IEEE Sponsored 2nd International Conference on Innovations in Information Embedded and Communication Systems
ICIIECS'15

Recommender System for Prepaid Mobile Recharging using APIs

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***Abstract*— This paper presents a Firefox OS app that can be used for suggesting an optimized prepaid plan available for recharging mobile phones according to the plans provided by the service providers. The salient feature of this application when installed on a Firefox OS phone is that it monitors and keeps track of the usage of data, number of calls and SMS. This is then used to suggest a recharging plan for the user based on the plans offered by the service providers, thereby saving a lot of time and money spent in searching for the best plan for a user. Firefox OS offers an Adaptive search, which is used to provide a dynamic interface that adapts according to the user's search. There is a database which is used to collect data from the application regarding the user's plan preferences. A counter is set to keep count of how many users use a certain plan and this data is analysed to create a business model for the service providers.**

Key words*— *Mobile Application, Firefox OS, API, Prepaid Plans, Mobile Recharging.

I. INTRODUCTION

Present generations uses mobile phones for most purposes. Mobile phones were originally only meant to be devices used to communicate wirelessly. It can be carried around and used from different location, movable hence the word - mobile. Now, the mobile phones have many purposes which do not stick only to audio communication but also focus on messaging, taking photos, video calling, recording videos/audios messages, using social networks, checking emails using the internet, etc.

These features can be used only after the user has given the required payment for the same. In the case of prepaid service subscribers, there are many plans available. These plans are usually generalised to three types: Talk time, Internet, SMS Boosters. Talk time plans focuses on providing cheaper or longer talk time when compared to its original price in normal cases. Internet packs focus on providing internet data usage that comes with substantial rates or special offers. The SMS boosters usually allow users to send a large number of texts/messages for a certain duration of days for certain rate. For a constant user of the SMS feature, this is a very useful offer. Each of these plans comes with different rates, each rate providing different offers depending on what type of plan it is [1].

This paper discusses a method to implement an optimising concept on the recharge plans after monitoring on the user's day-to-day requirement and suggest a recharge plan to the subscriber which would fit best for his/her usage. This optimisation algorithm can be scaled up and customized for any dynamic user interactive application.

II. SURVEY:

Need for Firefox OS:

Firefox OS is a mobile Operating System by Mozilla, which aims at making a difference and building an Open Web. It is also really flexible. From a developer point of view, the Firefox OS used to develop web apps which can be created using HTML5, CSS and JavaScript. The Firefox browser has a Simulator for the Firefox OS on which developers can test new apps or games before putting them on the Marketplace for other users to download it from their Firefox mobile devices. From an engineer's perspective, the Firefox OS is code named as "Boot to Gecko" (B2G). It was built by a team of volunteers as well as engineers working for Mozilla. The Firefox OS is the only operating system with an Adaptive search in it. Unlike other operating systems, Firefox OS uses key words provided by the user to search for available web apps based on the same. For example, if one searches for 'Fox', the background image changes to an image of a fox while the Adaptive search provides with web apps related to the keyword 'Fox'. These searches or queries can be bookmarked for future references in Firefox OS.

Recharging Approach:

Selection of the appropriate recharging plan to use for mobile connection is the one of the major problems faced by prepaid users. Each service provider has various plans for Talk time, internet or SMS recharge. Given the large number of plans, it makes the decision making process for the user a hard one.

Many Android applications exist which allow users to recharge their prepaid accounts using different plans available depending on the service provider. These plans is based on the requirement of the user, be it SMS booster, internet plans or Talk time plans. Each has a varied set of options to choose from. Even if the user has a specific requirement, say internet plan, there happens to be another large list which comprises of different internet plans at different rates.

Examples of some apps –

- Mobile Recharge and Bill Pay
  Company - MobiKwik
- Recharge mobile, DTH Online
  Company - FreeCharge
- Easy Mobile Recharge
  Company - EasyMobileRecharge
- Recharge Plans, Packs, Offers
  Company - iReff

All these apps provide a list of various plans available for recharging, but the decision making is left to the user.

III. PROPOSED CONCEPT

The proposed mobile application is for the Firefox OS, that monitors the number of online calls, offline calls, messages and data sent, and then suggests an optimised plan available from the service provider accordingly. This way, the user would save a lot of time searching for the plan he/she needs from the large number of choices given by the Service provider and also would save money since the application would suggest an optimised plan according to his/her usage. For an advanced user, this application would also have a manual option so that he/she could directly enter the number of calls, SMS and Data usage for a period of time which can also be set by the user, so that the calculations are done by the app and an optimized recharge plan is suggested to the user.

The recharge plans selected by the user are monitored by the application and is sent to a database which analyses the plan preferences and updates a counter based on the user's selection. This analysis can be used by the Service Providers to create or update their business models based on the user's preference. The existing applications in the market offer an option to recharge, but it doesn't suggest a personal optimized one.

IV. REQUIREMENTS FOR THE PROJECT

This project requires access to different prepaid recharge plans by most popular service providers. A Firefox OS mobile device is required to install the application for testing purpose. The application requires access to user information such as number of offline/online calls, SMS and data usage. A database is to be created to collect user plan preferences.

V. DESIGN DESCRIPTION

The application as shown in Fig.2 monitors the usage of the user on the mobile device and fetches a suitable plan from the list of plans offered by the Service providers. Depending upon the selection of the plan by the user, a counter is updated in the database which offers insights on the plan preferences and could be used to build a business model for service providers as shown in Fig 1.

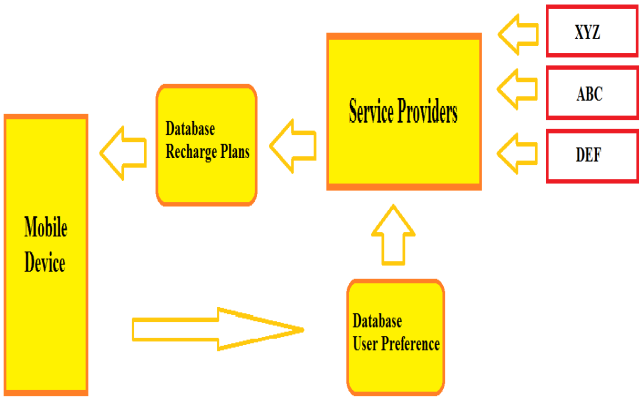

Fig 1. Application Control Flow

VI. USER INTERFACE

Initially, the application shows a screen to select the network provider of the user as shown in Fig 2.1. A general sample application is created as shown in Fig 4. Here, there would be various options with names of different service providers and the user could select theirs. Upon choosing the network provider, they are then taken to a screen to

select the mode they wish to choose. There are two basic settings which are used in this application:

Automatic:
If the user selects this option, then they are taken to a screen where the user enters the number of days the app needs to be monitored by the user. For the said number of days, the app will monitor your phone's data usage, number of SMS and calls.

Manual:
If the user selects this option, then they are taken to a screen where the user enters the details manually. These details are then used to suggest the plans based on the user's preference.

Finally, the user is taken to a screen where the top three options are suggested as shown in the prototype design Fig 2.2 If the subscriber isn't satisfied with the suggested options, then the user can click on the "Check again" button and it would take the user to the Manual section of the application where all the details can be filled beforehand and the user need only edit the option that they want to modify. On accepting, it takes the user to the website of the service provider where they can pay and recharge their mobile.

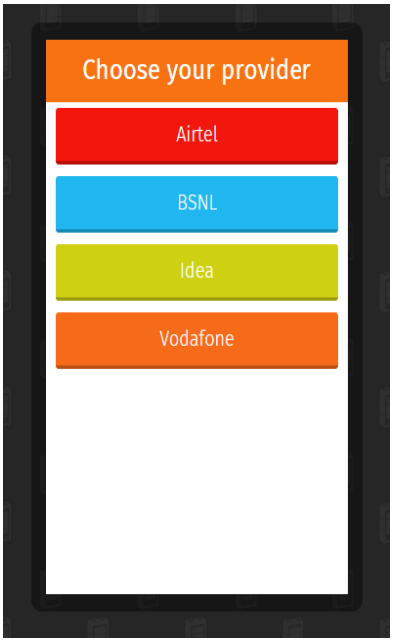

Fig 2.1. Sample Prototype of the Application

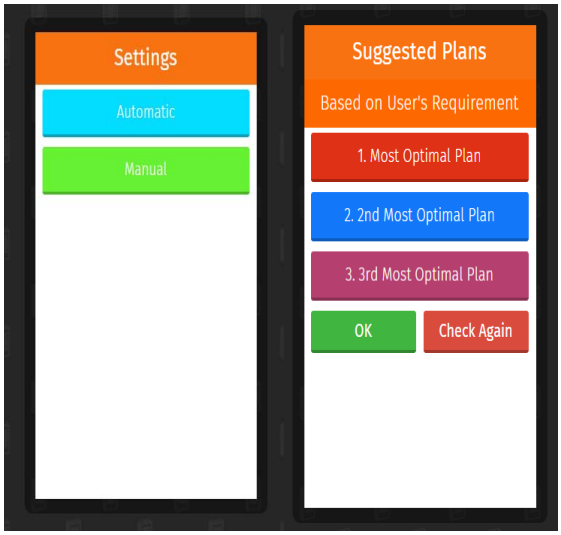

Fig 2.2. Sample Prototype of the Application

VII. INTERFACE DIAGRAM

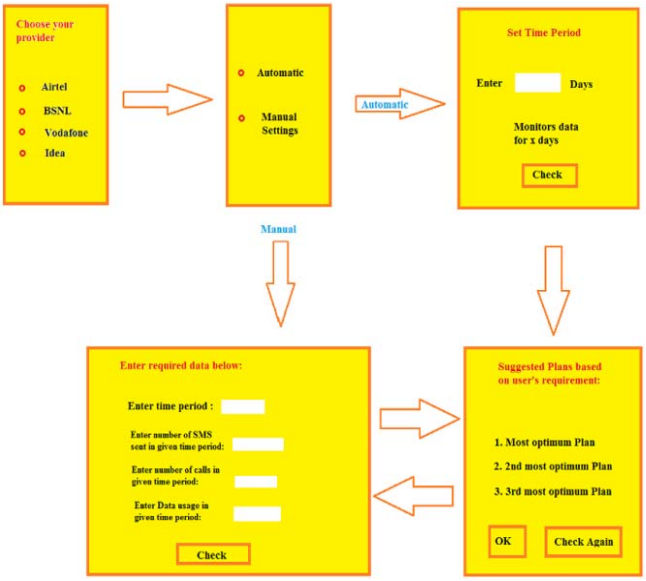

Fig3. User Interface for the Firefox OS application

VIII. SAMPLE FIREFOX OS MOBILE APPLICATION

Fig4. A sample of the Firefox OS Mobile Application

IX. DATA ANALYTICS USING HYBRID RECOMMENDER SYSTEM

A JSON database is used to collect data from the application regarding a user's plan preferences. This is classified under the Service Providers and further into the different plans provided by the Service Providers. In this paper, the data comparison is proposed to be done using recommender system. It is a sub class of information filtering system that is used to predict the preference a user would give to an item or in this case a prepaid plan. This system is implemented in the application to suggest the best possible plans depending upon the usage of the user.

Hybrid recommender system:

Hybrid recommender system provides a hybrid approach, by combining collaborative-filtering and content-based filtering or using them separately and then combining them. The purpose for choosing hybrid over the other recommender systems is that hybrid allows us to take into consideration a number of factors, which is essential for this application, unlike other systems that allow only certain factors like user rating or demographics as the key decision making factors. Few popular websites like Netflix use a hybrid system to provide recommendations based on Collaborative-based filtering Content-based filtering. Knowledge-based filtering suggests products based on inferences based on users' preference. The advantage of using this is that it takes into consideration many aspects. For instance, to suggest the best recommended options, every parameter involved must be taken into consideration- number of text messages, data usage and the total collective duration of calls during a certain period of time. All these factors are variables and depend on the usage from one person to another. An ideal system takes into consideration all of these variables and based on that, suggests a list of plans. A counter is set to keep a count on how many users use a certain plan. This data is analysed further, which in turn can be used to create new or update existing business models for Service Providers.

X. DESIRABILITY QUOTIENT

Desirability quotient is a factor that determines the desirability of a certain item based on the ratio of its benefits and risks. In this case, it determines the desirability of a plan based on a user's usage. This can be defined based on a simple log x graph as shown in Fig 5. In a Log x graph, y value increases in a very quick manner during the beginning stage of the graph and after a certain while the increase in y value becomes gradual but continues to increase.

The first requirement is to ensure that the plan satisfies the user's usage. Otherwise, the desirability quotient for the said plan is zero and therefore the plan does not satisfy the minimum requirement.

To calculate the desirability quotient, both the benefit and risk must be assessed. The benefits refer to the SMS, calls, data provided by each of the plans while the risk here refers to the cost of the plans.

The benefit value for each plan will increase quickly when the values of the plans are just greater than the user's usage values but as the values of the plans increase away from the usage values, the increment of the benefit value of the plans becomes gradual. The risk value is calculated based on the cost of each plan, the higher the cost, the less desirable the plan becomes.

The logarithmic value of the summation of the benefit value for the plan is divided by the cost of the certain plan to give the desirability of the said plan.

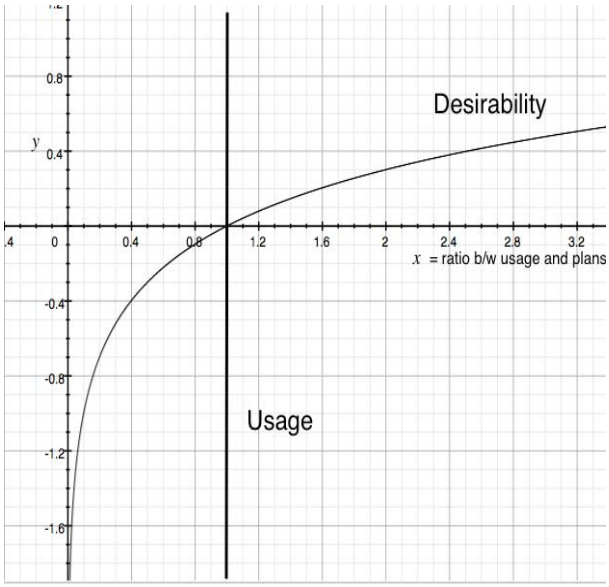

Fig 5. Desirability Quotient graphical representation

XI. CONCLUSION

This paper describes a Firefox OS mobile application which provides optimised prepaid recharge preferences based on user's data usage. The concept of Data Analytics using Hybrid Recommender system is also used to provide business models for Service Providers based on users' preferences.

XII. ACKNOWLEDGMENT

The authors acknowledge the support of developers from the Mozilla India community for their technical guidance. The authors also thank the Chancellor and the faculties of Sathyabama University, Chennai for their immense support.

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