a web app. It's actually built as a web app that runs inside a native app container. By exploiting specific native platform features and device hardware, hybrid apps deliver the benefits of a native experience while adapting to non-native scenarios. However, hybrid apps use front-end development tools including as JavaScript, HTML5, Ionic, Cordova, and CSS to power cross-platform features.

**Geolocation**

Geolocation is the capacity to detect the location of a device via GPS, mobile phone towers, WiFi access points, or a combination of these. As individuals utilize electronics, geolocation uses positioning systems to track their locations down to latitude and longitude coordinates, or more realistically, a physical address (Tom, 2015). Geolocation is supported on both desktop and mobile devices. Instead of tracking the user's location, this function tracks the phone's location (Hoque, 2016). The geolocation feature of the mobile application is configured based on the user's current location.

According to Estes (2016), criminals may utilize GPS and geolocation tagging to identify an individual's current or future location, enabling them to commit crimes such as burglary and theft, as well as abduction, stalking, and domestic abuse against that individual or his or her goods. Using an application mapping can also cause us as users to communicate discreetly with their publisher (National Coordination Office for Space-Based Positioning, Navigation, and Timing, 2022).

The goal of maintenance is to keep something in a decent, usable condition. Automobile maintenance is the process of routinely

servicing a car to avoid major breakdowns or the need for expensive repairs. Some of the kinds of auto services that may be required for maintenance include tire rotation, spark plug replacement, and oil changes (Villanueva, 2021). If a person follows the recommended vehicle maintenance schedule, it is thought that their car would live longer and perform better.
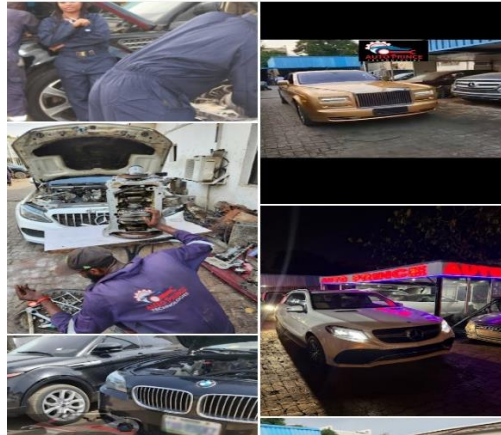


Figure 1: Cross section of Car Maintenance (A)



Figure 2: Cross section of Car Maintenance (B)

## MATERIALS AND METHOD

The Rapid Application Development (RAD) software development methodology is used in this research project. RAD is a method of developing computer systems that combines Computer Assisted Software Engineering (CASE) tools and prototype methodologies to accelerate software system development while providing a consistent formula for high quality and productivity. It adheres to the incremental development approach and supports transparent communication with the purpose of shortening the development cycle (Rashid; Mon and Kolandaisamy, 2019).

RAD eliminates the need for considerable pre-planning, allowing software to be created more faster and making it easy to change requirements. The RAD methodology has the following stages:

(a) **Requirement Planning:** This stage defines the functions and data subject areas that the system will support and determines the systems scope. It is also known as the concept definition stage.

**(b) User Design:** This is also known as the functional design stage. It uses workshops to model the systems data and processes and to build a working prototype of critical system components.

(c) **Construction:** The construction stage completes the construction of physical application system, builds the conversion system, and developers user aids and implementation work plans. This stage is also referred to as the development stage.

**(d) Cutover:** Represents the final tasks in the SDLC implementation phase, such as data conversion, testing, system changeover, and user training. When compared to traditional approaches, the entire procedure is shortened. As a result, the new system is designed, delivered, and operationalized considerably faster.

**Analysis of the Existing System**

From analysis gathered, there is no electronic application for car maintenance and mechanics detector in existence. During the course of analyzing this application some of the problems identified were the issues of errors in the documentation of the activities.

i.    Operations of tracking mechanics and their current locations are still done manually

ii.   There is no central database system where mechanics data can be distributed.

iii.  There is no platform where automobile mechanics details can be uploaded because there is no central database.

iv.   Difficulties in searching for information of an automobile mechanics from one location to the other.

**Analysis of the Proposed System**

Based on investigation made from the proposed model, there is centralized database system for automobile mechanics detector system. The proposed system has the following unique feature and many others for

the efficient car servicing and automobile mechanics detector system.

i.    Operations of tracking or locating automobile mechanics are now done electronically.

ii.   There is central database system where automobile mechanics data can be properly recorded/registered.

iii.  There is interactive application where automobile mechanics details can be uploaded because of the effective centralized database.

iv.   Very easy in searching for automobile mechanics' information and location because of centralized database system.

**Data Flow Diagram of the Proposed System**
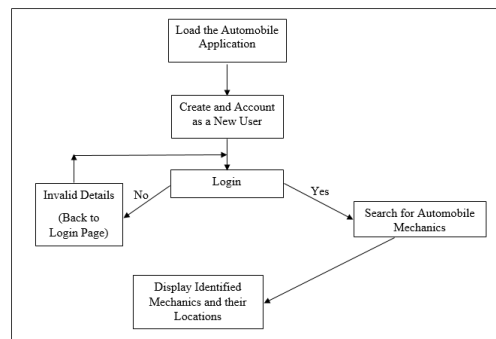


Figure 3: Data Flow Diagram of the Proposed System

**Entity Relationship Model of the Proposed System Database**

An Entity Relationship (ER) Diagram is a sort of flowchart that shows how "entities" in a system, such as people, objects, or concepts, interact with one another. ER Diagrams are most commonly used in the disciplines of software engineering, business information systems, education, and research to create or troubleshoot relational databases (Chen, 1976). They use a predetermined collection of symbols such as rectangles, diamonds, ovals, and connecting lines to illustrate the interconnectedness of entities, relationships, and their qualities. They are also known as ERDs or ER Models.
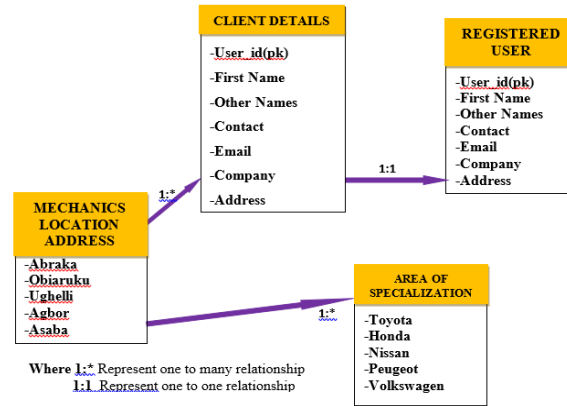
Figure 4: Entity Relationship Model of the Proposed System

## Web Application Processes

The web application enables users to enter their personal details during registration which is known as creating personal details, hence the user login into the application with the created details, and if correct, the application directs the user to "Search for Mechanics and their Location Page" and "Confirm Mechanics Location". Meanwhile, if the login is incorrect, the application displays an error messages and returns the user to the beginning (Login Page).
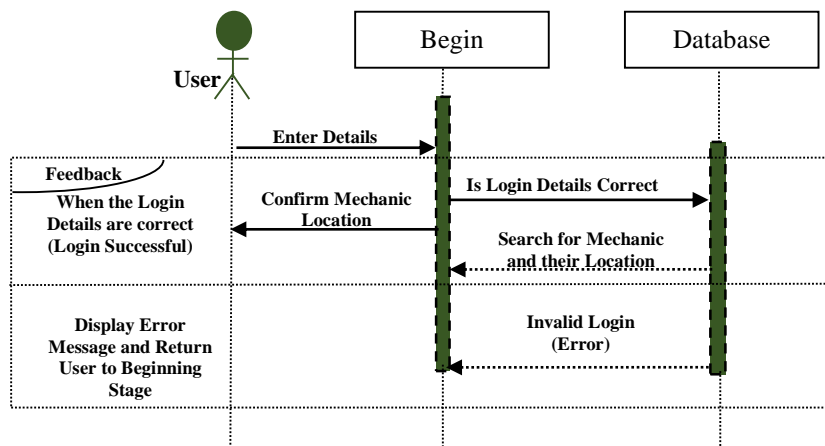


Figure 5. Sequence Diagram for Logging in the Application

## Alpha Testing of the Propose System

Alpha testing is a software testing that is done to find issues before releasing the product to real consumers or the general public. One type of user acceptance testing is alpha testing. This is called alpha testing because it is done early in the software development process, near the conclusion. The proposed

system will be evaluated by Twenty (20) participants to validate its performance.

After the validation process, the following observations were made:

- Eight (8) respondents representing 40% stated that the proposed system is user friendly by interacting with the system user.

- Twelve (12) respondents representing 60% stated that automobile mechanics were located and contacted with the proposed system.

**High Level Hierarchical Diagram of the proposed System**

The auto-mechanic mobile application is an overview of the flow and processes involved in the user and function of the proposed automobile location-aware system. In this model, the user can login into the application and have access to registered automobile mechanic in his/her geopolitical environment.

This model displays how automobile mechanics information and contacts are being assessed with the use of the application. In this model, the mechanics identified in red colours are the automobile mechanics located and situated around the user. While, those identified with black colours are automobile mechanics that are located but not in the same metropolis with the application user.
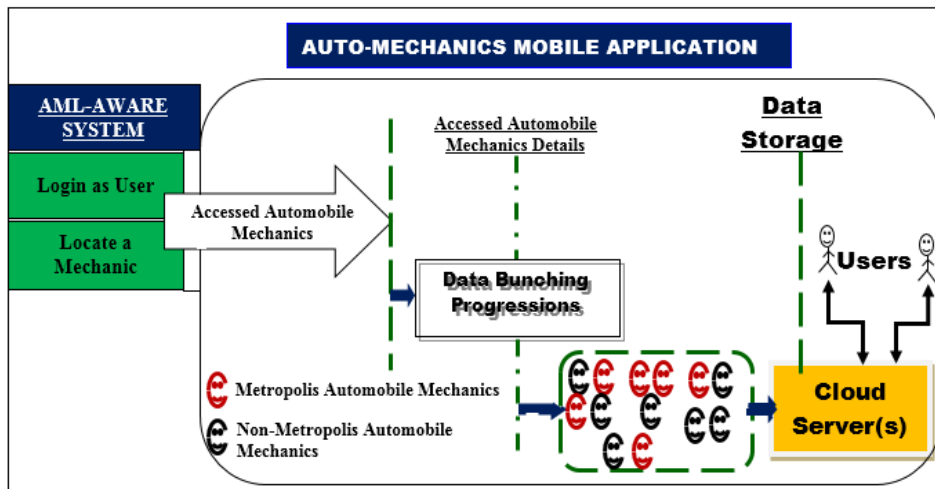


Figure 6: High Level Hierarchical Diagram of the Proposed System

**Implementation**

It is a good programming practice to include documentation on how a new system should be managed and maintained in order for the application to withstand the test of time. System implementation is the actual introduction of a new system to replace an

existing system. Similarly, system documentation entails writing a description of what a program does and how to utilize it. The new system can be installed in numerous phones through a stage-by-stage procedure or by running the program concurrently until the users have learned it. Furthermore, the program can be used in the same way as any other mobile phone application.

**Pseudo Codes**

| Begin | This enables the user load the proposed system |
|---|---|
| Create Account | As a new user, this enables you to create account before using the proposed application to locate mechanics. |
| If Account successfully created then | This validates the login details of a user to determine if the account created is successful or not. |
| Register Automobile Mechanics. | This allows mechanics to register their automobile workshop with their relevant details. |
| Store Details in the Database | This allows the storage of registered automobile mechanics into the proposed system database. |
| Search for Automobile Mechanics and their Location | This allows/enables the application users to search for available automobile mechanics and their location. |
| Else If Search is Successful then | This validates/determines whether the search of automobile is successful or not. |
| Confirm Mechanics Location | This is to confirm the automobile mechanics location if the search of mechanics where successful. |
| End if | This terminates the iteration of the automobile mechanics search whether successful or not. |

| End | This terminates the program after the search of automobile mechanics. |
|-----|---------------------------------------------------------------------|

## Specification

The following software was utilized in the creation of this project:

   i.    An operating system (Windows 10 OS)

   ii.    Android Studio

   iii.   JavaScript

## Login Page of the Proposed System



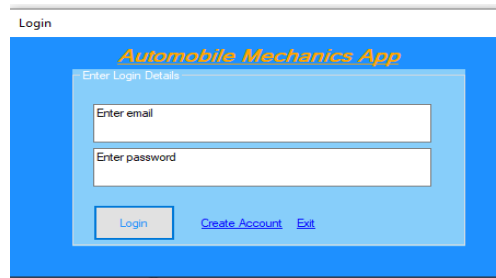Figure 7: Login Page

This page enables users to login and have access to available mechanics in any geolocation of the automobile user.
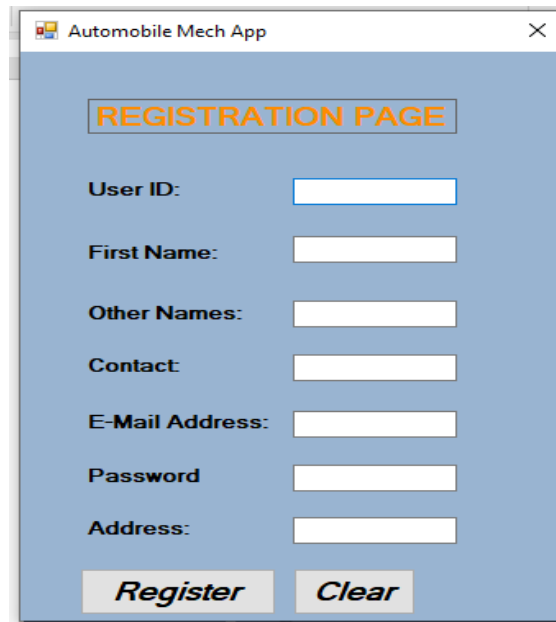
## Input Format

Figure 7: New Mechanics Registration Page

New Mechanics Registration Page: This Page allow car owners to register new mechanics Information.
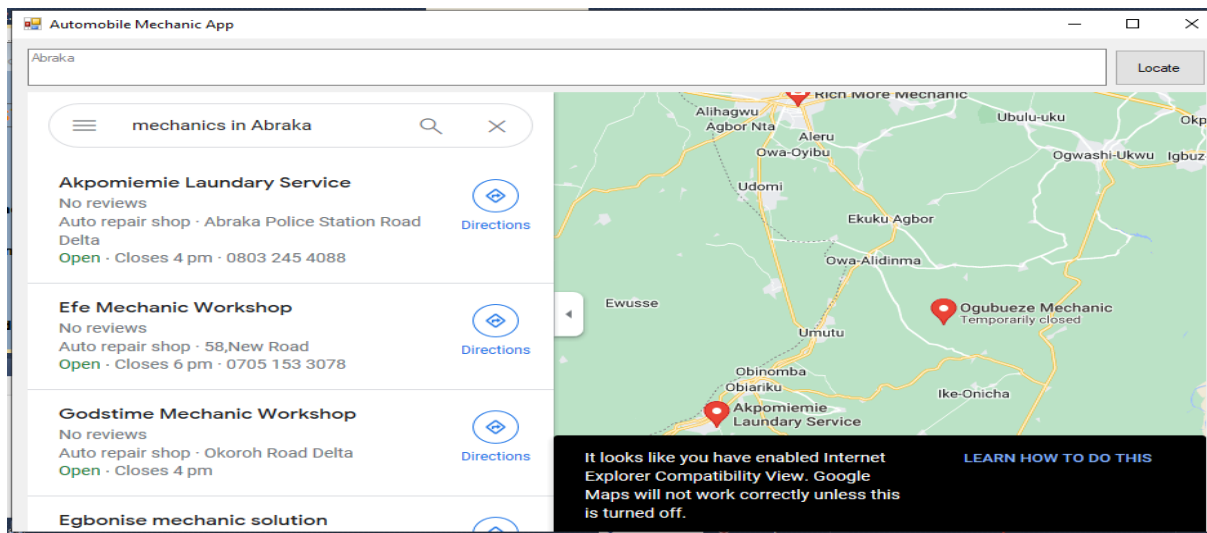


Figure 9: Overview of Identified Mechanics

**RESULT AND DISCUSSION**

This page displays the overview of identified mechanics: The results show that the auto-

mechanics workshops with red colour are those close to the driver or automobile engine user; while those without the red colour are identified automobile mechanics that are not close to the driver's current location.

This project is on the development of a localized based application for automobile mechanics' location-aware system and in the course of this research work, the Rapid Application Development (RAD) software development and Unified Modelling Language (UML) methodology is applied. RAD and UML is an approach for building android and computer applications that combines Computer Assisted Software Engineering (CASE) tools and with prototyping techniques to accelerate software system development providing it with reliable technique for top-notch quality and efficiency. Modern applications and web development technologies and techniques such as Active Server Page .NET (ASP.NET), Java technology was used, the technique was employed in the development of the mobile application.

Car maintenance and mechanic detector system is a method taken to reduce stress in the society. It is a continuous process and activity in our communities, national and other countries, and this application will be of

immense benefit to all vehicle/car owners or users in our communities and Delta States large. This work enlightens individuals', car owners, car companies and drivers including professional mechanics on the importance of mobile application for car mechanics detector system in our society.

**CONCLUSION**

As we all know, car and smartphone have become essential in everyday necessities. In other words, "must have" tool and supported application will make your life easier. As a result, it can be argued that this system was tested among selected respondents and met these objectives. It is useful for locating mechanics for routine car maintenance and servicing (Rajput, 2017). The device can also detect their location and make it easier to supply the necessary services. The results showed that the auto-mechanics workshops with red colour are those close to the driver or automobile engine user; while those without the red colour are identified automobile mechanics that are not close to the driver's current location.

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