The influence of user interface in route finding applications

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1 Introduction

The influence of apps and smartphones on modern human life is undeniable. Although the functionality is key, the user interface (UI) is just as key to ensuring the system is easy to use. Without an appropriate UI, it might be impossible for the user to work and use the application. In this report, the focus is on finding a good UI that improves user experience in achieving goals and leaves the users in a good emotional state.

There are multiple apps whose main focus is providing route planning, for walking or biking, or using public transport. The same apps can be used to identify locations for a given activity (e.g. restaurants, ATMs, shops, etc). The most popular to date is google maps, which gives users the ability to find all the shops close to him/her. Additionally, it has the option to find the path between multiple addresses, but it still struggles to identify the most convenient way-point to visit a location on route to the user's final destination.

There is a gap in the market for an app that, given some addresses and activities can find an optimal configuration of a path, to be as fast and efficient in both time and distance traveled. For example, if the user provides the location of a friend's house and wishes to go to an ATM on the route, the app can provide the best route to travel via an ATM. Either the user provides a specified preference of order, such as collecting money from an ATM before visiting a cash-only shop, or the App can be left to calculate an optimal route given the input parameters.

To collect user requirements a questionnaire was made with 3 questions (see appendix). In total 9 people took the questionnaire and the majority of the participants supported the idea and indicated that they thought this app would be a useful application to have and most of the participants agreed that they thought the app could help them save time and would use the app in their daily life.

2 Interface development

2.1 low fidelity

A low-fidelity prototype is an introduction to the utility of the application. There are different ways for low fidelity prototyping, the one used here is a storyboard showing the functionality of the prototype and how it can be helpful. Storyboard is shown in figure 1.

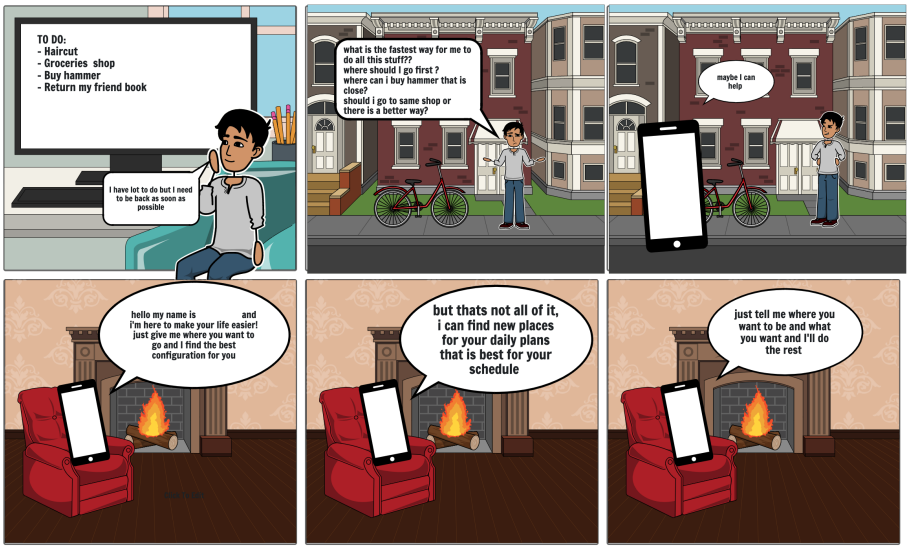

Figure 1: Low fedality prototype.

2.2 High Fidelity

There were two versions made for high fidelity prototypes, to be tested against each other. The difference between versions is the order of pages and differences in UI that going to be presented here. The reason for this is to be able to check which version can improve user experiment and efficiency. In this section, only the main pages of both high-fidelity prototypes are presented. The full version of both prototypes is provided in the appendices.

Figure 2 shows the first version high fidelity prototype. The first-page user encounter is an empty page with two buttons, first one is an add button that by clicking user goes to another page with 3 buttons, by clicking on the button "Address" the user goes to the next page that can add a location. by clicking on the "Activity" button user is led to another page that user can choose the preference activity, and save them. Again by pressing the same plus button they can add new addresses or activities. if there is an ordering preference for the user, he/she need to add the locations in that order, or if there are no

preferences there is a check box that by clicking the user can specify that the order doesn't matter and the app can find the best configuration and order. after adding all the locations, the user can go to the map by clicking the Go to Map button. There user can see locations in order and there is a map provided to show the way.

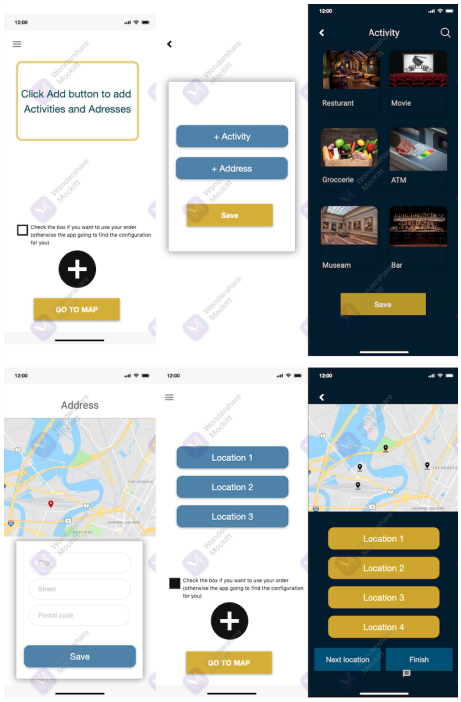

Figure 2: first version high fedality

Figure 3 shows the second version high fidelity prototype. In this version unlike the previous one, the first page the user encounter with is where to choose the activities and/or addresses. After adding all the locations and activities by using the same steps as before he/she can go to the next step by clicking the "Next" button. On the next page, user can see all the locations there add and there is a dropbox for each so that if there is a preference for the order in which each location need to be visited they can specify, also there is a check box like the previous version that by clicking the user can specify that the order doesn't matter and the app can find the best configuration and order. after finishing this stage either by specifying the order or by leaving it for the app, the user can press the "Go to Map" button to go to a map page with all the orders and paths.

Both versions have the same functionality, the biggest difference is in the initial version the user needs to add the locations and activities in the correct order if they want to specify the order preference. In the second version, the

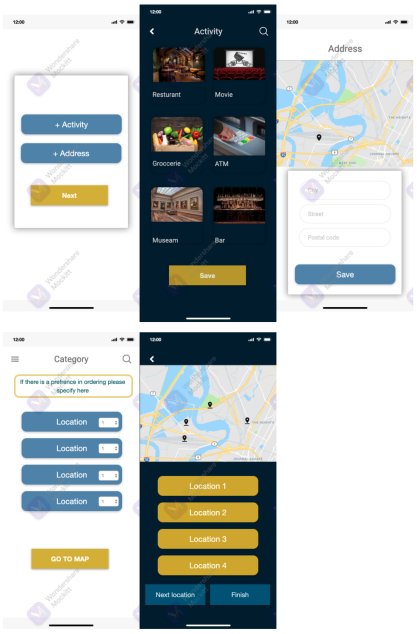

Figure 3: Second version high fedality

user can add in any order and after if needed specify the order prefrence.

The whole functionality of the app is summarized here but to make a good user interface, there is much more that needed to be added. There is a login page and sign-up page for making a new account. After that depending on the version of the prototype they go to the rest of the prototype. On each page, except the home page, there is a back button that let the user go to the previous page, and on the last page after finishing all the tasks by clicking on the finished button user can go back to the home page. For adding an address, the user has two options, to use the location in the map provided or write the address down. All these features are added for users to have a more flexible and easier app to use and navigate.

2.3 Hard coded Tasks

For testing the usability of these two versions and finding the best user interface two tasks were formed. Users need to do both tasks in both versions and by checking the report the time took them to finish each task and mistakes.

2.3.1 Task 1

In task 1 user needs to add 2 activities, available on the main page (without using the search button) add 2 locations one with an address and one with the

map provided and order them. After that only click on the "Go to map button" and finish button.

2.3.2 Task 2

The second task is similar to the first one except here the user doesn't need to specify an order and needs to check the box to let the application find the best route.

3 User Test

To show that there is a correlation between interface visually appealing vs. time to complete the task, ease of use, and frustration of the user, two-sample t-test paired was used. The reason is that each individual was presented with two different versions of the prototype and two different questionnaires. Two hypotheses were made, null hypothesis chosen here is that users going to perform the same on both versions of prototypes and the differences in the user interface are not going to influence the performance of the user, in other words, the true mean of both data is going to be the same. The alternative hypothesis state that the second version is going to increase the performance of the user(the means going to be different). as mentioned above the reason it is believed that the second version going to perform better is that they can add locations in any order and after if needed specify the order preference.

3.1 Participant

The population sample was a sample of 20 people most students. To avoid bias half of the sample first triad the first version of the app and the other ten first receive the second one. In this way, we can roll out the effect of familiarity. Also the same bias can affect the way they do each task again if they do one task first they will be more familiar with the system than the second task. but because everybody was getting the task in the same order it didn't matter because familiarity influences everybody the same amount.

3.2 Questionnaires

After using the app a questionnaire was formed to capture the data and user experience.Eight questions were asked for each version of the prototype. First two questions where yes/no question about if the users where successfully finish each task. For each task users were asked to provide how long took them to finish the task in seconds and to report the number of mistakes they made. The other two questions were provided to capture user experience about how easy was navigating the app for them and how frustrated they were after using the app. The emotional questions have a linear scale from 1 to 5 to capture the easiness and level of frustration. All links to these questionnaires can be found in the appendices.

3.3 Result

In this section, result of the questionnaires is provided with the statistical analysis of the data. Table 3.3 shows the result of the experiment on two tasks and the data gathered from questionnaires. Data seen here are all averages of all the data gathered from the user. From the data, we can see that all participants were succeeded to finish all the tasks in both prototypes. However, analyzing the average time taken for participants to finish tasks (in seconds) shows that participants finish tasks faster in the second version both in task one and task two. As we can see all participants use less time to finish task two, which was predicted because users are more familiar with the app after finishing the first task. However, the number of mistakes was very similar for both versions. The

	Task 1	Task 2	mistakes T1	mistakes T2	finish T1	finish T2
Version 1	44	43	2	1	100%	100%
Version 2	38	32	2	0.5	100%	100%

most obvious difference where seen in time taken. As is seen in the chart 4 there is a significant different in time taken from users to finish tasks in version one and version two. Table 3.3 show the answer concerning emotional questions,

Figure 4: chart of time, y axis in second x version of the prototype

this table also shows that people navigate easier with the second version and feel less frustrate using the app.

	Ease of navigatin the app	Level of frustration
Version 1	3.5	2
Version 2	4.5	1.5

Two Sample t-test paired was used for these result with a confidence level of 95%(alpha = 0.05). these test where only done on the time to for finishing the

tasks, as mention above that was the only data that we see significant different between both versions.The result of the t-test is presented in table 5.

	T value	P value
How long took you to finish task 1	-2.315034	0.03195
How long took you to finish task 2	-7.20997	0.00001

Figure 5: Result of T-test

The first row shows the result for the time taken from the user to finish task 1. The result is significant at p less than 0.05. As we see the p value is less than 0.05 so the data is significant.The same thing shown for the time taken for task 2, the value of p is .00001. The result is significant. From this result, we can reject the null hypothesis and accept the alternative which states that the changes in UI going to influence the performance of the user, and the difference in the second version going to increase the time user is used for finishing the tasks.

4 conclusion

UI is one of the key aspects of application development. Here it was shown that only small changes in UI can improve user experience and efficiency. The results from the experiment prove the alternative hypothesis and the significance of the data was shown using two Sample t-tests paired.

Appendices

A Prototype

Prototype version 1: `https://mockittapp.wondershare.com/app/25b3d62c7e009c41cdb6ab185a19ca226e6`
`simulator_type=device&sticky`
Prototype version 2: `https://mockittapp.wondershare.com/app/07d733e624cd077f83fe1fd0a8c877dac29`
`simulator_type=device&sticky`

B Questionnaires

Starting questionnaire: `https://docs.google.com/forms/d/e/1FAIpQLScN-tRRjpuSnYnFMActw6HrwuWQcvZX`
`51jjxk51z4tEJM2w/viewform?usp=sf_link` Questionnare for version 1: `https:`
`//docs.google.com/forms/d/e/1FAIpQLSdfxfZWis9qPuoJNg7sikUfwa02RXGUxDfNcxA4oHcmcxNmOA/`
`viewform?usp=sf_link`
Questionnaire for version 2 : `https://docs.google.com/forms/d/e/1FAIpQLSfKsRcNGyHLYiOtd1qO7Wv1V6wp`
`viewform?usp=sf_link`