Development of Mobile Application with Geolocation Technology for Car Service Workshop

Nor Arzami Othman[1]*, Mohd Nizam Osman[2], Khairul Anwar Sedek[3], Muhammad Farid Mohd Bohari[4]
[1,2,3,4] Faculty of Computer and Mathematical Sciences,
Universiti Teknologi MARA Perlis Branch, Arau Campus, 02600 Arau, Perlis, Malaysia.

Corresponding author: * arzami@uitm.edu.my

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HIGHLIGHTS

- Geolocation technique that uses data from a user's smartphone or computer to identify or characterize the user's exact location very helpful.
- User also can set a service reminder, manage vehicle expenses, maintenance reminders and track vehicle's fuel running cost
- Car users will be aware about regular maintenance and services.

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ABSTRACT

Mobile application with geolocation function has been on the market for quite some time. It has been implemented on most of the application to detect the user current location. With the lack of use and awareness of this features, we took that opportunities to develop mobile app and collaborate with YS Auto Workshop. It will detect the customer current location when they request for car breakdown from YS Auto workshop. Notification will be sent to the manager of the workshop and can see the marker on user current location and take an action. Main objectives are to design and develop mobile app and to evaluate its usage using user acceptance test in improving the user needs. Agile methodology has been used based on requirement and it is suitable in the development of mobile application. The development of the system has use agile method which has fifth phases including planning, analysis, design, development, and testing. Three expert users involve during Functionality Testing meanwhile thirty random selected respondents from district of Batang Kali involved in the experiment and perform Heuristic Evaluation and User Acceptance Test questionnaires. Analysis shown that application is interesting and helpful. The system is developed successfully and can make more improvement for the future.

Keywords: *Geolocation, reminder system, notification, mobile application, tracking*

INTRODUCTION

With the advancement of mobile phone technology, mobile application creation has quickly increased the importance in everyday life. It also used in industry, entertainment, communication, and health. Mobile application is moveable and easy to use, that is why many of user nowadays prefer mobile applications rather than website. As what we can see, many of business nowadays are gaining their profits using mobile application (Islam & Mazumder, 2010).

Most of mobile applications has a geolocation function. Using this function must be connected to the internet. Geolocation is helpful because it can give exact location of any devices or a person (Rashid et al., 2019). This function is similar to Global Positioning System (GPS) in a way but it little bit difference. For example, geolocation is using the cell site triangulation rather than GPS to detect the location (Rajput, 2017). Geolocation can be used in several application. One of the examples is cab-based application which is Grab. It can also be used in any retail application for knowing the location of the customer (Rajput, 2017).

Car service is regular maintenance health inspection for our vehicle that evaluates everything from the fluid levels of the engine to overall wear and tear. In this development of the application, YS Auto Car Service that is located in Batang Kali, Hulu Selangor which have been operated for almost 20 years. This application will use a new function called geolocation technology to connect the customer with their mechanic. Which means the customer can assign the mechanic to come over for repair their car with using a geolocation function. This will help the YS Auto to improve their service, not only in the workshop and it will increase the customer satisfaction and build good reputation.

The significance of this project is to ensure the record of customer information and record of services provided can be kept well in this application. This application will also benefit the user especially the regular customer which will help them to service their car. This app can connect the mechanic and customer well which is with geolocation function which integrated in this application.

Geolocation

Geolocation is the capability to monitor a device's locations via GPS, mobile phone towers, Wi-Fi access points or a combination of these. Since gadgets are used by persons, geolocation employs positioning systems to monitor an individual's locations down to latitude and longitude coordinates, or more realistically, a physical address. Both mobile and desktop computers may utilize geolocation. This function follows the location of the phone, not the user's location. Geolocation feature of the mobile application is used to determine the user's current location during the application's setup.

There are some impact and implication in using geolocation such as when we are exposing our geolocation information publicly, it can conduct to increased personal risk. This is because of geolocation tracking, even if you do not want to share your location. According to Villanueva (2021), using too much geolocation data has enabled many amazing things, but it has also permitted some unpleasant thing. When your location is known to others, like people know where you are, and it can bring to another risk lie your family, your belongings, and other assets. According to Estes (2016), a GPS and geolocation tagging may be used by criminals to identify an individual's current or future location, allowing them to commit crimes such as burglary and theft, as well as abduction, stalking, and domestic abuse against that individual or his or her possessions. Using an application mapping also can make we as a user quietly interacting with their publisher.

EXISTING ISSUES

The first problem is lack of organization of data about customer especially regular customer and service provided. It means YS Auto did not have a good management on their customer information. Other than that, it is hard and take time for their manager to check the last services with their customer's vehicles and customer information. Based on unformal interview, staff at YS Auto kept their customers information and services provided on a logbook. Thus, chances of mission of the data can be high.

Next, the customer did not aware about their vehicle maintenance such as change the oil filter, brake pads, spark plugs, tire, etc. Especially for the person who always busy and do not have time to inspect their car. According to Grady (2007), until delivering their cars to the final assembly line, car designers expend billions of dollars planning, manufacturing, and performing performance and reliability studies and evaluations. That is why we need to take care the vehicle properly. The maintenance is important because it will take a proper care about our vehicle. It won't lead to something goes wrong or any breakdown.

Hence, customer cannot connect well with mechanic in case of breaks down. Most of the customer that have a broke down car, they do not know how to fix their vehicles. Although the car is in good condition, but it can be unavoidable when it comes to breakdowns. Because of that, the customer can be panic if they are in the following situation. No matter when the car breaks down, it can be a terrifying experience (Sethi, 2019). This problem leads to an idea to develop an application that can synchronize contact between customer-mechanic. In line with main features added in this application which is geolocation, it will help their regular customer well in case of breakdown.

METHODOLOGY

Agile approach is the best choice for this project since it needs less preparation and breaks down the work into manageable chunks. The agile method is designed for short- term projects requiring cooperation and adhering to the software development life cycle. Furthermore, involving software learning management with consumers lowers the risk associated with the software. The agile approach is iterative, with adjustments made in response to consumer feedback (Sharma, 2017).
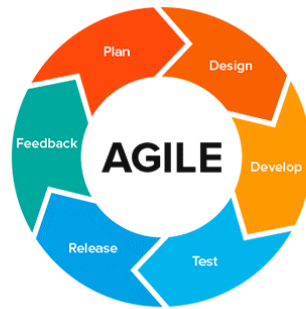

Figure 1: Agile methodology
Source: *https://www.codeupset.com/reason-to-adopt-agile-methodology/*

Planning

The initial stage is to planning which entails creating a high-level plan by defining the existing issue that has led to the project concept, as well as the objective or goals of the project. Project requirements and possibilities are being addressed in order to achieve and fulfil the project objectives and goals. Literature review, related works helps a lot in determining or identifying the problem statement, the aim, the scope, and the significance of the proposed project, among other things. In addition to that, information from journal, article, websites, and other related works is used as a source of information in gathering an information.

Analysis

Analysis from journal, articles, websites and related work has been conducted. Functional and non-functional requirement and analysis also determined.

a)   Functional Requirement
- User can login the system by using google sign in.
- User can assign the mechanic by giving their exact location in using geolocation API.
- User can manage their car information in the application

b)   Non-Functional Requirement
- Validation - The application will be showing a title for every page that have in an application.
- Security – User can only view & modify their own information and Only Admin can view all user's information.
- Simplicity - The application will be as simple and user-friendly

Design

Modelio has been used in designing such as UML use case diagram process. Storyboards are sketched to give an overview or lay out of images in sequential order to create the flow of the system. This part represented the outcome of the design the development with implementation from the prior raw drawing on the storyboard for the application, which had been discussed in the preceding portion of the document. This comprised the implementation of the application flow in accordance with the order of the application flow, as well as the explanation of the screenshots of each part or screen that had been developed with graphical user interface.

Development

Android Studio has been used during this stage with Java scripting language for programming part. Android Studio is the Integrated Development Environment (IDE) for the Android mobile operating system developed by Google. Android Studio, which includes support for the Google Cloud Platform as well as Google app integration, provides developers with a comprehensive toolset for developing Android applications and other projects. It has been an important component of Android development since 2013. In integrating geolocation features, developer needs to create the Google Maps API key. The Google Maps API provides and Android Map widget that display a map based on developer configuration. The map size, map center latitude and longitude, zoom level, map style and other options has been configured to initial preferences and updated on the fly. Firebase has been used as an online real-time database. A free platform called Firebase serves as a server, API, and a database for the mobile application in question. Authentication, Realtime Database, and Storage are just a few of the features that have been implemented. First objective was achieved after accomplishing this task.
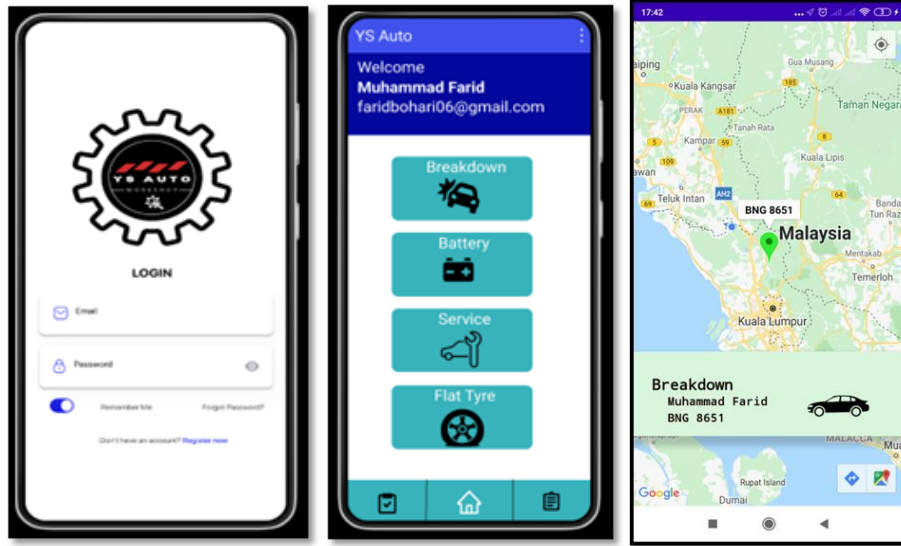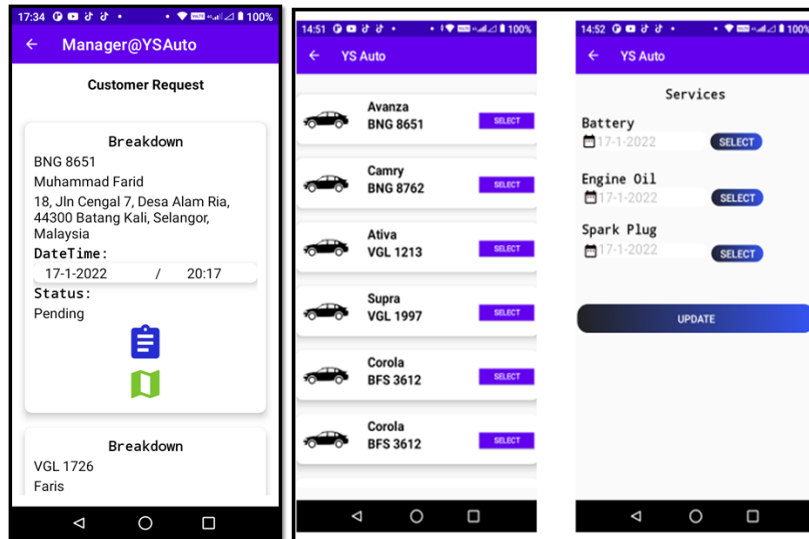
Figure 2: Some of screen shoot of developed pages

Figure 2: Some of screen shoot of developed pages (cont.)

Testing

In ensuring no broken link and its work well, functionality testing was conducted before it experimented to the selected users. In achieving another objective, heuristic evaluation is to test the usability and functionality of the. User Acceptance Test (UAT) has been conducted after that for users to test the application. A sample of 30 volunteer users randomly selected among Hulu Selangor to use the car service management application with geolocation. All the respondents are required to install that app and explore that system. In capturing their opinion, they are required answer a series of questionnaires through google form that consist of Demographic Information, Perceived Usability and Perceived Ease of Use. Data has been collected and analyzed using simple statistical analysis software.

FINDING

The results are calculated based on 5 Likert scales in the Google Form which starting from Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree.

Table 1: Questions for Heuristic Evaluation

No	Questions
1	YS Auto Application give a pop up when the user made a request for help in the application.
2	The label stated in the application clear or simple language.
3	YS Auto Application enable user as customer to update their car information.
4	YS Auto Application provide the customer and manager with a consistent user interface.
5	YS Auto Application gives an appropriate error message when users do not fill in the required item in the form.
6	YS Auto Application enable users to interact with the application without having to follow any instructions on how to make request for breakdown car.
7	YS Auto Application helps both novice and expert users in request for breakdown car.
8	YS Auto application provides a simple interface design to ease users in doing the task in the application.
9	The column that labels in YS Auto application was clear, well known, and descriptive.
10	The "Geolocation" function that provides in the application are well integrated.

The question 1 answered by experts is about a pop up when a user makes a request for breakdown in the application. In this question, the data that has been analyzed and experts are strongly agree 100% that the pop up will appear when the user submits a request for car breakdown. Next, the question 2 is about whether label used in this application are clear or simple language. In the Heuristic Evaluation (HE), most of the experts have voted to strongly agree. It shows that the system that has been tested uses clear and simple language which most user can understand. In the question 3, the experts were asked about whether the application allows users to update their car information. Majority of the experts have voted strongly agree that the application allows users to update their car information. Question 4 is about user interface; most experts have responded strongly agree that this application provides customer and manager with a consistent user interface.

Then, in the question 5 is about how the application can help user to recognize, diagnose and recover from errors. In this question, the experts have responded strongly agree that the YS Auto Application gives an error message when the user does not fill in the required item in the form. In question 6, the question is to investigate that user is allowed to interact with the application without having to follow any instruction on how to make a request for breakdown car. In this case, the experts mostly strongly agree that the user can use the application without any instruction. Furthermore, question 7 was created to determine that the application could assist novice and expert in requesting help due to breakdown. Most of the expert strongly agree that this application can help both to complete the task. Question 8 is to determine the user interface design applied in this application can ease the user in performing the task. In this case, most of the experts voted for strongly agree, because the design that developed for application is suitable for all ages.

Then, the question 9 was created to observe that the column that has label in the application are well known, clear and descriptive. From that, most of the experts strongly agree that the column with labels is clear, well known, and descriptive. Lastly, question 10 is about the geolocation integrated in this application are well integrated. In this case, 2 of 3 experts strongly agree that the geolocation is well integrated and 1 of 3 experts agree maybe because of internet connection makes location detection during use can be a little bit slow. The analysis in the Heuristic Evaluation is beneficial to measure the system with answer from experts. The HE will assist developers to fix the system and design according to expert's advice in objective way

User Acceptance Test (UAT)

According to Otaduy and Diaz (2017), when software is validated in a real-world situation by the target audience, this is known as User Acceptance Testing (UAT). There are 3 sections highlighted which are Demographic Information, Perceived Usability and Perceived Ease of Use.

a) Demographic information

The Figure 3 represent about participants such as gender, age, occupation, and education level. The results from the graph show the frequency of participants in the number and percentage.
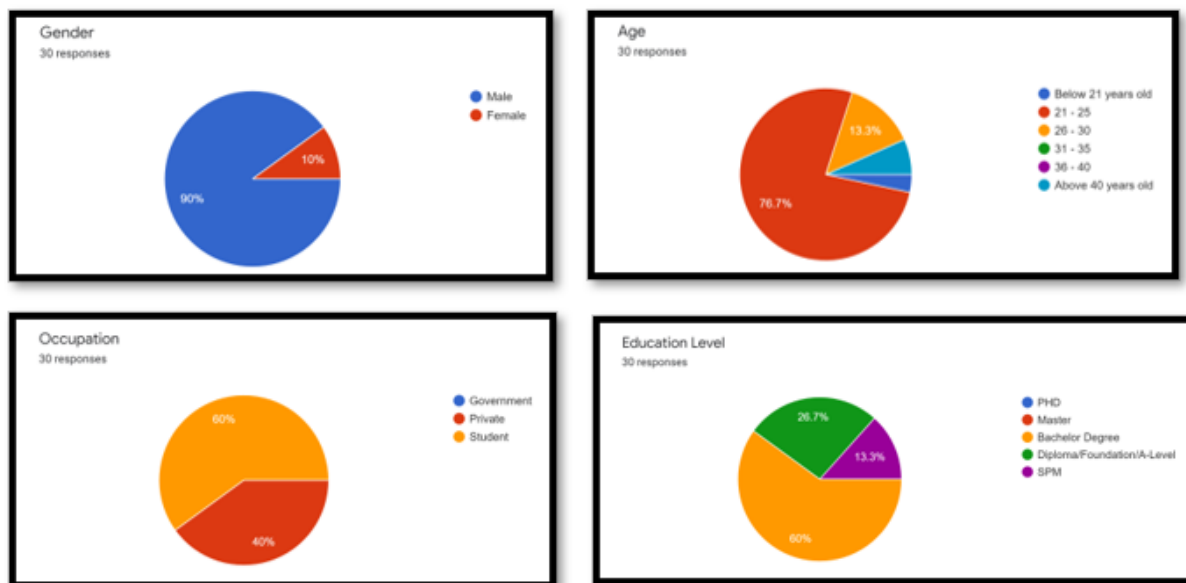

Figure 3: Pie Chart of Demographic Section

The statistic show that majority of the respondents are male which is consist of 90% and female 10%. The results show most of the respondents age are between 21-25 years old which is 76.7% are the most respondents compared to 26-30 years old in (13.3%). Next, there are 6.7% are from above 40 years old and 3.3% is from below 21 years old. As shown in the pie chart, majority of the respondent's occupation are students which 60% and the other 40% are private sectors. For education level, majority of the respondents are bachelor's degree level which is 60%, 26.7% are Diploma/Foundation/A-Level and another 13.3% are SPM level.

b) Perceived Usability

The Bar Chart for mean score and Pie Chart for the percentage of perceived usability question represent about the data that has been analyzed.

Figure 4: Bar Chart Mean Score of Perceived Usability

Based on the bar chart, the highest average is at the item 6 which is 4.8 and that means the average of the respondents are agree with this item. While item 2 is the second highest with scale 4.77 which means they also agree with item no 2. The third highest is item 5 which is the score is 4.73 and it represent as agree. Next, the fourth highest is item no 3 which is score 4.67 and it means they also agree with this item. The average for items 1 and 8 is same with score 4.63 which means this are the second lowest and it represent as agree. Lastly, for item 4 is the lowest score which is 4.4 and it represented as agree.
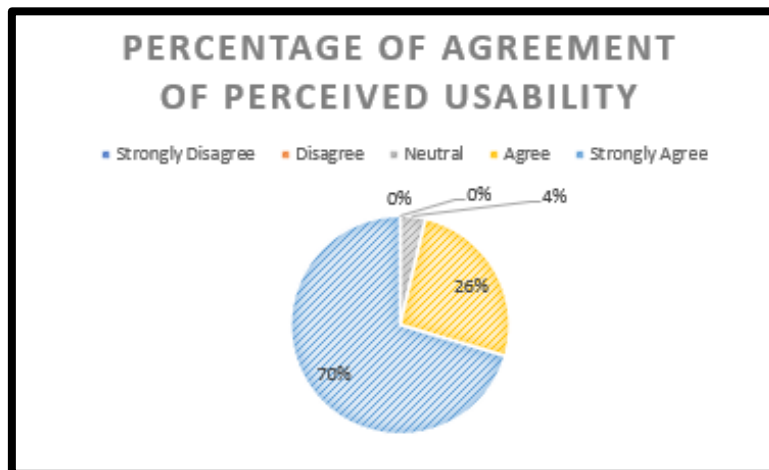

Figure 5: Pie Chart of Perceived Usability

Based on the pie chart above, the average of the respondents is strongly agreed with perceived usability. 70% of the respondents are strongly agree with the question about YS Auto Mobile Application. 26% of the respondents are agree with the question and only 4% of the respondents are neutral. There's none of the user not satisfied with this app. As we may know, most of the users like to use this application because it eases the users to use.

c) Perceived Ease of Use

Data analysis for perceived easy of used represented in subsequent Bar Chart for mean score and Pie Chart.
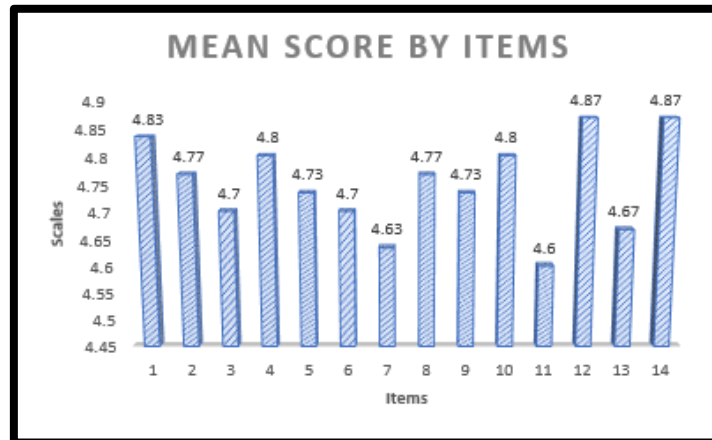

Figure 6: Bar Chart Mean Score of Perceived Ease of Use

Based on Figure 6, the highest average is items 12 and 14 which are 4.87 and that means the respondents are agree with this item. While item 1 is the second highest with scale 4.83 and the respondents also agree with this item. The third highest score are representing the same score which is items 4 and 10 with score 4.8 and it shows as agree. The fourth highest items 2 and 8 are also share the same score with 4.77 and it represented as agree. Next, for items 5 and 9 are also share the same score with 4.73 which is it represented as agree. Then, for score 4.7 items 3 and 6 also show as agree. For item 13, the score it 4.67 which is it represent as agree. Last but not least, for item 7 it scores 4.63 which the second lowest and it represented as agree. Then, for item 11 it represents agree which means it is the lowest score from respondents with score 4.6.
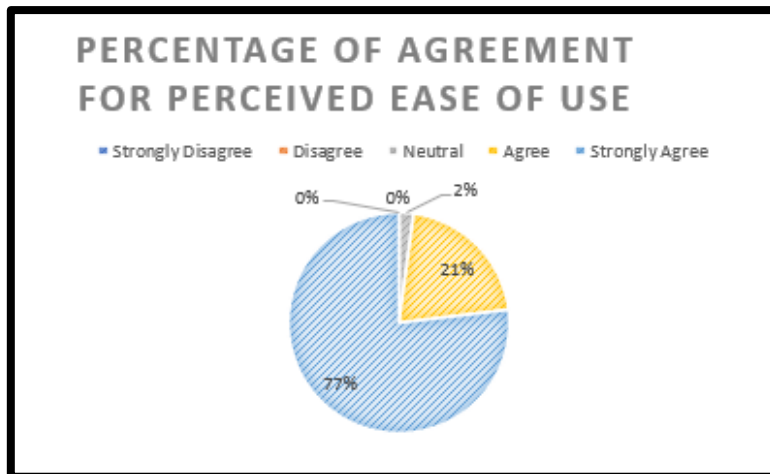

Figure 7: Pie Chart of Perceived Ease of Use

Figure 7 shows the pie chart of perceived ease of use. 77% of the users are strongly agree with the questions about this application. 21% of the users are agree and only 2% of the user are neutral. For the disagree and

strongly disagree is 0% which means there's none of the user not satisfied with this app. Maybe because of the user-friendly interface. Also ease for user to make a request for car breakdown

CONCLUSION AND RECOMMENDATIONS

As we all know, car and smart phone have become one of the basic needs in daily life. In other words, "must have" tool and supported application will make life easier. So, it can be concluded this system has been tested among selected respondents and achieved these objectives. It helpful in reminding for car regular maintenance and services. The system also can trigger their location and it make more easier to provide services required.

The first recommendation for the application was to extend the usability and development mode which is not just limited to the android user, but available for iOS as well. It is recommended to make it accessible for both platforms since many of the users are come from various type of phone users. This could help in widen the usage of the mobile application. Secondly, separated the status requested. The customer wants to know the status that the customer has requested whether accepted or rejected. If the manager application already updated the status, it should separate to the history page. As a result, this function can ease a customer to make many requests for car breakdown.

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CONFLICT OF INTEREST DISCLOSURE

The authors declared that they have no conflicts of interest to disclose.

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