SYNTHETIC SOLUTIONS INC.

Project Deliverable D: **Conceptual Design**

GNG 1103 – Engineering Design

Faculty of Engineering – University of Ottawa

Team C01-1

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Abstract

In the previous deliverable, a design criterion as well as specifications for the application were formed from the group's interpretation of the needs and information learned from benchmarking other applications. These were then used to create five conceptual designs. The purpose of this report is to outline and explain all five designs, and to benchmark the group design with other recycling applications offered in the market.

Table of Contents

Introduction

Synthetic Solutions Inc. wants to make an application that will provide three main ideas to the user. A scanner that recognizes what item of recycling is being scanned and rewards users, a recycling themed game, and a way for users to learn more about recycling in their local area. In the report, each member's design will be discussed as well as the final design created by the group. This final design will be created out of the individual designs, taking elements from all of them to create the best design.

The conceptual designs mentioned in the report are the following:

- Concept 1: Group Design
- Concept 2: Lilly's Design
- Concept 3: Ben's Design
- Concept 4: Camila's Design
- Concept 5: Angie's Design

Group Design

The ideas and visuals of all members of the group were analyzed and combined to formulate this conceptual representation of the app. The app will have a home screen to navigate different sections of the application. The respective sections are: A scanning section, a game section, and an educational section.

The first button on the home screen takes the user to the AR-operated scanner where there will be a button to take photos should the user allow camera access. An animated box will exist for placing the object into, so that the focus is on the desired object. Once the photo is taken, the scanner will have a pop-up notifying the user if the object is paper, plastic, glass, trash, or compost.

The game section features an interactive, entertaining recycling game. Accessible via the second button on the home page, the game screen will have a play button to start a game where the users sort items into the bin they belong, i.e., plastic/metal/glass, paper, organic waste, and garbage. The game will have levels of increasing difficulty. *Level one* will consist of a small number of items, approx. 10, to sort out among three different bins: A black bin, representing regular trash, A green bin, for recyclable products, and an orange bin, for compost. *Level two* will expand out the recycling bin into four different ones: paper, plastic, glass, and metal. Including the previous organic and trash bins, the user will be presented with six different colored-coded options to sort out the items. In case of any doubt, there will be a search button within the game, to allow the user to lookup certain items. This will display a list from where the item can be found and be identified as recyclable or not.
The game section will also feature a trivia section about recycling and sustainability, to which the facts and theories behind that trivia should be accessible from the educational section.

Finally, the third button navigates the users to the educational section, where they can learn more about recycling in their area. The users will get to choose their preferred search engine and browser, provided that the application is being allowed access to location services. An information

page showing them what is and is not recyclable will be available. In addition, a link to the local recycling regulations of the user's area will be included, if location services are enabled.

All app sections will have a 'back button' or a 'home button' implemented in some corner to allow easy, quick navigation between app sections and the main page. Moreover, a Settings section will be present where other preferences such as volume, brightness, etc. can be adjusted. And finally, a Tutorial section, where a 30-45-second-long video recorded by the members of the group as a more interactive guidance can also be found on the home page.

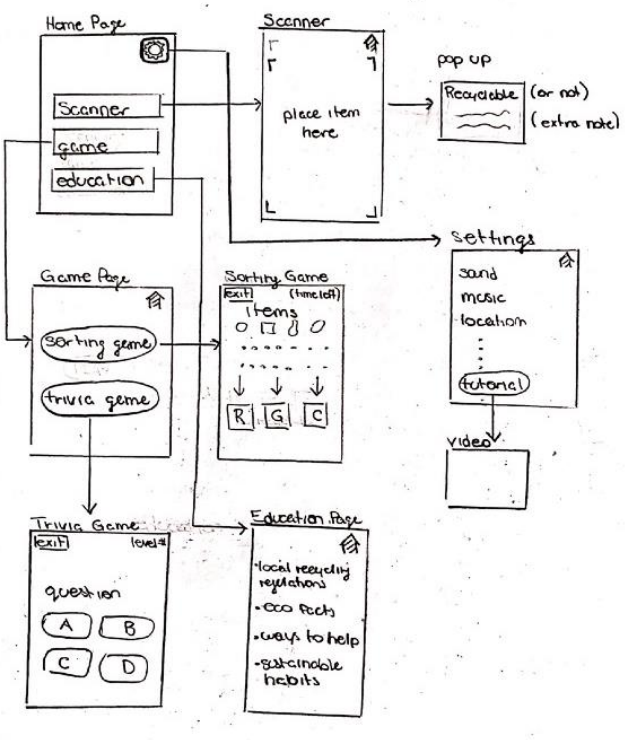

Figure *1*: Group Design

Lilly's Idea

Lilly's idea featured an app with a scanner, game section, educational page, and incentivization system. The home screen of the app would have all of those options present which would take the user to a different screen depending on what they wanted to do. The scanner section would use the Teachable Machine system to inform the user if the product was recyclable, compostable, or garbage by training the scanner to recognize these things. The home button gives the user the possibility of going back to the main screen.

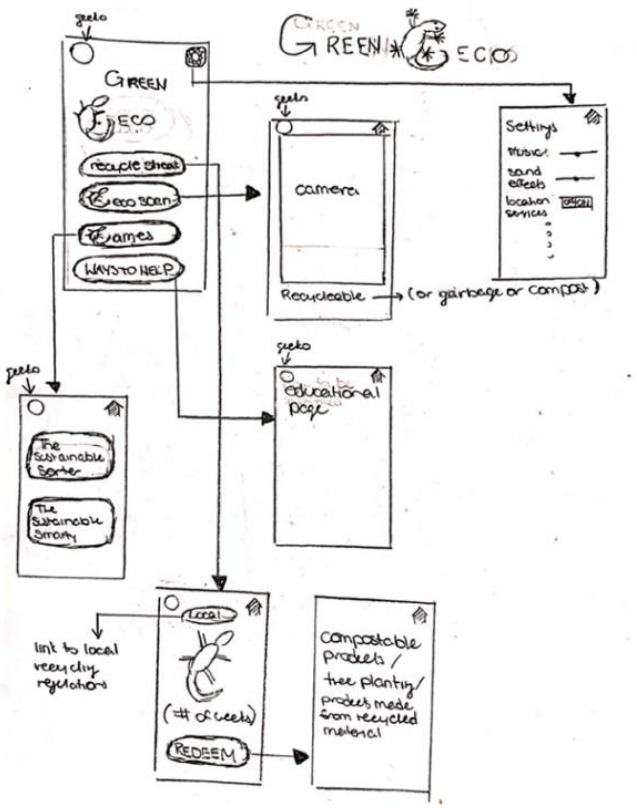

Figure 2: Lilly's Design

The educational page would include sustainability tips for the user and potential links on how to get involved in positive environmental protection and restoration. The game section would feature a recycle sorting game and an eco-fact trivia game both with increasing difficulty. For incentivization, the app could track the number of consecutive weeks of smart recycling done by the user and then after a certain number of weeks the user could get a reward. The exact reward has not been decided on yet, but it should be eco-friendly. This page also includes a link to the local recycling regulations (if location services are enabled). There would also be a settings page in order to control certain aspects of the app.

This design has all the interpreted client needs included, however with additional components there is additional difficulty bringing the design to life. It may also be difficult to track the users recycling streak, so the incentive system could instead be connected to the number of scans the user has completed. Regarding game section, two games is quite ambitious, so maybe one of them could be left out in the final design.

Ben's Idea

Ben's design features a full application with AR scanner, a game, as well as a page with more information on recycling. The design first starts with a home page with buttons to the different sections. The first button takes the user to the AR scanner, which would be laid out as is in the figure below.

In the scanner there will be a back button in the bottom corner as well as a button to take a photo. A box will exist for placing the object into, so that the focus is on the desired object. Once the photo is taken the scanner will have a pop up notifying the user if the object is paper, plastic, glass, or trash.

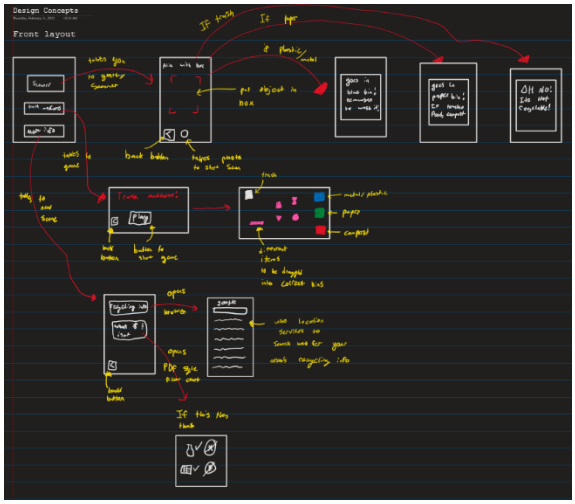

Figure 3: Ben's Design

The next button, trash madness, will take the user to the game screen. On the game screen there will be a play button and a back to main page button. The play button will start a game where the users sort items into the bin they belong to, plastic/metal/glass, paper, organic waste, and garbage. The game will have users sort more and more items with less time until they fail.

Finally, the more info button takes users to a screen where they can learn more about recycling in their area. The first button, recycling info, will take users to their preferred search engine and browser with the key words *Recycling information *insert current location**. This current location would be obtained from the application being allowed to use location services. The other button, *What is & isn't*, will take users to an infographic page showing them what is and is not recyclable.

Camila's Idea

For Camila's idea, her focus was the development and design of the game portion of the app. This will consist of a sorting game, that allows the user to identify assorted products or items found in the household as recyclable or not.

Maintaining the idea of an interactive and engaging system, the users will have the option to select distinct locations within the house. For example, the kitchen, a study area/office, the bedroom, the garden, etc. Once selected, the app will display said location, with items lying around that, can be found there. The goal would be to successfully sort out the items into the correct bin.

Different levels of difficulty will be available for the users to select. Level one will consist of a moderate number of items, approx. 10, to sort out among three different bins. A black bin representing regular trash, A green bin for recyclable products and, an orange bin for compost. The next level will have more options, expanding out the recycling bin into four different ones:

paper, plastic, glass, and metal. Including the previous organic and trash bins, the user will be presented with six different colored-coded options to sort out the items.

In case of any doubt, there will be a search button within the game, to allow the user to lookup certain items. This will display a list from where the item can be found and be identified as recyclable or not.

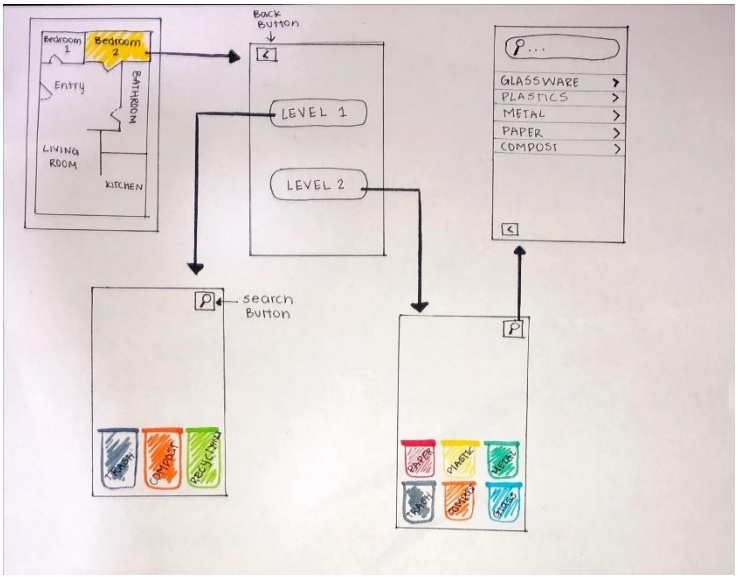

Figure 2: Camila's Design

Angie's Idea

Angie visualized that within the app must be a tutorial. A 30-45-second-long video that pops up at first but is also skippable and can be accessed later from a 'More Info' section within the app.

The app will be dedicated to identifying recycling bins only in areas where they are often present, such as: malls, food courts, parks, etc. Angie suggested that a location feature be installed within the app to, after the user allows through privacy settings, be able to locate the available bins in the area.

Furthermore, once the user physically finds the bins, he/she can also use their camera to scan the individual bins and provide detailed information on what can be disposed into each bin and what may not. Sort of an educational aspect to the app.

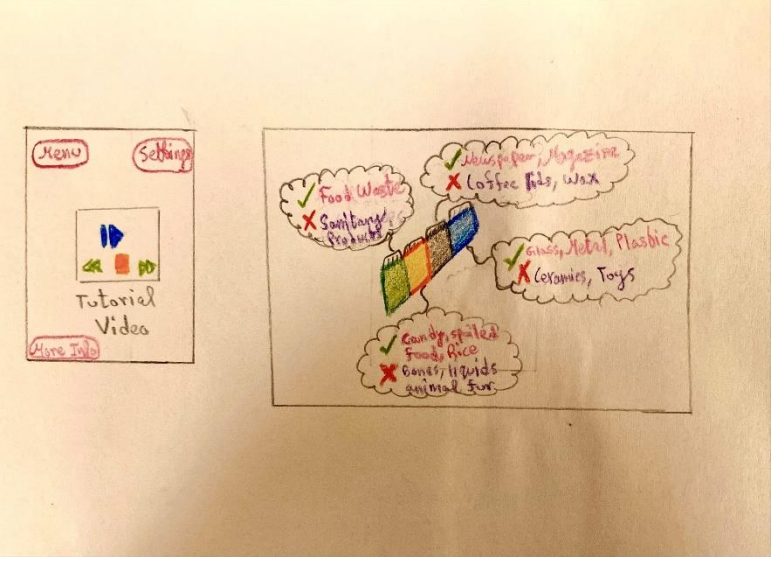

Figure 5: Angie's Design

Benchmarking and Verdict

Based off the previous benchmarking done, Synthetic Solutions idea was compared to the AR apps that were researched.

Specifications	Froggipedia	BBC Civilisations AR	Pokémon GO	Synthetic Solutions Inc.
Cost	$5.49	Free	Free	Free
Cross Platform Usage	iOS	iOS & Android	iOS & Android	iOS & Android
Ease of use	Yes	Yes	Yes	Yes
Rating	3.6	4.5	3.8	N/A
Accuracy	Low	High	High	High

Table 1: Benchmarking Including Synthetic Solutions Design

Since the Synthetic's solution is not on the app store, it does not have a rating. Therefore, to analyze it fairly, this specification was removed prior to totalling the values for each application.

Specifications	Importance	Froggipedia	BBC Civilisations AR	Pokémon GO	Synthetic Solutions Inc.
Cost	**3**	1	3	3	3
Cross Platform Usage	**5**	2	3	3	3
Ease of Use	**4**	3	3	3	3
Accuracy	**5**	1	3	3	3
Total		30	51	51	51

Table 2: Values Given Criteria Including Synthetic Solutions Design

Synthetic's solution AR section is comparable with BBC Civilisations and Pokémon GO given this criterion. It is important to note that there are other factors including the specific scanning AR feature that makes Synthetic's design better for the needs of the application.

The recycling app detailed in the group design is difficult to benchmark against other apps out there because it is the first recycling app of its kind that aims to bring many components onto one platform. The fun game and educational aspects that are incorporated in the design of this app will help make a difference in recycling ability and knowledge. Therefore, taking all the client needs into account, the group design is the best option to help make recycling easier and more accurate for everyone.

Conclusion and Recommendations

The group design features three main aspects: A scanner that provides information of the material being recycled, a recycling-based game, and an educative section for users to benefit from. This idea will be presented to the client, in exchange for feedback for any changes to be made before finalizing the design.