A Pervasive Social Networking Application: I-NFC enabled Florist Smart Advisor

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Abstract. Location based service is an information and entertainment service, accessible with mobile devices through the mobile network and utilizing the ability to make use of the geographical position of the mobile device. NFC location based service is using one of the modes of NFC such as peer-to-peer, reader/writer, and card emulation to obtain the information of the object and then get the location of the object. In this paper, the proposed solution is I-NFC-enabled Pervasive Social Networking apps for florists. It combines the NFC location based service with Online Social Network (OSN). In addition, a smart advisor in the system to provide output in making their own decision while purchasing products. The development of the system demonstrates that a designed commerce site is provided which enable a communication between NFC-enabled smartphone, NFC-enabled application and OSN. GPS functionalities also implemented to provide map and location of business services. Smart advisor also designed to provide information for users who do not have ideas what to purchase.

1. INTRODUCTION

Location Based Services (LBS) are services offered through a mobile phone and take into account the device’s geographical location [1,6]. There are several categories of LBS from a technological point of view which is categorized by depending on the positioning approach they use to locate mobile stations [2]. The categories are GPS approach, handset-based approach, network-based approach, RFID technique and NFC technique. E-commerce is electronic system [3]. It refers to any kind of economic activities that are conducted through electronic connections [3]. Economic activities mean the activity of buying and selling over the Internet, telephone and e-mail. M-commerce is mobile commerce. It is a process of buying and selling products and services through wireless handheld devices such as smartphones, tablets and so on [5]. M-commerce is convenient if compare to e-commerce because mobile works on satellites while e-commerce is required the use of computer and internet connection [5]. Recently, most of the business owners have combined social media with m-commerce business. This is because the usage of smartphone and Online Social Network (OSN) is growing speedily. Hence, they use this chance to increase their business revenue.

In the past, paper map was used when people did not know how to go to the destination when they want to go to a place which is new for them. Paper map has a primary problem, which is it does not show where the persons they are. People needed to find out their origin and the routes of the destination on the paper map to decide which routes is the best and estimate the duration of the routes by themselves. For example, people needed to plan where to go first and then read through the paper
map to list out which routes is available to use. This is very time consuming. Besides, paper map is not accurate because sometimes the roads were built, rerouted and closed. If the person was using an old version of a paper map, then he/she may go to a wrong way. This causes people waste their time and energy to go to a destination. Furthermore, people need to plan early before going a trip. This is because they need to plan where they want to go and figure out the routes of all the destination, so that they would not be lose the way in the town. All of the problems have shown the important to have a technology-based location based services application that can eliminate all of these problems. There are many smart advisors in the world. Most of the smart advisor’s field covers on trip, restaurant, and clothes. For example, TripAdvisor which is the application that allows user to find a desired hotel, flight and so on. It is very useful when users want to make decision on their travel. However, there is still a lack of smart advisor for flower shop. People who want to find a flower shop or buy flower will difficult to make a decision. This is because they do not know which flower shop or flower product is the best. This problem has shown the important to have a smart advisor for flower shop.

The main idea of this project will be designed a I-NFC-enabled smart advisor for Florists. This app stands as a Pervasive Social Networking app in which both sensors and social media are used in its implementation. The details of this system are stated as below:

- To implement GPS functionalities which are providing maps and location of business services at outdoor.
- To enable a communication mechanism between NFC-enabled smartphone, NFC-enabled application and OSN with designing e-commerce site.
- To design a smart advisor which provides users with some information in making decisions especially in purchasing products.

The focus of this app is to present the idea of Pervsive Social Networking. The florist business is chosen as a case study which is suitable as a PSN. This system will be used by consumer and business owner. The consumer is the person who is the random public person who wants to use the application. The business owner is the person who wants to do their business and promote their business site through the application and registers under the web services. When a consumer wants to buy flowers, he/ she can use the application to find a shop that selling flower which nearby him/her. This application will shows the location discovery map and then consumers can select which shop he/she prefers. After that, the navigation to the shop will be shown to lead the consumer. The shop and each of the products has NFC tag. A consumer can use their NFC-enabled device to scan the NFC tag and then it will lead to a social media page of that shop. The consumer can give a comment to the shop or certain products.

The outline of the paper is as the following. Section 2 presents the Background and Related Work. Section 3 demonstrates the proposed PSN application. Section 4 and 5 present the testing and discussion of the system. Finally a section on conclusion is given.

2. BACKGROUND AND RELATED WORK

NFC is a short range radio technology and it uses a high frequency band of up to 13.56 MHz, with a data transmission speed of 424 kilobits per second [4,7]. NFC is an open platform technology and was approved as an ISO/IEC global standard in December 2003. NFC consists of two types of device which are:

- Initiator: Devices that begins and controls the information exchange
- Target: Device that responds to the requirements of the initiator

An electromagnetic field is generated where the information can be exchanged in one, or both directions, depending on the type of devices used: Initiator or Target. NFC works using magnetic
induction, which is an air-core transformer. For instance, an initiator emits a small electric current, which creates a magnetic field between the devices. The field has become a bridge between them and the field is received by a similar coil in the target device. The target device turns back into electrical impulses to communicate information between the devices [7-8]. There are three types of NFC devices are involved in NFC communication. For example: NFC-enabled smartphones, NFC tags, and NFC readers. NFC tags are the small tag that doesn’t produce power source. NFC readers are devices that can have a data transfer operation with other NFC devices such as NFC tags and NFC-enabled smartphones. In reader/writer mode, it enables NFC devices to read data from different standardized tag types. While, in peer-to-peer, it enables two NFC devices to exchange data with one another. Whereas, in card emulation, an NFC device is a contactless smart card. Card emulation usually permits payment and ticketing.

2.1. Study on Location-Based Services Technology

Location-Based Services (LBS) is LBSs are information services accessible with mobile devices through the mobile network and utilizing the ability to make use of the location of the mobile device.

2.2. Study on NFC based Social Networking

Nowadays, social networking has become an important part of human life. NFC is a complementary technology that facilitates social networking [8]. Social networking is the use of dedicated websites and applications to interact with other users, or to find people with similar interests to oneself. According to the white paper NFC technology and Social Networking [8, 11], the use of NFC and social networking is growing rapidly in the recent days. There are a lot of surveys and researches are conducted to develop this technology. In a recent survey, more than 31% of mobile developers are supporting the NFC in their mobile applications. Besides, there are 45% of them plan to develop their mobile applications with NFC technology in the next 12 months. It can be said that NFC is the next evolutionary step in mobile computing. Furthermore, NFC has high potential to enhance social networking. There are several applications that offer location based networking. For example, Foursquare, Facebook Places, Placecast, Gowalla and so on [9].
Table 1. Difference of Existing Application and Proposed application[9].

|                  | Foursquare                                                                 | Facebook Places                     | Go Walla                                                                 | I-NFC-enabled florist smart advisor |
|------------------|----------------------------------------------------------------------------|-------------------------------------|-------------------------------------------------------------------------|-------------------------------------|
| **Description**  | Allow users to share their location with their friends and collect points. | Allow users to share where they were, where they are now and where they are going. | Allow users to find their friends in a map and Check in to gain status and unlock offers. | Allow users to get information: location and URL of OSN of a shop and product by tapping a NFC tag. |
| **Social Media Integration** | Facebook, Twitter                                                          | Facebook                             | Facebook, Twitter                                                       | Facebook                            |
| **NFC support**  | No                                                                         | No                                  | No                                                                      | Yes                                 |

2.3. Smart Advisor Technology

Smart advisor is designed to give useful information to users. Smart advisor can be implemented in many fields such as travel, place to eat, clothing stores and so on. Hence, users are able to pick the right choices in their life. Users are able to search their desired products, then analysis process will be carried out based on the users’ search. Finally, a result will be provided after the analysis process. Recently, there are many smart advisor system available in the world. For example, TripAdvisor and Foursquare are common smart advisor (see Table 2).

Table 2. The Differences of Existing Smart Advisor and Proposed system.

|                  | Foursquare | TripAdvisor | I-NFC-enabled florist smart advisor |
|------------------|------------|-------------|-------------------------------------|
| **Description**  | Provide users useful information to convenience users find out where to eat. | Allow users to find out desired hotel, restaurant and flight. | Provide users some information to enable users make decisions more easily while purchasing products. |
| **Scope of business** | Restaurant | Travel      | Flower shop                         |

In this proposed system, reader/writer mode is chosen as the operating mode. The reader / writer mode is NFC-enabled smartphone as initiator and NFC tag as a target. In this proposed system, it enables users to read the information about the shop or product. Hence, NFC tag is suitable to use to store different standardized tag types. Besides, NFC-enabled smartphone is used by users to read data from the NFC tag.

The combination of Near Field Communication (NFC), Location Based Services (LBS) and Online Social Network (OSN) is a need in this system. NFC is a complementary technology that facilitates social networking. By combining the three services, it saves the time of the users. Users who use this system able to access the designed e-commerce site which contains all the information about the shop or products. That information is included address that enables location based services to work, Uniform Resource Identifier (URL) of the online social network page that enable user to access online social network in one click. Users also can scan NFC tag to obtain the information about the shop or product in few seconds by just quick tap NFC tags with their NFC-enabled smartphone. Smart advisor is everywhere. However, there is still a shortage of smart advisor for flower shop. In this proposed system, the scope of business will be focused on flower shop. This facilities users, either business owner who wants to promote their flower shop or consumer who wants to search flower shop or products.
3. PROPOSED SOLUTION - SMART-ADVISOR FOR FLORIST USING NFC TECHNOLOGY

In this system, there are three modules which are Administrator Module, Business Owner Module and Consumer Module.

3.1. Administrative Module
In user registration, administrator able to register into the system. Administrator able to update administrator profile. Login authentication is required after registration. In location management, administrator able to manage the location of the shop. Administrator able to manage the location of the consumer.

3.2. Business Owner Module
During user registration, business owner able to register into the system. Business owner able to update business owner profile. Login authentication is required after registration. In business management, business owner able to add and update their shop information such as type of shop, shop name and shop OSN account. Business owner able to add and update their product information such as product name, product description and product origin.

3.3. Consumer Module
During user registration, consumer will be able to register into the system. Consumer also able to update consumer profile. In OSN management, consumer able to connect application to their OSN and add feedback in designing e-commerce site such as rating and comment to certain shops and product. In smart advisor, consumer able to search shop or product by entering a keyword. Consumer able to sort the shop or product results by distance, rating or price.

There are two main components need to be implemented, which are web application and mobile application. For web application and mobile application, all types of user can register into the system. Users need to login to their account before they accessing the system. They can update their personal profile after successfully updating. For administrators, they can manage user in the system. Besides, they also can manage NFC information. For business owner, they can add or update their shop or product information. For consumers, they can track and delete the history that they viewed before. Besides, they can give feedback to each shop or product they viewed. Consumers can also sort the shop or product list in the main menu by distance, rating or price. They also can search their desired shop or product by entering a keyword.

For mobile application, consumers can use the application to scan an NFC tag that is available in the shop which is already registered in the system by clicking the Scan NFC Tag button. After the consumer is scanning the NFC tag, consumer can view the information about the shop and product in the NFC tag through the mobile application. A consumer can get direction from the mobile application. When the consumer view the shop, consumer can use GPS to direct himself/herself to the destination. Section 3.4 and 3.5 are respectively demonstrating Figure 1 and Figure 2.

3.4. Use Case Diagram
Figure 1. Overall use case diagram of the I-NFC enabled florist smart advisor system.

Figure 1 show the Use case diagram with three main class of users which includes the Administrator, Bussiness Owner and Consumer. Next, Figure 2 show the system architecture of the proposed app.

3.5. System Architecture Diagram
4. SYSTEM TESTING

System testing is an important part in the software development life cycle. System testing is the testing of the behavior of an integrated system based on the system requirements that analyzed during the system analysis stage. System testing plays an important role in testing on the system to find the errors or bugs of the system and check whether the system meets the functional requirements of the system. As a good practice in the final stage of the software development life cycle, system testing should be carried out.

4.1. Security

An evaluation of the system is carried out based on X.800 Security Standards. Table below shows the evaluation of the system with X.800 Security Standards.

4.1.1. Authentication. Authentication is the process to assurance that communicating entity is the one claimed. In this system, user is prompted to enter correct user ID and password to access the system. If the user fails to provide correct user ID and password, he/she is not allowed to access the system. This is to ensure there are no third entity can interference in the communication.

4.1.2. Access Control. Access control is the process to prevent unauthorized user use the resource. In this system, role-based access control approach is used. Role-based access control is the control access based on the roles that users have within the system and on rules stating what accesses are allowed to users in given roles. In this system, there are three roles, which are administrator, business owner, and consumer.

4.1.3. Data Confidentiality. Data confidentiality is the process to protect data from unauthorized disclosure. In this system, user can view own personal data only, such as identity card number, phone number and so on. For example, consumer and business owner which login successfully can only view own personal data. Only administrator has the privileges to access all the personal data. Data Integrity.
Data Integrity is the process to assurance that data received is as sent by an authorized entity. For example, only the consumer who login successfully is allowed to post feedback in the system.

4.2. Comparison between system

Based on the Table 3, the security of the I-NFC-enabled florist smart advisor system is greater because unauthorized user are not allowed to access the system. Only registered users can access the system. Besides, the effectiveness of I-NFC-enabled florist smart advisor system is high because this system combine with NFC which enable user to retrieve the information of products or shop immediately by scanning the shop’s or product’s NFC tag. The usage of sensor technology higly support the security mechanism. Unlike other systems, there are only provide a list of shop or product to the user to search. Besides, I-NFC-enabled florist smart advisor system enable user view the feedback in the system and also feedback in Facebook. This is because it provides a link to shop or product Facebook page which enable user can access the Facebook page easily and view the content in the Facebook page. Table 3 show the comparison between Systems.

|                         | Security | Effectiveness |
|-------------------------|----------|---------------|
| Foursquare              | Medium   | High          |
| Facebook Places         | Medium   | Medium        |
| I-NFC-enabled Florist Smartadvisor System | High     | High          |

5. SYSTEM DISCUSSION

I-NFC-enabled florist smart advisor is implemented based on the requirements that discuss before which is proposed solution. In this system, it has strength, weakness, opportunities, and threats (SWOT).

5.1. Strength

- The portability of the system increases because it includes web application and also mobile application which allows user to access the system through various devices such as smartphone and laptop.
- This system make convenient to the consumer. This is because it combines location based services (Google Map), online social network (Facebook) and scan NFC tags function which available in mobile application. Consumer can be directed to Facebook page, view the location of the shop or product via Google Map in this system. Besides, consumer can get information of shop or product directly from NFC tags via mobile application.
- The system provides smart advisor which enable consumer to choose the right shop or product by using the sort by function and search function.
- This system protects user’s privacy. The password of the user will be converted to another form by using password hashing. Hence, the password of the user is protected.

5.2. Weakness

- Google Map API is used in the system to show the location of the shop. If the network failure happens, the location of the shop will not display out.
- The user who has smartphone with NFC only can access scan NFC tag function in the mobile application.
● Nowadays, there have different screen resolution and screen size of the Android smartphone. However, in this mobile application, it only applicable for screen solution of 1080 x 1920 pixels and screen size of 5.7 inches in order to present the user interface perfectly. For example, Samsung Galaxy Note 3 is the most suitable android smartphone to access this mobile application.

5.3. Opportunities

● Nowadays, NFC become more and more popular in the mobile devices. By implementing the scan NFC tag function in the mobile application, it can facilitate consumer to be good at using NFC-enabled smartphone.
● There are less application among the same type of application that have NFC function. Hence, it can be said that it is a new emerging application.

5.4. Threats

● Database server does not own any certificate for its secure socket layer.

Figure 3-6 presents screenshot on the I-NFC Interative LBS System

Figure 3-6 : I-NFC Interactive LBS System for Bussiness [Fig 3-4] and Consumer Screenshots [Fig 5-6]

6. Conclusion

This system is using devices that already exist in the surrounding. For example, NFC-enabled smartphone. It is a cost-effective system because it no need to spend a lots of money to but the hardware but just use the devices that around people. Besides that, this proposed solution is supporting GPS functionalities which are providing maps and location of business services at outdoor. Consumer
can easily get the location of the shop and go to the destination. Furthermore, consumers can give feedback to certain shops and product. Hence, implementation the I-NFC-enabled florist smart advisor is a best solution to for business owner to promote their flower shop with OSN and also customer to get the information directly by just quick tap to the NFC tags in the shop. For the future plan of this project, the weakness of the system should be overcome. The mobile application should be able to install in iOS platform. Hence, iOS users can also use this system. Besides, screen resolution of the mobile application should be improved. In addition, the usability studies on this should be carried out.

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