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MPD COursework

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# Design

The design of the application is centred around making sure that the application can meet the functional requirements while providing the user a user-friendly experience. To establish what type of user interface the application will require, the functional requirements will first have to be defined so that the design can be influenced by them. Most of the functional requirements of this application come from the project specification. The functional requirements of the application are as follows:

## Functional requirements

* The system must display data on the last 100 days of earthquakes in the UK
* The system must allow the user to search the earthquake data for a specific earthquake
* The system must display the earthquake data on a map to the user

From the functional requirements we can identify some key design features which will have to be implemented for this application. As the past 100 days’ worth of earthquake information must be displayed to the user this could be a lot of different events which have to be shown. Due to this we can identify that a scrollable interface of some description will have to be implemented. Also, as it is on a mobile device, the information must be easy to read and give the user the most important information at a glance. So, for this the information that is took into the application must be trimmed and made suitable for display. As the user must be able to search for a specific earthquake, an interface which allows for the user to search for information must be included in the design. So, this will mean some form of data entry for the user will have to be considered as well as a place for the information which is searched is displayed. Finally, as the user must be able to view the data for the earthquakes on a map, it allows us to make some design choices to implement this feature. A map interface will have to be included in the design to show the earthquake data visually to the user.

## HCI considerations

Now that the functional requirements have been established and some key design points have been recognized the system is almost ready to be designed. Before it is fully designed, some key HCI principles will have to be considered to help guide the design for a better user experience.

Several of Shneiderman’s golden rules could be considered for the design of this application to help improve the user experience.

### Offer informative feedback

As this application will involve some user interaction, offering the user feedback whenever they carry out an action will let them know that their action was registered by the system and is being worked on. One example of this which could be implemented into the design of the application is when the system is searching for user input, have a loading bar appear while the system searches for the input.

### Consistency

As this application will be simple in its nature, it should have a consistent look when used on different devices. This will allow a user who uses the application to go onto another device and have the confidence that they will be able to utilise the applications features straight away.

### Support Internal Locus of Control

As the application is a simple one the user should never feel like they aren’t in control of what is happening with the application. The design of the application should guide users to the different actions without making it feel like they didn’t make the choice themselves.

## Screen Design

Within this application there are 2 main screens that the user will interact with, the main screen and the maps screen.

## Main Screen

The main screen utilises a Scroll view with a linear layout to display the data. On the main screen there is 2 main buttons, a text box for data entry, list view and a menu bar. Each of these components will be broken down in the subsections below.

### Buttons

On the main screen there are 2 main buttons which are displayed. One button is used to carry out the users search and is labelled “Search for Earthquake”. This button is placed directly below the text box so to imply to the user that the search query which will be used by this button has to be entered the text box above. If the user does not enter a search query, they would receive a toast prompting them to enter a query into the search box before continuing.

Below this button is the button which allows the user to view the earthquakes on a map. This button is labelled as “View Earthquakes on Map”. This button is big and clearly labelled so should clear to the user the intent of the button.

### Text box

For the entry of a search term, the user can provide a search query in the text box provided. The text box is placed above the button which carries out the search and the box comes pre populated with a prompt which says, “Enter a search query here”. This placement of the box and the prompt should make it clear to the user the intent of the box and what it will carry out.

### List View

Below everything else is a list view which is used to display the earthquakes to the user. This view takes up over half of the screen to display earthquake information and can be scrolled to view earthquakes further down the list. The items within the list view are colour coding so that the user can understand some information about the earthquakes at a quick glance. The text for each earthquake is displayed in a clean font and on separate lines to ensure that the information is clear and easy to read for the user.

### Scroll View

The entire screen is within a scroll view which ensures when data comes off screen and can no longer be displayed, the system allows the user to scroll the screen down to see rest of data. This is useful for the earthquake list as it allows the user to freely scroll the earthquake data. This meets one of the functional requirements detailed above.

### Linear Layout

The main screen also incorporates linear layouts to allow for specific elements within the screen to be positioned in a linear order one after the other. This allows for elements to be displayed to the user in a particular manner.

## Maps Screen

The maps screen will utilise the google maps API and will display a google map of the UK to the user. On the maps screen there will be icons for each of the earthquakes which have to be displayed on the map. These icons will be colour coded depending on the severity of the earthquake and will provide the user with a quick visual indicator of the how bad the earthquake was. This information will also be explained to the user with a key at the top of the map screen. Each of the icons on the map will be clickable and provide the user with information about the earthquake such as the location, magnitude, date and depth of the earthquake.

## Conclusion of design

Overall the design of the system fulfils the requirements that were laid out in the specification however can be improved in the future with the feedback gained from testing. The main screen of the system can display the earthquake data to a user in a clean and easy to read manner and they are able to tell at a glance the severity of the earthquake due to the colour coding system. It also allows for the user to search for earthquakes and this gets displayed neatly in the same place the earthquake data was before. One improvement suggested in user testing which can be made to improve the readability of the earthquake data, would be to include an icon or flag of the country in which the earthquake originated. This would give the user an indication of roughly where the earthquake originated at a glance.

The maps screen displays the information on the earthquakes that have been selected (either all the earthquake data or searched data) in an easy to read format on a map. This gives the user a visual representation of where the earthquakes are happening, and they can receive information on them within the maps screen. One improvement suggested in user testing would be to have a search bar within the maps screen to allow the user to search for earthquakes on the map without having to go back a screen. This would improve user experience as they would be able to search for a term and see the map update in front of their eyes without having to juggle 2 screens.

# Testing

The application that is produced will be required to be tested in different ways to ensure it is suitable for use. The program code will need to be tested to ensure the code it suitable and meets the functional requirements of the program. Meanwhile the user interface would need to be tested using usability testing to ensure that the UI is intuitive and user friendly.

## Program testing

First the program will need to be tested to ensure that it meets the functional requirements of the program. The functional requirements were established in the design stage and were as follows:

### Functional requirements

* The system must display data on the last 100 days of earthquakes in the UK
* The system must allow the user to search the earthquake data for a specific earthquake
* The system must display the earthquake data on a map to the user

To test these requirements, individual tests will have to be created to ensure that the input to the application meets a required outcome.

To test if the system correctly takes the correct data from the British Geological Survey feed and passes it into the system, the RRS feed will have to be compared with the data which gets parsed into the application. As there are many earthquakes in the list, the first three earthquakes, three from the middle and three from the end will be compared to ensure that the data is getting taken in and displayed correctly.

To test that the user can search the earthquake data for a specified term there will be a variety of different search terms used to ensure the system can search correctly for them. The search tests will check if the application is able to search for an earthquake at a specified location. Also, the search will check if the system can find earthquakes which match a specified magnitude.

For the map testing, the system will use all the earthquake data and it will be tested to see if the data displays on a map in which the user will be able to see clearly the location of the earthquakes. To test that this is accurate, the map will be loaded with the earthquake information and then once it is displayed, the result will be compared to the latitude and longitude of the location when found on google maps externally.

If these tests all meet a satisfactory level of quality the functional requirements have been met for the system.

## Usability Testing

To test that user interface for the program is user friendly and intuitive to use, usability testing would be required. Usability testing would provide feedback from users about different aspects of the user interface and user experience which could be then used to improve these aspects for the future. This would highlight potential flaws with the user interface which the developers could have overlooked when making the user interface and could receive potential features which could be implemented which are missing.

To establish that the testing would be consistent and give accurate results, a set of questions would need to be established that would be asked of the user about the application. This set of questions would be the same over all user tests to ensure consistent testing between each user. The questions would need to range from questions which ask the user for their opinion on certain aspects of the user interface, to asking the user how they would carry out a task on the application and watching them perform the task. The questions that would be asked the to users would be as follows:

* Initial thoughts about the UI?
* Search for Earthquakes in Ireland
* Search for an earthquake with 2.4 magnitude
* Refresh the data on the page
* View the earthquakes on a map
* Search for Stirling and view on a map
* Is the User Interface easy to use?
* Does it Display the info in an easy to read manner?
* Anything you would change in the User Interface?

While the user is being asked these questions or carrying out the actions, the tester will be evaluating the user based on set criteria.

* Did the user need assistance/prompting to complete the task?
* Did the user make an error while performing the task?
* Time took to complete the task.
* Comments by tester on users’ actions.
* Users comments after task.

With the data gathered from the usability testing, the tester will be able to evaluate each question against the criteria and the data gathered will give an understanding into how a user will interact with the user interface. To establish a broad range of answers for the usability testing, a variety of users will need to be asked with different experience using technology and mobile applications. This will allow for a look at how a range of users will interact with the user interface. For this usability testing there will be 3 different users being tested with varying degrees of experience using technology. Below the users selected have been detailed along with their experience using technology.

### Users Stories

* Helen. 70. Rarely uses mobile phones except for emergencies. Little to no experience using technology.
* Peter. 57. Uses mobile phones on occasion to browse internet and social media. Medium experience with technology.
* Laura. 25. Uses mobile phones every day to browse internet and social media. Uses other technologies such as laptops and tablets. Large amount of experience using technology.

Using these users to test the application, the tester will be able to gain a valuable insight into how the users will interact with the mobile application and as such, may gain valuable feedback to check if the system if fit for purpose and feedback about changes which could be made to further improve the systems interface.

# Documented Testing

## Program Testing

|  |  |  |
| --- | --- | --- |
| Test for | Expected Output | Actual Output |
| 1st Item |  |  |
| 2nd Item |  |  |
| 3rd Item |  |  |
| 13th Item |  |  |
| 14th Item |  |  |
| 15th Item |  |  |
| 3rd from last item |  |  |
| 2nd from last item |  |  |
| Last item |  |  |

In the above test the expected output has been taken from the raw xml feed on the British geological societies RSS feed and the actual output is the output from the app. As the actual output and the expected output match, the system is parsing the data in order correctly.

|  |  |  |
| --- | --- | --- |
| Test input | Expected output | Actual output |
| “Stirling” | Earthquakes in Stirling appear, and no other earthquakes appear. |  |
| “Surrey” | Earthquakes in Surrey appear, and no other earthquakes appear. |  |
| “Ireland” | Earthquakes in Ireland appear, and no other earthquakes appear. |  |
| “Spain” | No earthquakes for Spain are found so no filtered results appear. |  |
| “Ex” | Any earthquakes which contain “Ex” in their title appear. |  |
| “W” | Any earthquakes which contain “W” in their title appear. |  |
| “1.3” | No earthquakes with magnitude 1.3 so no filtered results appear |  |
| “1.0” | Any earthquakes with 1.0 magnitude appear |  |
| “2.0” | Any earthquakes with 2.0 magnitude appear |  |
| “-0.1” | Any earthquakes with -0.1 magnitude appear |  |
| “100” | No earthquakes with magnitude 100 so no filtered results appear |  |
| “999” | No earthquakes with magnitude 999 so no filtered results appear |  |

In the above tests, the test input is the data entered by the user into the app to be searched, the expected output is what should appear according to the RSS feed and the actual output is what is displayed on the app. As the actual output and the expected output match, the system can search the list correctly.

|  |  |  |
| --- | --- | --- |
| Input | Expected output | Output |
| Earthquake at Donegal Ireland |  |  |
| Earthquakes at Skye |  |  |
| Earthquakes at Whitstone Cornwall |  |  |

The above testing, the input is the earthquake which is being searched for in list, the expected output is the earthquakes latitude and longitude values being searched in google maps and the output is the output which the application provides. As all of the above tests show that the application can accurately display the location on the map.

## Usability Testing

### Helen

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Question | Did user need assistance | Did the user make any errors | Time to complete action(seconds) | Comments | User comments |
| Search for earthquakes in “Ireland” | Yes | Yes | 50 | User had pressed search button first. User had to be shown where searchbox was. | Prompt for textbox wasn’t very clear. |
| Search for Earthquakes with “2.4 magnitude” | Yes | No | 28 | User didn’t understand how to put a “.” In between the 2 and 4 | N/A |
| Refresh the data | Yes | No | 30 | User did not recognize the three dots at the top were a menu. After being prompted to press the menu the user found the refresh data button | N/A |
| View the earthquakes on a map | No | No | 5 | User found how to get on the maps quickly by pressing the maps button. | Map was interesting to look at. |
| Search for earthquakes in “Stirling” and view them on the map | Yes | Yes | 68 | User opened the map and looked for Stirling manually. When informed she was to search for Stirling user pressed search button before entering any search query. User eventually worked out the process on third attempt. | There should be a search bar on the map to carry out the search. |
| Initial comments on UI(Asked at beginning of test) | N/A | N/A | N/A | N/A | UI was colourful to look at. |
| Is the UI easy to use? | N/A | N/A | N/A | N/A | It was okay to use. Took some time to get used to |
| Does the UI display the information in an easy to read way? | N/A | N/A | N/A | N/A | Some of the text could have been bolder/bigger to make it easier to read. |
| Anything you would change? | N/A | N/A | N/A | N/A | Have the earthquakes on the main page be clickable which would take you to the map to show you the location of the earthquake. |

### Evaluation of Results

From Helens feedback there are several things which could be took away for improvement or for features to be added:

* Helen pressed the search button before entering a search query to the search bar on several occasions. This could be looked at to either make it clearer to the user that a search term must be entered first or remove the search button until a search term has been entered.
* Text in the UI could be looked at to be improved to be more readable for people who have bad eyesight.
* A potential feature which could be added in a future increment is for earthquakes to be clicked on the main page and take you straight to a map of that earthquake.

### Peter

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Question | Did user need assistance | Did the user make any errors | Time to complete action(seconds) | Comments | User comments |
| Search for earthquakes in “Ireland” | No | Yes | 33 | User pressed search button before entering any search term. After seeing toast user corrected his mistake. | Search was fast to show results. |
| Search for Earthquakes with “2.4 magnitude” | No | No | 5 | User learned from previous test and knew how to search better than first attempt. | N/A |
| Refresh the data | No | No | 13 | Took the user afew seconds to scan the screen to find where this option would be. | Said he knew where to find it from similar apps he has used in the past. |
| View the earthquakes on a map | No | No | 7 | User found how to get on the maps quite quickly. User also spent some time interacting with map. | Map was colourful and pleasing to look at. |
| Search for earthquakes in “Stirling” and view them on the map | Yes | Yes | 21 | User typed in the search term then pressed map before searching for the term. This caused the whole map of earthquakes to be displayed. | Map should search for the term without having to press the other button. |
| Initial comments on UI(Asked at beginning of test) | N/A | N/A | N/A | N/A | User guessed that red earthquakes would be worse than green ones. |
| Is the UI easy to use? | N/A | N/A | N/A | N/A | Yes, user friendly and intuitive. |
| Does the UI display the information in an easy to read way? | N/A | N/A | N/A | N/A | Yes, colour coding helps differentiate severity of earthquakes at a glance. |
| Anything you would change? | N/A | N/A | N/A | N/A | Symbols or icons next to earthquakes to show region they happened in(e.g Scotland flag next to Scottish earthquakes, Irish flag next to Irish earthquakes etc.) |

### Evaluation of Results

From the results gathered from Peter, a few insights were highlighted about the user interface:

* The colour coding of earthquakes was intuitive to the user and did not need a description to get an idea of what each colour meant for the earthquake.
* The menu which holds the data refresh was section nature to the user as similar apps he has used have put similar functions in this position.
* Potential addition for the future would be icons to better differentiate earthquakes based on location, such as a flag in country of origin.

### Laura

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Question | Did user need assistance | Did the user make any errors | Time to complete action(seconds) | Comments | User comments |
| Search for earthquakes in “Ireland” | No | No | 14 | User typed in search term as prompted and hit the search button | Search prompt helped her find search box |
| Search for Earthquakes with “2.4 magnitude” | No | No | 4 | User was fast to enter data | N/A |
| Refresh the data | No | No | 9 | User tried to pull screen down to refresh data before checking menu | Thought the list would be able to be refreshed with a pull-down motion like most apps. |
| View the earthquakes on a map | No | No | 3 | User instantly clicked the maps button after the question. | N/A |
| Search for earthquakes in “Stirling” and view them on the map | No | No | 13 | User done the task correctly first time. | N/A |
| Initial comments on UI(Asked at beginning of test) | N/A | N/A | N/A | N/A | The UI was colourful and the buttons were big |
| Is the UI easy to use? | N/A | N/A | N/A | N/A | Yes simple to use |
| Does the UI display the information in an easy to read way? | N/A | N/A | N/A | N/A | Yes the information that you would want to see is displayed well. UI isn’t cluttered. |
| Anything you would change? | N/A | N/A | N/A | N/A | Refresh motion to get new data. |

### Evaluation of Results

Overall the results from Laura’s results were positive, however some points to note:

* Having the list of earthquake data refresh with a “pull-down” motion may make refreshing the data more user friendly and easier to use.
* User commented the buttons were quite big, buttons could be readjusted to make them slightly smaller.
* Overall the UI seems to be intuitive for someone who has had experience with other applications in the past.

# Video GitHub Link

# Project GitHub Link

# APK GitHub Link