

Unified Emergency Auto-Service Mobile App

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Abstract- An emergency is an unexpected happening that needed immediate intervention due to its degree of threat, while an emergency response is a mechanism devised to control and manage it. A vehicle breakdown is a specific emergency that has caused vehicle owners and travellers frustrated moments, especially when it happened in an unfamiliar location. Furthermore, access to competent vehicle technicians and other related services is limited and can be worsened by language barriers and unfamiliar area. In this work, we created a unified vehicle emergency response mobile App. to use sets of mobile App developing techniques and Google Geo-locator. The mobile App connects vehicle drivers to a well-defined database of competent vehicle technicians, security officer posts and towing van services within the emergency locality. The mobile app interface is designed in English and WAZOBIA languages to make it more user friendly for Nigerians and a solution to the language barrier. Online payment interface is integrated for accountability and cashless society promotion. The system serves as a trusty link between vehicle owners and competent auto-technicians.

Keywords: *Google Geo-locator, Mobile devices, Flutter, WAZOBIA language, Emergency response App.*

1. Introduction

An emergency is an unexpected happening that needs immediate intervention due to its degree of threat; while an emergency response is a mechanism devised to control and manage the emergency [1]–[3]. As of the Q4 of 2017 and 2018, the total number of licensed vehicles in Nigeria was 11.6 million and 11.8 million, respectively [4]. Unscheduled breakdown of these vehicles is an unavoidable situation, especially in localities with poor road maintenance culture. A vehicle breakdown is a specific emergency that had caused vehicle owners and travellers' frustrating moments, especially when it happened in an unfamiliar location. There has been a predominantly high car breakdown rate in Nigeria due to the roads' poor conditions. This breakdown can occur in remote areas, especially when embarking on a long-distance journey. Getting the services of a competent mechanic or electrician in that dire situation becomes complicated. In Nigeria, drivers and travellers trapped in a vehicle breakdown situation resort to asking the locality inhabitants for any mechanic/electrician that could help fix their vehicle without being bordered on a competency. Also, drivers usually contact a mechanic/electrician that he/she has contact with, which might be at a very far distance from the point of breakdown. Most times, access to competent vehicle technician and other related services is limited and worsens by factors like language barriers and not knowing where you are. Leveraging about 85.5 million Android mobile phone users in Nigeria [5] and Network connectivity at hand, an emergency mobile App that connects the vehicle owner to the nearest competent Mechanic/Electrician is designed and implemented. A unified auto-service mobile App is created using sets of mobile App developing techniques and Google Geo-locator. The mobile App connects vehicle drivers to a well-defined database of competent vehicle technicians, security officer posts and towing van services within the emergency locality.

2. Design Methodology

This section was used to explain the Design and Architecture of the developed solution as a proof of concept.

- **System Architecture**

The client-server architecture approach was adopted for the development of the system. This acts as a distributed model that divides tasks between resource providers known as servers and service requestors known as clients (Drivers/Mechanics/Electrician). The architecture of the system and how its various components interact is shown in Figure 1 below. The proposed model uses a GPS locator to provide location-based information to the clients and technicians mobile apps. This includes a front-end, which is an Android application, and a database.

The client requests location details from the GPS locator, which the server would use to fetch technicians' information within the fetched location. The data or request that was being sent to the server by the client is being transferred to the specific technician who is accessible through the mechanic/electrician mobile app interface.

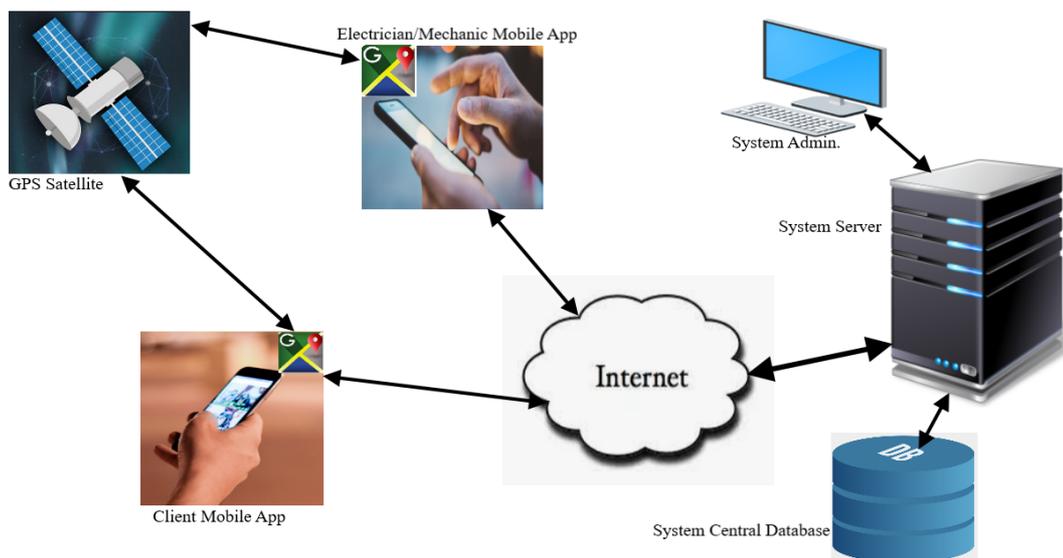


Figure 1. General System Architecture

- **Google Geo Locator**

Google Maps are commonly used to determine the destination location, calculate distance and approximate time to reach a destination point from one's current location. Google Maps have an extensive array of application program interfaces (APIs) that let you embed the great functionality and effectiveness of Google Maps into your Smartphone applications [6]. Google gives Google play a library for using Google Maps into Smartphones application [3], [6], [7]. This system utilizes Google Geo Locator in fetching the coordinates (longitude and latitude) of both the driver and the nearby auto technicians.

- **WAZOBIA Language Translator**

WAZOBIA is an acronym representing the three major Ethnic languages in Nigeria: Hausa, Igbo, and Yoruba languages [8]. WAZOBIA means "Wa" (come) in the Yoruba language, "Zo" (come) in the Hausa language, and "Bia" (come) in the Igbo language, respectively. The

system was built to operate in the English language (default) and WAZOBIA languages as an option.

3. Implementation and Testing

The mobile application was built to run on Android-enabled phones and platforms using Dart with flutter framework and firebase storage as the database. Android was preferably chosen as the main platform for developing the mobile application due to its ease of learning and use and availability for free use with significant community support. The system was then put on a series of tests for workability and determined whether it meets the actual designs' requirements. This section presents the implementation and testing results. Below are screenshots of the mobile application and its functionalities.

- **Choose Language (WAZOBIA Selector)**

Once the application opens, it gives room for the user to choose a preferred language, which is either English(default) or any of the three major Nigeria native languages (Igbo, Hausa and Yoruba), also known as WAZOBIA language. The screenshot is as shown in Figure 2 below:

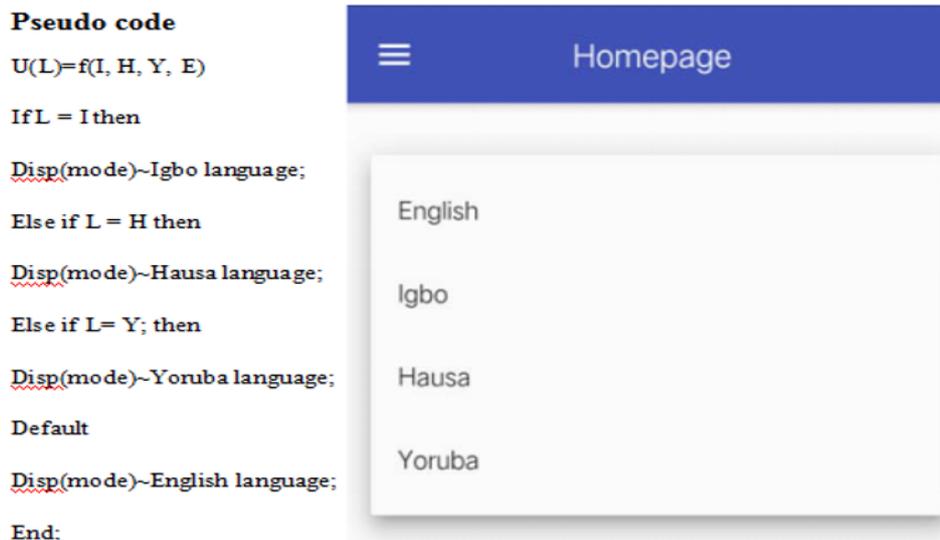


Figure 2. Pseudocode and screenshot of the WAZOBIA Language Selector Homepage

- **Quick Fix Tips**

This window gives the user some essential emergent repair tips, which could easily be implemented by the driver/user on the car before contacting a competent auto-technician (Mechanic or Electrician). The screenshot is shown in Figure 3.

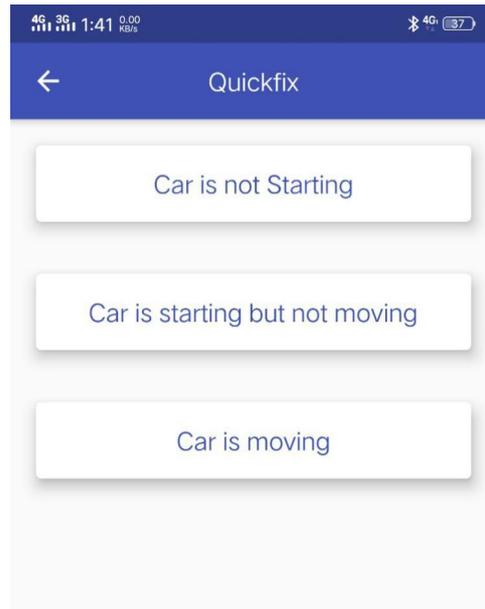


Figure 3. Screenshot of the Quick Fix Tips Window

- **Registration**

A user is meant to register either as a client or mechanic/electrician. Figure 4 shows the screenshot of the registration window and requirement for account creation.

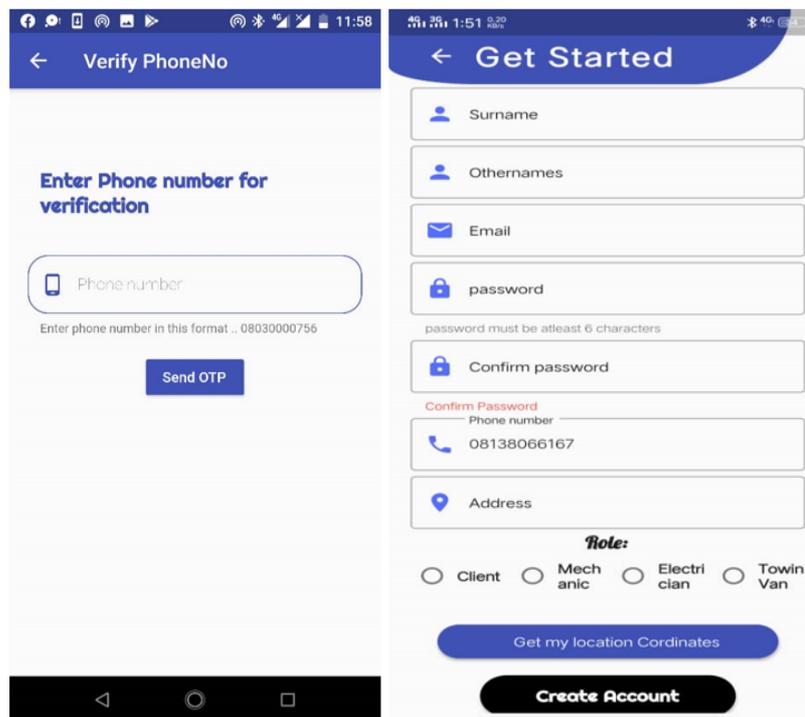


Figure 4. Screenshots of the Registration and Phone Verification Window

- **Search Mechanic/Electrician/Towing van Process**

When a user needs an auto-service, the user must provide a faulty car model and click on search. The user can place a request by selecting and requesting any of the listed technicians in the search result.

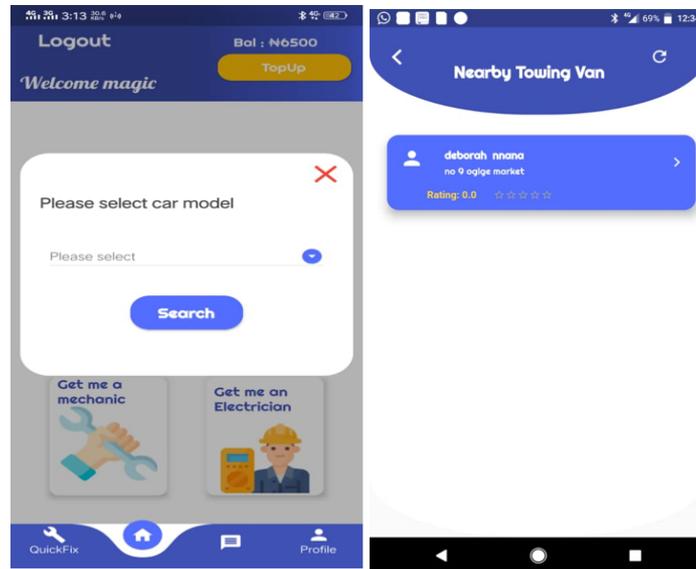


Figure 5. Search for Mechanic/Electrician/Towing Van Process Window

- **Payment Window**

Upon completing work by the auto-technician (Mechanic or Electrician), the user would be able to make payment for the service through a personal e-wallet or could as well pay by cash. Figure 6 below describes the process:

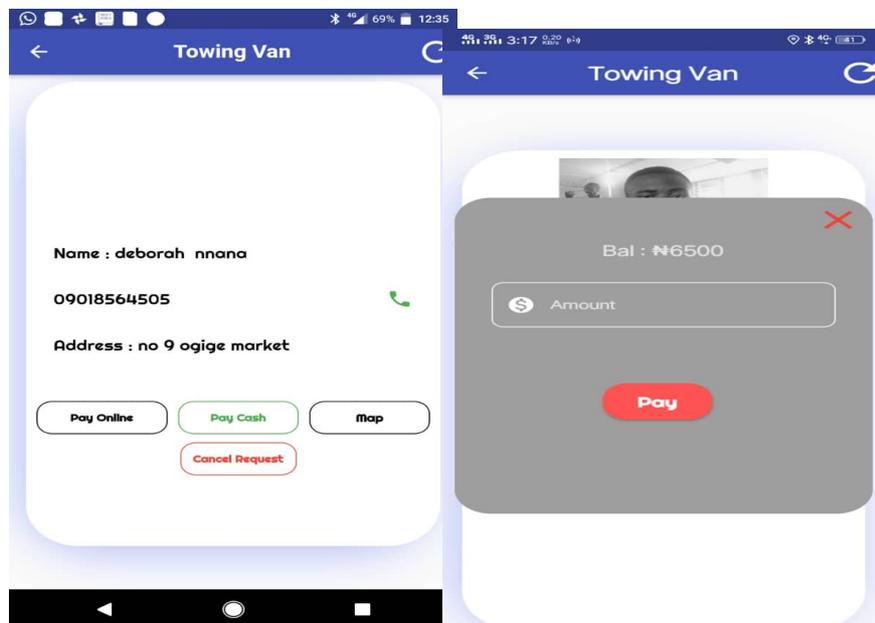


Figure 6. Client's/User's Payment Process Window

4. User Testing

This testing was carried out to obtain the users' feedback on the mobile App using questionnaires distributed to respondents/public users. Users were given instructions on downloading and interacting with the mobile App by being supplied with the application's name on the Google Cloud Store [9]. A chart representation of the response from the respondents is shown in Figure 7.

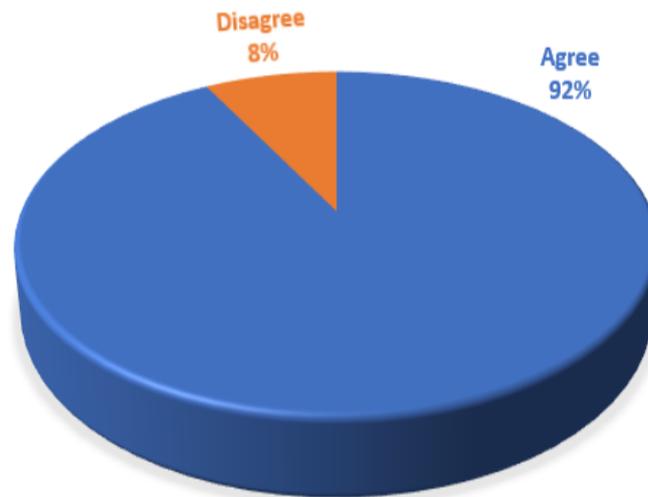


Figure 7. Usability Test Response

Thus far, the usability feedback from the active users showed that the mobile App is functioning very well for 92% of the population. However, circa 8% of the users' population encountered minor glitches with the application suspected to be an effect of inadequate network coverage within the test region.

5. Conclusions

In summary, a unified emergency Auto-service mobile App was conceptualized designed and implemented. The implementation was done using sets of mobile App developing techniques and Google Geo-locator. The system connects vehicle drivers to a well-defined database of competent auto-technicians, security officer posts/stations, and towing van services within emergency or vehicle breakdown locality. While the chances of a properly maintained vehicle experiencing a breakdown are slim, it is never possible to predict when and where the vehicle breakdown may occur. Hence, this system promises to act trusty between drivers and competent auto-technicians, especially in an emergency. Due to some users' inadequate network coverage in some geographical locations, it is planned to solve the challenge by creating a mobile app version that functions offline in most situations.

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