

SlashiT An Android Application for Expense Management using Hash-maps

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Abstract—Expense management is a system to track and take actions on the expenses made by people or organization in day to day life. Hash-map is a data structure based on hashing which is used to handle huge data efficiently. This paper presents the details of an android application called 'SlashiT' which solves the problem of managing group expenses. It was tested with 30 volunteers and the results were positive.

Keywords-Debt payments; Expense Management; Group expenses; Hash-map; Slashit;

I. INTRODUCTION

With the enormous change in mobile technology in the last decade, mobile applications are gaining popularity over desktop applications. Currently, Android is a versatile operating system based on Linux kernel created by Google for smart phones and tablets with touch-screens. Android's source code is released under open source licenses. It is popular among innovative organizations that require an instant, low-cost and customizable working framework for cutting-edge gadgets. Its open nature has empowered an extensive groups of developers and fans to utilize the open-source code as an establishment for community driven projects which add new features for their users. The performance and user experience of Android devices is much better than the desktop software, so they have taken over the whole market today. Due to small investments in making Android devices, many companies are selling Android phones at cheap and affordable rates which has made them reach the masses and rural areas of the country. The usability is letting even the least literate to easily make best use of these devices, be it for any cause. There is no much expertise required to download and use an Android application and so the scope is enhanced to a different level on the whole.

There are different social applications supporting people in different ways in different parts of the world. People in rural areas who did not have the fate to get good education and are losing their benefits can use good applications for their growth and improvement. Android applications like SRIJAN focuses on enhancing the productivity and profitability of the small farmers. Statistics say that due to SRIJAN's intervention, Soya Samriddhi farmers received 47% higher average yield than other farmers in spite of poor rainfall [1]. SNEHA is another application that works on women empowerment and inclusive development. This application protects women in rural areas [1]. There are forums to report violence and efforts are made to decrease these acts. There is an emergency alert system which can help any victim to call for help in case of emergency. There is also a toll free number to be contacted in case of help needed.

The present work is an attempt to develop an Android application called 'SlashiT' with a social cause. This application finds a solution to settle expenses made by a group of people. The application minimizes the effort people put in dividing the expenses made on different outings and events. Consider the following scenario. A group of people went on a dinner and had both vegetarians and non-vegetarians among them. There were people who preferred cocktail over mocktail. After the dinner they realized that the division of the expenses and who owed how much was a mess. One of them paid the whole amount and they were in a pickle. SlashiT is an attempt to solve this problem using an android application. All that a user has to do is add people, group them and add different parts of the bills like total of the vegetarian food and non-vegetarian food for the mentioned scenario. SlashiT does all the calculations in a fraction of a second.

The rest of the paper is organized as follows. Section II presents the related work to the current project. Section III talks about usage of Hash-maps in android apps. Section IV discusses the design and implementation details of SlashiT. Section V elaborates the experiments and test results. Section VI concludes the paper highlighting the extensions of the work in future.

II. RELATED WORK

There are various applications similar to SlashiT in the market which are doing quite good in the expense management and division area. Previously, calculations were done on paper taking away a lot of time and there was a risk of losing the sheet and thus no record could be maintained unless kept with responsibility. Applications like Settle Up [2], AccountsApp [3] and Spendee [4] have changed the way these calculations were done. They have made daily life calculations easier and are a big time-saver. The calculations once done can be passed on and saved for later use. Settle Up is a mobile application for organizing group expenses. A user can simply add the person who made the payment and the ones for whom the payment was made. Using these details the calculation is done and the result is the details of payee and payers with the corresponding amount. Similarly, in AccountsApp, a bill, the person who paid it and the group of people who are sharing the bill can be added. After the calculation, the results are the details of who lent and who owes what amount. Spendee is an app in the same category but focuses on individual expense tracking. One can make an account and add a wallet. Details like overall budget can be provided and expenses as well as income can be recorded on a daily basis. There are 26 expenses and 5 income categories to choose from. The application gives a statistical view of the areas of expenses made and where and when the users went over the budget. It is an amazing application to track personal and family expenses.

III. USE OF HASH-MAPS IN ANDROID APPS

Most of apps mentioned in the previous section are supported by multiple mapping techniques and databases. Different mapping techniques like hash-maps, array-lists, and linked-lists are available for handling data in android apps. Hash-maps have a wide variety of uses which includes storage and retrieval of objects that contain data about users and global settings. They are widely used for caching since data can be stored by name and a search can be performed whether an object with a certain name already exists. Array-lists support dynamic arrays that can grow as needed. They are created with an initial size and when the size is exceeded, the collection is automatically enlarged and when objects are removed it automatically shrinks. Linked-lists are normal list structures to store data. Every bit of data is linked to the next one with a node and so there is a lot of space saved as only the address of the first value is to be saved and the rest can be found with the help of the addresses saved in the nodes. The use of such mapping techniques help Android developers in building efficient applications. Settle Up is one of the popular apps that uses hash-maps for efficient working of the application. It can handle more than 15 people in an event with efficient storage and retrieval of the data [2].

Hash-map is an array with a set of numbers and a unique key that helps in identifying the value in the array to be used. Hash-maps use objects with links between them in order to sort data. The advantage of hash-map is reduction in cost. By using a hash-map, the binary search tree's complexity is Big $O(\log n)$ and that of a hash table is $O(1)$ which when compared to an array is $O(n)$. Hash-maps are simple way for conveying the sorted information, displaying information and searching a random data. They store values in key pair and allows null values. They are fast as they are not synchronized. Another feature of hash-maps is that the search uses an index instead of a brute-force method thereby making it fast.

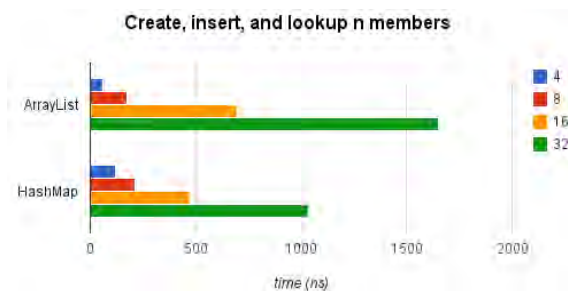


Figure 1. Comparison of hash-maps with array-lists

Figure 1 [5] illustrates the comparison of hash-maps with array-lists. It is observed that as the number of members in a transaction increases. When there are 32 members, array-lists takes around 1600ms to create, insert and lookup operations whereas hash-maps does the same in less than 1100ms. As the number of members increases hash-maps proves to be faster than array-lists. Due to the proven advantages of hash-maps and inspired by an already existing popular Android app such as Settle Up, the present project uses hash-maps to solve the problem of expense management in the back-end to handle data.

IV. DESIGN AND IMPLEMENTATION

SlashiT has different modules which gives its users a good experience in terms of usability.

- **Event:** Allows the user to add an event, name an event, add details like people involved, and add notes and bills/transfers.
 - **People:** Allows the user to add details about people involved and group them.
- **Bill:** Allows the user to add multiple bills with the details of people involved. There is a calculator available for the convenience of the user and a picture of the bill can be added as well.
- **Payment:** The amount owed to a person can be paid online through any online payment method and the account between them would then be considered settled.
- **Notification:** When a person is in need of money and is supposed to receive the same from others, a notification can be sent to their cell phone through this module.
- **Share:** The event creator can notify others involved in the event about the results of the transactions through email and other sharing options like WhatsApp, etc.

The sequence diagram in figure 2 depicts the user interactions with various modules of SlashiT.

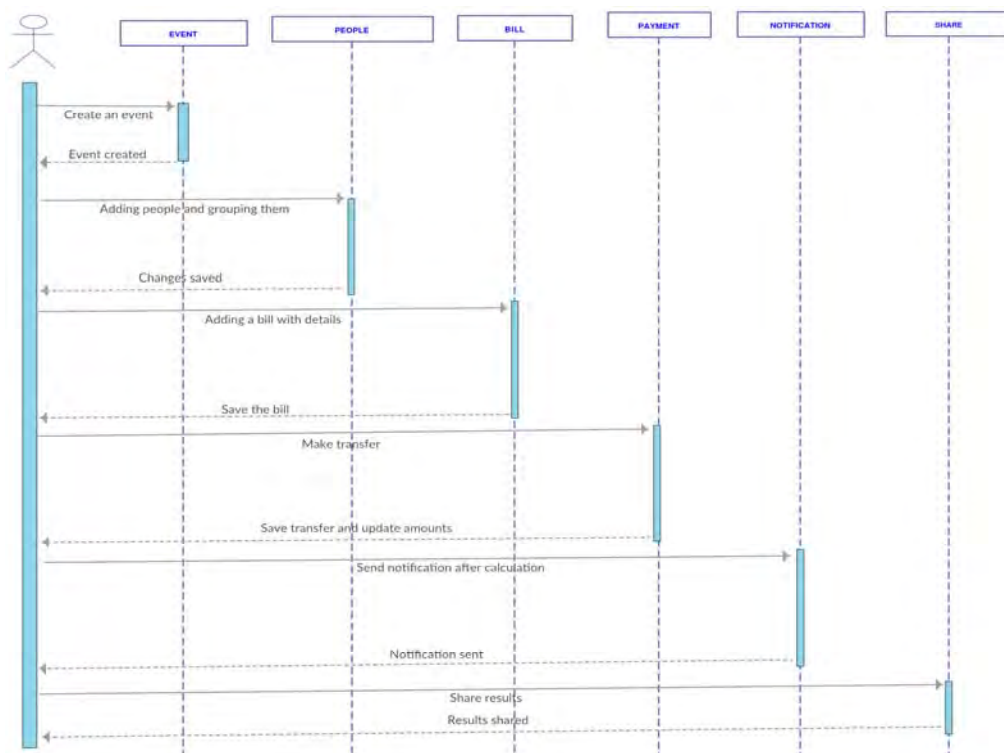


Figure 2. User interactions in SlashiT

V. EXPERIMENTS AND TEST RESULTS

SlashiT has been tested with 30 volunteers who went for trips and were instructed to use the application for managing their group expenses. The size of each group varied from 3 to 6 members. They were provided with the apk file and the instructions about the usage. All volunteers used the application for their expense division and management. A feedback was taken from each volunteer individually. The overall satisfaction level was found to be 95% and a number of suggestions to make it more user friendly was received. Volunteers suggested that if there is some expense which is to be divided only among a few in the group then provision for doing so should be available. For this, a provision was made to include only a few among the members for a particular bill. It was also noted that a person who paid multiple bills had to calculate the total and then enter it in the application, responding to this a calculator was added in the billing module to let the person calculate then and there and add the bill amount.

VI. CONCLUSIONS AND FUTURE SCOPE

The present work is an android application titled SlashiT that was taken up as part of the student project. It aims at expense management among students who travel in groups and would like to have a tool to ease the process of managing their expenses. Based on existing apps and literature survey, hash-maps proves to be an efficient mapping technique in Android apps for handling large amount of data. SlashiT uses hash-maps for the similar

reasons and the results are quite satisfying. This app will save a lot of time that people manually waste on these calculations.

Hoping that this application does better in the future there are enhancement plans for the application. Currently, the app is working for a single user to make the calculations and shares the results with its group members through emails. This could be enhanced by providing a link through which the other users could download the application and have the details of the events saved. There could also be a direct connectivity between applications running on multiple devices for that event. Thus, notifications could be sent easily. Money transfers could be implemented by linking it to some e-wallet and make payments across accounts through mobile numbers or actual bank account numbers.

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