Informatics Large Practical

Coursework 1

Project Plan

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Design Decisions

On opening the application:

1. Ask the user for permission to use their location and network if permissions have not been granted. They must allow these permissions in order for the map to be downloaded and for their location to be tracked, and they game will not function if the permissions are denied.
2. Download the map for the current date if it has not already been downloaded.
3. Show current map on screen.
4. Sign the user in:
    a. If the user has not signed out since the last time the app was use, authenticate their details through Google Firebase.
    b. Else present a popup asking the user to enter their username and password, or to create a new account.
5. The user's location is shown on the map with an icon.
6. There will be a coin button on the screen that will display the exchange rate of the different currencies when the user presses it.
7. The amount of gold in the user's bank account will be shown at the top of the screen next to a button which will bring the user to the bank screen.
8. There will be a wallet button next to the bank button which will bring the user to their wallet.

User accounts:

1. Each user will have an account that is authorised through Google Firebase using their email and password.
2. The user will be asked to sign in the first time they use the app on their device but they will remain signed in until they sign out manually.
3. If the user does not have an account they can register to create a new account:
    a. The user must enter an email address that is not being used by another user, but they can enter any password they wish.
4. The user can sign out at any point by pressing a sign out button on the main activity screen.
5. The user cannot use the app until they have signed in with a valid email and password.

Collecting coins:

1. Get the user's location every 5 seconds.
2. If the location has changed:
    a. Move the camera to keep the user icon in the centre of the map
    b. Check if the user is within 25 metres of a coin.
3. When the user is within range of a coin present them with the option to pick it up:

    a. If user accepts the coin, it will go into their wallet and disappear from the map
    b. Else it remains on the map and can be picked up again if the user returns to the location of the coin.

Wallet:

1. When the user taps the wallet button on the main activity, they will be taken to the wallet screen.
2. The coins the user has collected that day will be shown as a scrollable list in the order they were collected.
3. The user can select coins by tapping them.
4. Selected coins can either be sent to the bank or transferred to another user:
    a. If the coins are sent to the bank, they will be converted into gold and will be added to the total amount of gold in the user's bank account.
        i. Once the user has paid 25 coins into their bank account on the current day, no more coins will be sent to the bank; they will remain in the wallet and the option to pay coins to the bank is disabled until the next day.
    b. If the coins are transferred, the user will be asked to select a friend from a list of players they have previously transferred coins to, or they can type in the username of another existing user who is not in the list. This new user will also be added to the friend list.
5. Coins in the user's wallet at the end of the day will remain there indefinitely and can be banked or transferred at any time.

Bank:

1. When the user taps the bank button on the main activity, they will be taken to the bank screen.
2. The total amount of gold the user has is displayed on the screen.
3. There will be a scrollable list beneath the gold total that displays the coins that have been transferred to the user that day along with the name of the user who sent them.
4. All coins sent by another user will automatically be converted into gold and deposited into the user's bank account.
5. A user can receive a coin from another player even if they have already banked it themselves, and there is no limit to how many coins a user can be sent in one day.
6. The coins will be transferred between user accounts via a NoSQL database provided by the Cloud Firestore in Google Firebase.

Bonus Features

Bomb coin

- There will be one extra coin on the map every day that will be a "bomb" coin.
- This coin will look like a normal coin of a random denomination, but when the user picks it up, it will destroy all of the coins in the user's wallet.

- This will incentivise the user to bank or transfer coins, rather than hoarding them in their wallet until the exchange rate to gold is higher.
- The user will also have to decide if they will play it safe and bank each coin as they pick it up until they reach the 25 coin limit, or if they will wait until they have collected the high value coins but risk losing them all.

Hints

- Users can buy up to three hints a day, using gold from their bank account, which give information about the bomb:
    - First hint - tells the user what denomination the bomb coin is.
    - Second hint - tells the user what marker value the coin has.
    - Third hint - shows which coin is the bomb on the map.
- The user must buy the hints in order, from 1-3, with the first hint costing the least amount of gold and the third costing the most.
- By asking the user if they want to pick up a coin before putting it in their wallet, they will not accidentally pick up the bomb by walking within its range.

Level up

- The will be a set number of levels that the user can achieve when they have a certain amount of gold in their bank account.
- The user can see what level they are when they are in the bank, and the user can see other player's levels when they select the player to transfer coins to.
- This will allow the user to decide if they want to transfer gold to players who have a low level to increase that player's level, or to transfer coins to high ranking players in the hope that they will receive more coins in return.
- Adding this feature will give user's more motivation to collect coins as it will set an achievable goal to work towards.

Development Language

I have chosen to develop my application in Java. In 2017, Java was the third most popular language on GitHub[1], and in 2018, 45.5% of professional developers on Stack Overflow used java, compared to 4.7% who used Kotlin[2]. In addition to this, Java is the main language used in Android development, with Kotlin only becoming fully supported in Android Studio 3.0, which was released in October 2017. This means there is a large amount of support online from the Java community, and a developer would be able to find example code or solutions to problems they might encounter during development.

The popularity of Java would also make it easier to find a team of experienced developers to maintain and develop the app in the future. Kotlin is a very new language (Kotlin 1.0 was released in February 2016), so there are very few professional Kotlin developers. It would take a significant amount of time and money to fully train a team to use Kotlin. However it would be possible to train the development team in Kotlin while they continue to maintain the app in Java, a language they are more familiar with. This could be done because Kotlin is completely interoperable with Java, meaning it is possible to switch to Kotlin at a later date, when the online community and resources available have grown larger, without having to rewrite the current code for the app.

[1] https://octoverse.github.com/

[2] https://insights.stackoverflow.com/survey/2018#technology

Week-by-week timetable

(Milestones are highlighted in bold and each week will run from Monday to Sunday)

Week	Plan
2	**Install Android Studio.** **Create new project.** Draft plan and think of bonus features.
3	**Set-up version control on the project.** Write up finalised project plan.
4	Create Mapbox account. **Add Mapbox to MainActivity in app which starts at George Square.** Set up Google Firebase. **Submit plan.** Implement code for downloading and parsing the Coinz map for the current day from the Geo-JSON server. **Show coins on map.** Write description of how the map and coins were implemented in the report.
5	**Detect the user's location.** Write description of how user's location is found. Add button to show current exchange rate for coins. Test location functions
6	**Find how close the user is to each coin.** **Add user accounts using Firebase** Create sign in screen. Create screen to register for an account. Add sign out button. Test sign in and account creation. Write description of how the user's proximity to coins is calculated.
7	**Add the ability to collect coins by being in their proximity.** **Create wallet to store user's coins.** Design wallet screen. Test coin collection
8	**Create bank to save users coins.** Design bank screen. Enable user to send coins from their wallet to the bank, changing from coin value to gold. Show amount of gold currently in the user's account in the bank and on the main activity screen. Write description of how the user's coins and gold are stored in the app.

9	**Add ability to transfer coins between user accounts.** Test bank and transferring. Write description of transferring coins to other players.
10	I**mplement bomb coin that will remove all coins from the wallet.** Test bonus feature bomb. Write description about how it has been implemented.
11	Add hints and levels. Write description of hints and levels. Test hints and levels.
12	Add discussion of any parts of design that were not realised in implementation of the app to the report. **Test full app.** Fix bugs.
13	Ensure any additional features not in original design have been added to the report. Take screenshots of app in use. Label screenshots. Check that all acknowledgements have been added to the report. Finalise report. **Submit**