NFC Based Store Automation

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Abstract: *In the world of commercialization, shopping has seen a lot of evolution from small shops to mall to ecommerce giants. The ecommerce sector is evolving at a high pace, but it can nowhere be seen replacing the traditional shopping at malls for groceries or any products of daily use. So the proposed system aims at improving the traditional shopping experience. In the traditional shopping customers need to carry the basket/cart and pickup products and carry it around and checkout. But now proposed system aims to replace heavy basket/cart with smartphones. Smartphones come with a prebuilt NFC (Near Field Communication) reader/writer. These readers can read NFC tags. In the shopping centre, group of a similar product would have 1NFC tag that contains whole information about the products. Information includes the image of the product, a concise description of the product and its price etc. customer can touch or wave their mobile on NFC tag and add the product to the cart and they can also delete the products from basket at any interval during shopping. This way reduces the system task load effectively by half. At the merchant's end, there would be a system for billing where customer would scan their smartphone and transfer the product details for billing. Merchant's can also provide payment gateways or mobile wallets for payment.*

Keyword: *e-commerce, mobile commerce, Near field communication.*

I. Introduction

In the traditional shopping spaces, people need to carry around baskets all over the shopping mall and get the products they need and add it to their baskets. All the products in your basket are then billed at the exit counter. So there's a long queue for checkouts and payments at the exit counter. This extra overhead in shopping takes a lot of time and thus require extra manpower at desk to handle large crowds. These overhead can be reduced just by introducing a user friendly hassle free Android based M-commerce system. In recent years, use of smartphones .has been rapidly increased. Now the smartphones are used for purposes apart from calling but also for multimedia. People use smartphones for surfing, E-mail, updating social media status, games, watching videos, TV etc. Attractive interface, billions of application, best quality smartphone support billions of application and variety of technologies via Bluetooth, NFC , IrDA etc. screen resolution make smartphone easy to use. Mobile phone manufacturer rapidly adding new features to make cell-phone smarter.

Nokia, LG, BlackBerry and most big companies include NFC technology in their smartphones. Near field communication is a latest wireless transmission technology with the radius of radial field which is developed from the intersection of the RFID. and the contactless identification. With the help of NFC installed on a mobile device, the transaction process like retrieving information through NFC tags, micro-payments or payment transactions can be done by collaborating it to the Near Field Communication reader, which is fitted inside the user's mobile handset.

A. Near Field Communication

NFC integrates the technology of RFID and Smart Card putting it into a mobile phone. It standardized for consumer smartphone. With an NFC -enabled mobile phone, user can turn the phone to an active RFID containing personal information, credit cards and set of keys. Moreover, as the NFC device have great mobility, devices can communicate using peer to peer mode, it, on the other hand, enhance the interactions of mobile phone usage.

B. Project Objective

The goal of our project is to write an smart Android application using NFC service. We have set the following objectives for our app to achieve the goal:

* This app should be Interactive and robust. The beauty of NFC is the connection between virtual world and the reality.
* Be Interesting. The idea has to be interesting which makes user to share with their friends, and finally addicted to it.
* Contains user-generated content. (UGC). helps the applications. to grow by users themselves, a fruitful content attracts new users and keep the old users alive.

- Has well and effortless user-experience. User may feel awkward if it has bad user-experience, which may stop user to continue using the applications.

C. *Working of NFC Tags*

NFC tags are considered passive devices, which means they are reliant on an active device to come into range before they are activated. The problem here is that these devices are passive on their own instead they are basically used to transfer information to an active device, such as a smart phone.

In order to power these NFC tags, emi is used to create a current log in the passive device. We won't get too technical on this, but the main idea is that the coiling of wire strands can be used to produce em waves, which can then be picked up and turned back into current by another twist of wire. This is very related to the techniques used for wireless charging technologies, such as Qi or A4WP.

D. *Literature Review*

Here the The author discusses how aisle based arrangement is used. Different components like Cart Location Detection Unit(CLDU), Server Detection Unit(SDU), User Interface Display Unit(UIDU), Billing and Inventory Management Unit(BIMU) were set up. All these sophisticated microcomputers provided an easy trip through the mall for the consumer[1].

In this paper[2] the customer scans RF tags of products and the price is shown on the led display fitted with the shopping trolley. The trolley is fitted with ARM7 processor which further sends all the data of customers shopping at the billing desk. When customer checks out he is ready to checkout directly without any barcode scanning at billing desk. In this paper[3] author discusses the QR code is typically scanned for adding products into the cart with ease. Also the main focus of the project was providing a shopping trolley which would be autonomous in operation. An android app is connected in real time with the mall server which receives all the details of the product taken by the customer.

In this system NFC cards are used for tagging products and adding them through a android enabled NFC or another NFC card Using e-wallet and J2ME which are now mostly outdated[4]. This is a survey paper[5] which focuses on analysis of all the available ways to use NFC to enhance business process model but Not widespread yet.

II. Existing Systems

Here comparison of different technology as shown in Table.1

Table 1 Existing System

	NFC	RFID	IrDA	Bluetooth
Set-up time	<0.1 ms	<0.1 ms	-0.5 sec	-6 sec
Range	Up to 10 cm	Up to 3m	Up to 5m	Up to 30m
Usability	Human centric ,easy, intuitive fast	Item centric easy	Data centric easy	Data centric medium
Selectivity	High, given security	Partly given	Line sight	Who are you?
Use cases	Pay, get access, share, intiate service, easy set up	Item tracking	Control and exchange data	N/W for data exchange headset
Customer experience	Touch, wave, simply connect	information	Easy	Configuration needed

NFC isn't a fundamentally groundbreaking technology. Like Bluetooth & Wi-Fi, it's a wireless radio communication standard. In the wireless world, NFC's closest relative is actually RFID. (radio frequency identification).

III. Problem Statement

Today's systems are traditional commerce or e-commerce systems of the retail domain which have a whole herd of disadvantages like every e-commerce system has. The prototype application's aim is to eliminate all the inconsistencies as possible from these systems and to make a system which is consumer friendly and high performing.

The system's ultimate aim would be consumer convenience and an overall time efficiency. This goal could be achieved by using the Mobile-Commerce system implemented using NFC technology. The current trends in the shopping industry show a shift of spectrum towards e shopping but the traditional shopping is still prevalent and rakes almost 60% of capital share. So the traditional shopping needs some innovation towards the business process to minimize manpower and ease the customer efforts` as well. As of 2015, more than 250 Wal mart and Vtech stores have implemented qr code. based trolley system that has been so far successful but has glitches in terms of customers understanding of the system. So keeping in mind the customers mindset a system needs to be developed which provides customer an easy to use interface and also a way for the vendors to endorse more products alongside. This could be achieved through the NFC technology which is currently in its preliminary stages.

IV. Proposed System

The proposed system aims to replace heavy basket/cart with smartphones.In the shopping centre, similar products will have a NFC tag associated which would contain all the information about the products. Customer can swipe on NFC tag and add the products to the cart and they can also edit the basket any time during shopping.There would be a system for billing where customer would scan their smartphone and transfer the product details for billing. Payment can also be made through existing payment system. As shown in fig.1.
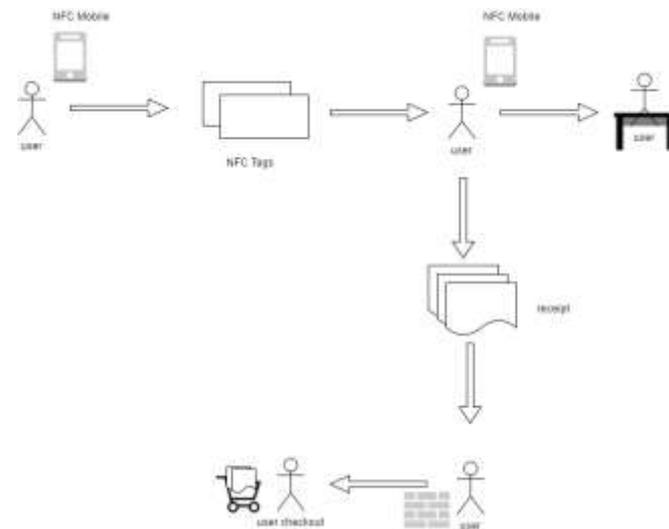
Fig.1 Proposed System

V. Methodology

The System Requirements to develop such a system could be classified as follows

Domain: Mobile Computing.

Software Requirements:

Front End:

- Android Application Development: Android SDK, Android Studio, NXPSemiAndro Plugin, NFC TagReaderWriter API.
- Web Service: Spring/JSF based web service tier

Backend: MySQL/Maria DB

Hardware Requirements: Android based Smartphone enabled with NFC reader/writer

VI. Architecture

Module 1: Server

We have considered two database management systems: SOLite and MySQL. we have chosen MySQL as our database management system. The version of MySQL we are using is 5.0.51a-24+lenny5 - (Debian). Also, we use the PHP as the interface As shown in fig.2

MySQL: We have created 3 tables: comment, ctag, and table tag.

PHP: Our PHP involves 6 modules: db_connect, get_comments, get_rank, get_search_result, submit_comment, and update_ctag.

Module 2: Android App.

In the application, we have chosen to use Java with Eclipse (provided by official Android SDK) in Windows. Since we are developing NFC   application which is relative new in the Android market, using official Android SDK can get better support. We also limits the version of Android, from version 3.0 (Honeycomb) to version 4.2 (Jelly Bean), in order to support NFC foreground dispatch system.

User Interface

The user interfaces design of Cucom when users open the apps. The top of the interface used the tab bar which contains Home, Search, and About.

Modules

Search Engine, Voting System, Commenting System, NFC Dispatch System.
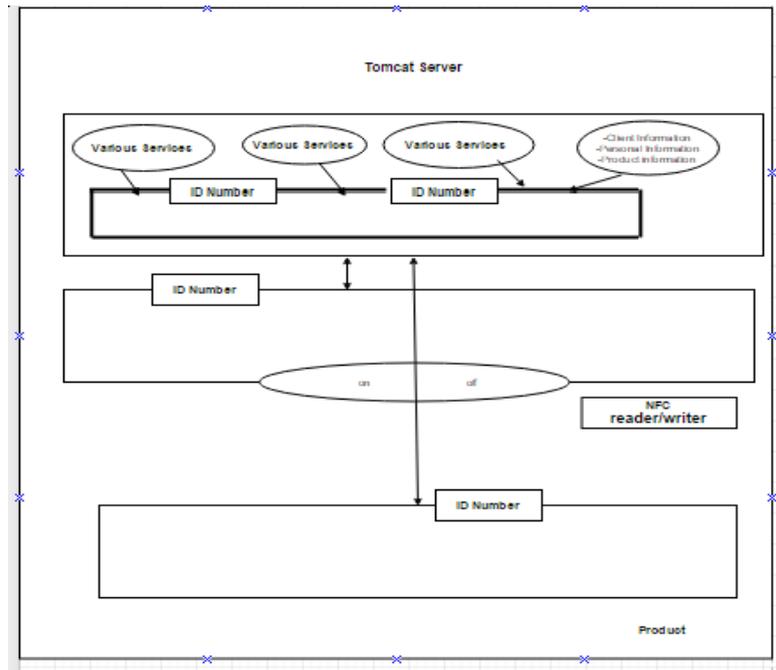
Fig.2 Architecture

VII. Scope of The Project

A . Comment in Offline
Suppose Google app allows user to like and dislike without accessing the internet. However, if user wants to leave a comment to the location, they still have to connect to the internet. To make use of the interactivity of NFC , Google app can be further improved by letting user to comment offline.

B . Enhance User Interface
In future, we can add set of themes and characters for selection. Also, we can add motion gesture to do some critical action, such as like and dislike. For instance, User can give like by shaking or rotating their phone

VIII. Result
To connect ARDUINO we need to download 2 software and their drivers(CP2102 ,ARDUINO IDE).After installing connect the ARDUINO hardware with computer. The PN532 is a highly integrated transmission module for contactless communication at 13.56 TMHZ including micro-controller functionality based on an 80C51 core. The transmission module utilises an outstanding modulation and demodulation concept completely integrated for different kinds of passive contactless communication methods and protocols at 13.56 MHZ. As shown in fig 3.
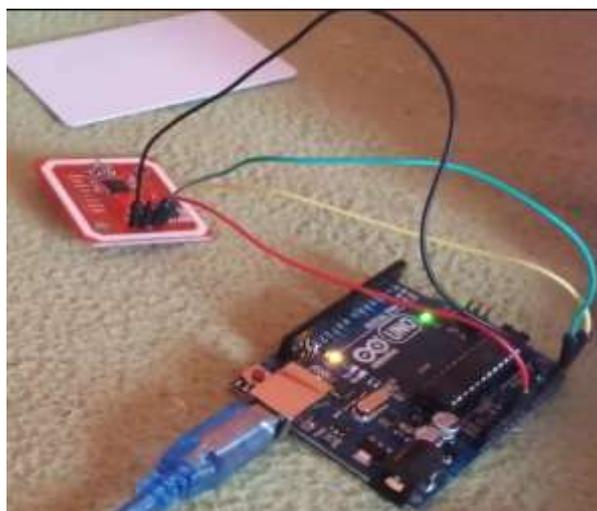

Fig.3 Connectivity

Proposed system aims to replace heavy basket/cart with smartphones. Customer can touch or wave their mobile on NFC tag and add the product to the cart and they can also delete(represent CROSS[X] in fig) the products from basket at any interval during shopping. This way reduces the system task load effectively by half. As shown in fig.4.

Fig.4 List of the product

IX. Conclusion

Applications created with ease of understanding and the design can be created and tailored to the shopping process to make it more effective and user friendly. Thus making it easier & convenient for the users to do the entire shopping process with the use of this application, as compared to the existing systems.

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