RecyClic

Team B03

Deliverable D – Conceptual Design

Engineering Design – GNG 1103

Team Members

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Introduction

The group wishes to create an application which harnesses AR technology to aid people in sorting out garbage and recycling into the proper bins. The application will take the form of an app on a mobile device. This deliverable will have the following conceptual designs:

- Group Conceptual Design
- James' Design
- Patrick's Design
- Moyin's Design
- Gabrielle's Design
- Franck's Design
- Chelsea's Design

The group design is the best overall design yet as it is based off all the group members conceptual designs.

Group Conceptual Design

To make this conceptual design, each member of the group contributed different idea proposals to generate a collective group design. Brief descriptions of app functionalities as well as core features are included in Figure 1. through Figure 4. Concerning Figure 1., this design depicts the application's main screen. Using AR technology, the application will scan objects while utilizing the device's camera to capture data such as the object's shape and color. By means of an algorithm, the app will then provide relevant information on how and where to recycle these items. Regarding Figure 2., the concept is similar to that of Figure 1., however also captures high-resolution texture data on real-world objects. Figure 3. and Figure 5. propose the use of an automatic sorting bin. While figure 3. depicts a machine used in public areas that will guide users on how to dispose their waste, figure 5. shows a machine that will simply do all the work of sorting the waste as long as individuals provide them.

James' Design

James' idea is focused on the functional side of the app. As stated in previous deliverables the goal is to create an app that can use AR technology to differentiate between several types of recycling and trash. To do this, there are a few components that need to be put in place.

The first component is a scanner of some sort. For this case we are going to use the camera on modern mobile phones (iOS and Android) Figure 1. From this scanner we will need a few things. The first is the ability to detect an object. From the detected object we would need to be able to tell the shape of the object as well as its colour.

From this information there would need to be an algorithm which can sort out objects into their respective recycling categories based of the shape and colour of the object.

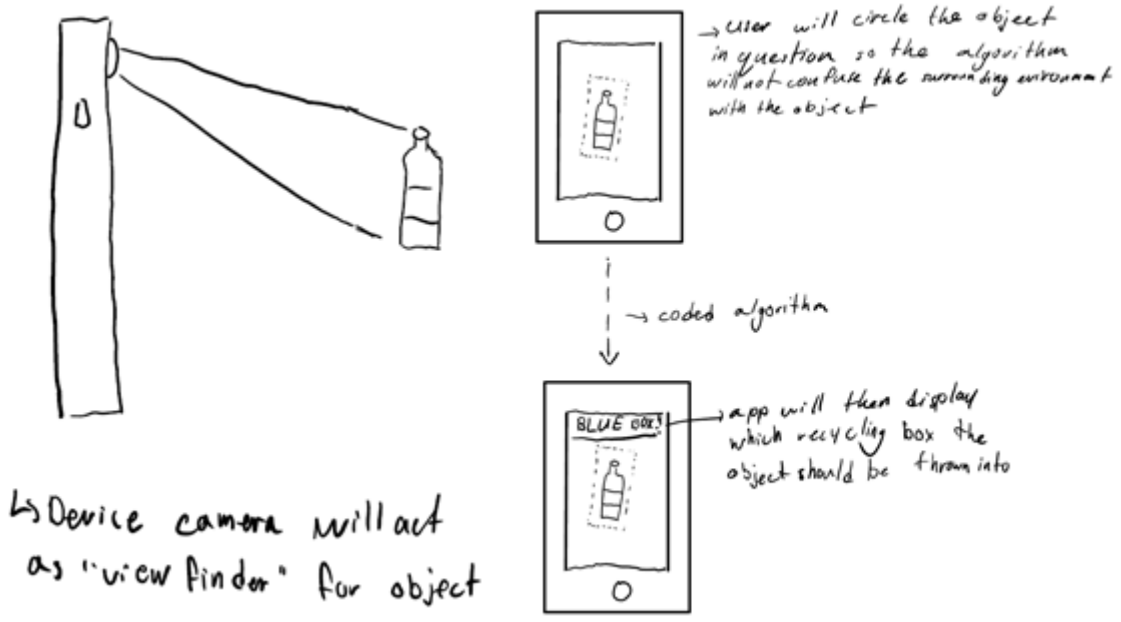


Figure 1. James' Idea

Patrick's Design

Patrick's first idea would involve a scanning mechanism. This scanner would be included in the application and would be able to be used through the phone's or device's camera. The scanner would be able to differentiate between recyclable items by recognizing its color. By recognizing the colour, the app would determine how the item should be disposed, for example as to whether the item was plastic or cardboard. The app would then notify the user as to how to dispose of the recyclable item.

Patrick's second idea would be very similar to his first. The only difference is that instead of the application scanning for color, it would rather scan for texture. In this way, it would be able to differentiate between the textures of plastic, cardboard, and other recyclable items.

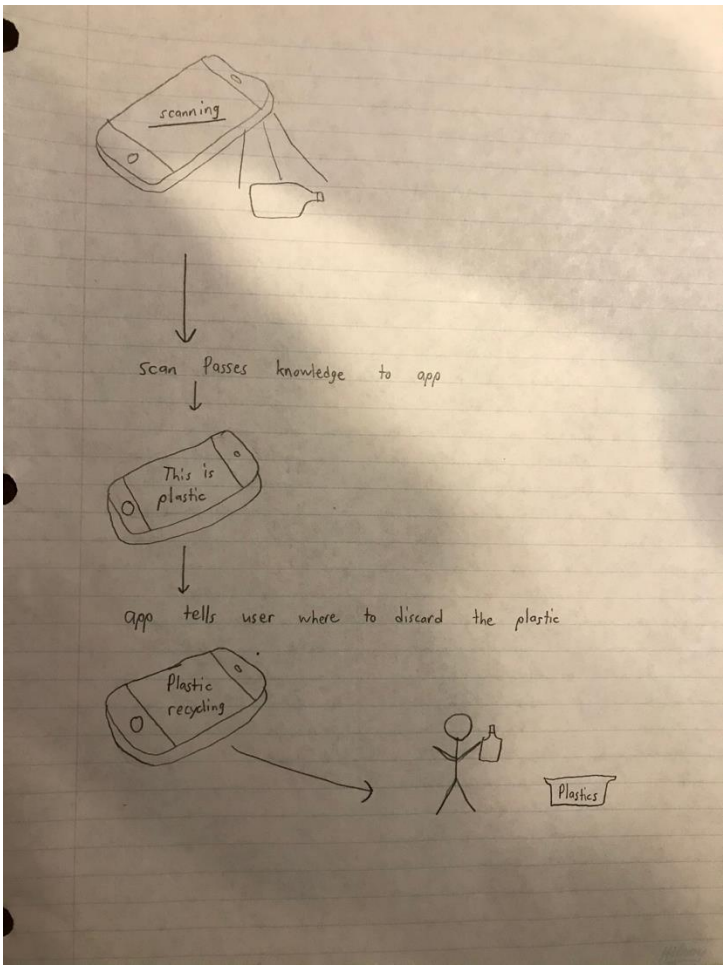
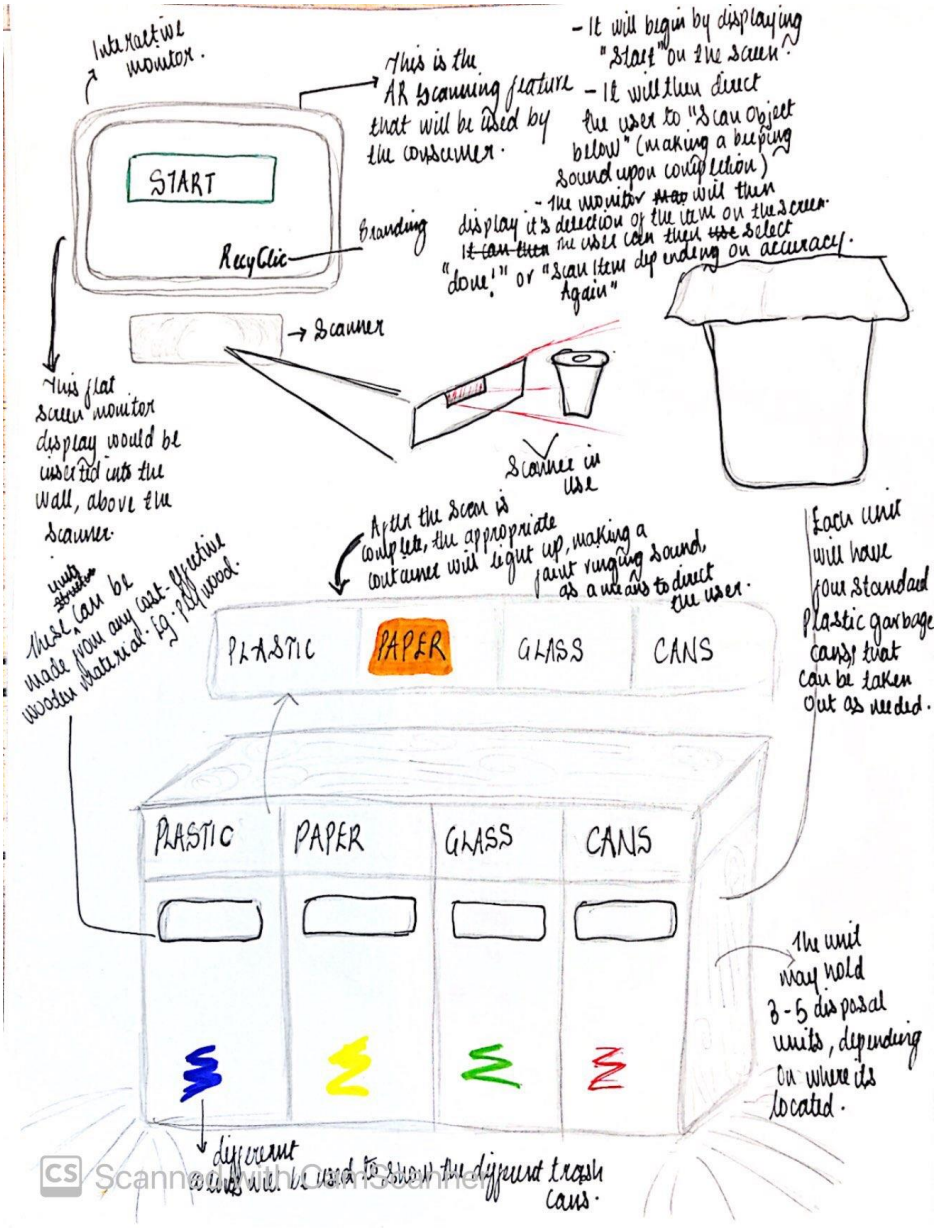


Figure 2. Patrick's Idea

Moyin's Design

Moyin's idea deviates from the standard approach of a mobile app; however, it also incorporates AR technology using a scanning feature that would be designed to detect the material of the object. This design will involve the use of an automated mechanical system for garbage units in commercial areas as well as residential accommodations. The system essentially uses an interactive scanning feature to identify the material of the object based on it's; color, density and shape. It then highlights/indicates the respective garbage container that must be utilized for that object. Hence, the user is using very minimal effort for a system that enables them to correctly organize their waste.



-Figure 3. Moyin's Idea

Gabrielle's Design

Gabrielle's design expands on flexibility and user engagement. New features (added to the above) include a game and a news tab. The former to visualize recycling achievements, while the latter for recent and relevant developments in the recycling industry. Also, the settings allow the user to customize their initialization, and therefore what shows up on starting the app.

The concept drawings were done using Miro (Miro | Online Whiteboard for Visual Collaboration; Link).

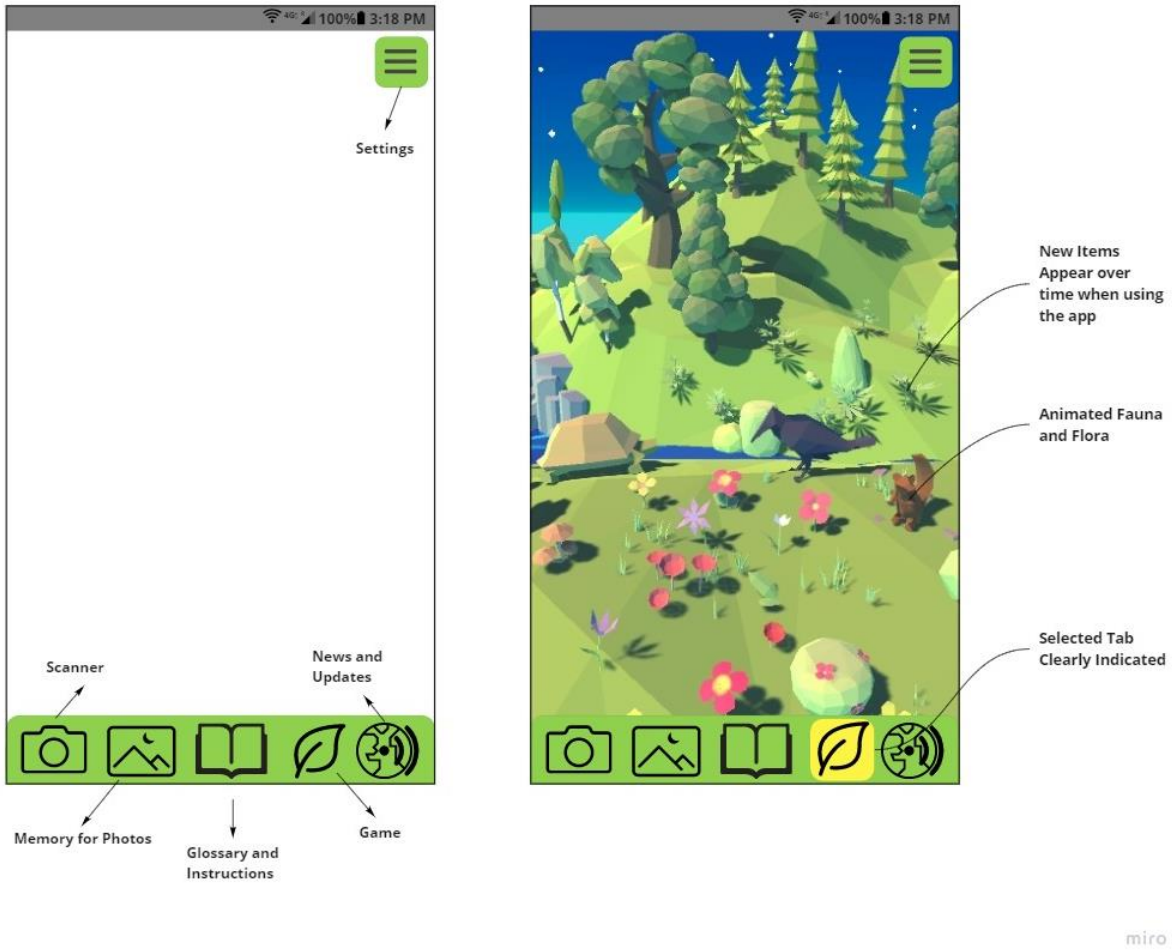


Figure 4. Gabrielle's Idea

Franck's Design

Franck's idea is to develop an automatic bin that will sort items thrown by individuals into two; either recyclable or not.

With the use of different sensors like a weight, metal and glass sensor, the material item would be identified. The automatic bin has a microcontroller that will analyze the inputs from the

different sensors and decide on whether the item is recyclable or not. Two storage (output bin) will collect the item at the end.

This idea can be furthered by using other LDR and lasers that will determine if the object is transparent, translucent, etc.

A hand sketch is provided below to illustrate Franck's idea.

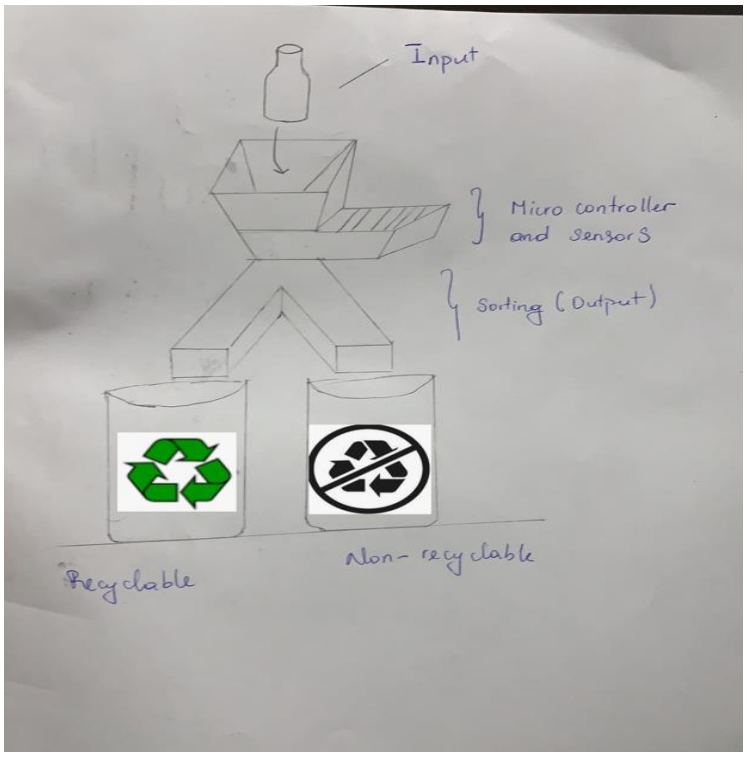


Figure 5. Franck's Idea

Chelsea's Design

Chelsea's idea entails an application that will make use of a device's camera and smartphone sensors to optically scan a real-world object. Having captured features such as color, shape and material texture, the app is designed to direct the user to the correct recycling bin. Provided also is additional information on the object's recycling guidelines for educational purposes. This will be done by outputting a list of online resources that the user can consult as his/her discretion. Using the smartphone's location information, the app will also display nearby recycling centers to offer the user profitable and accessible recycling options.

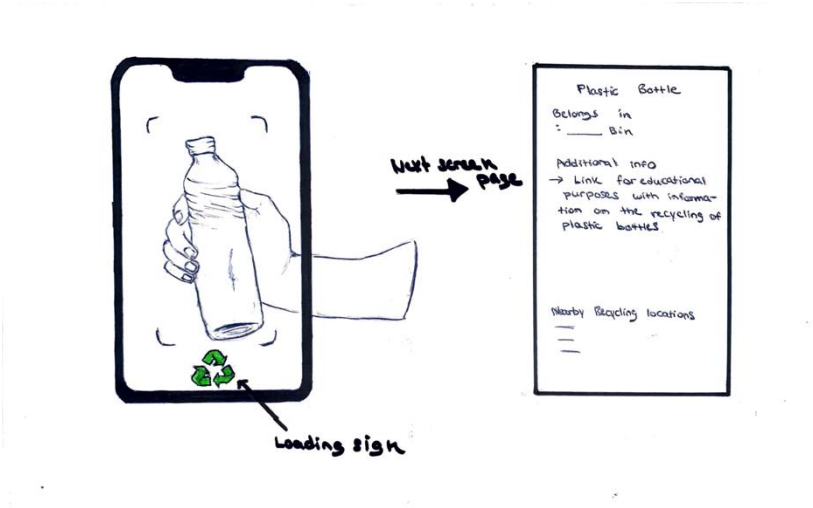


Figure 6. Chelsea's Idea

Conclusion

After a period of brainstorming, our team was able to establish a conceptual design of our solution, by gathering important features in each individual design and using them to develop an effective design. The design mainly incorporates the features presented in Figures; 1, 2, 4 and 6, as they propose the concept of a mobile app as it enables functionality across a larger scale. However, the interactivity and Usage of AR proposed in ‘Figure 3’, as well as the ability to sort out and categorize waste in both ‘Figure 3’ and ‘Figure 4’ is implemented as a main purpose of the conceptual design.

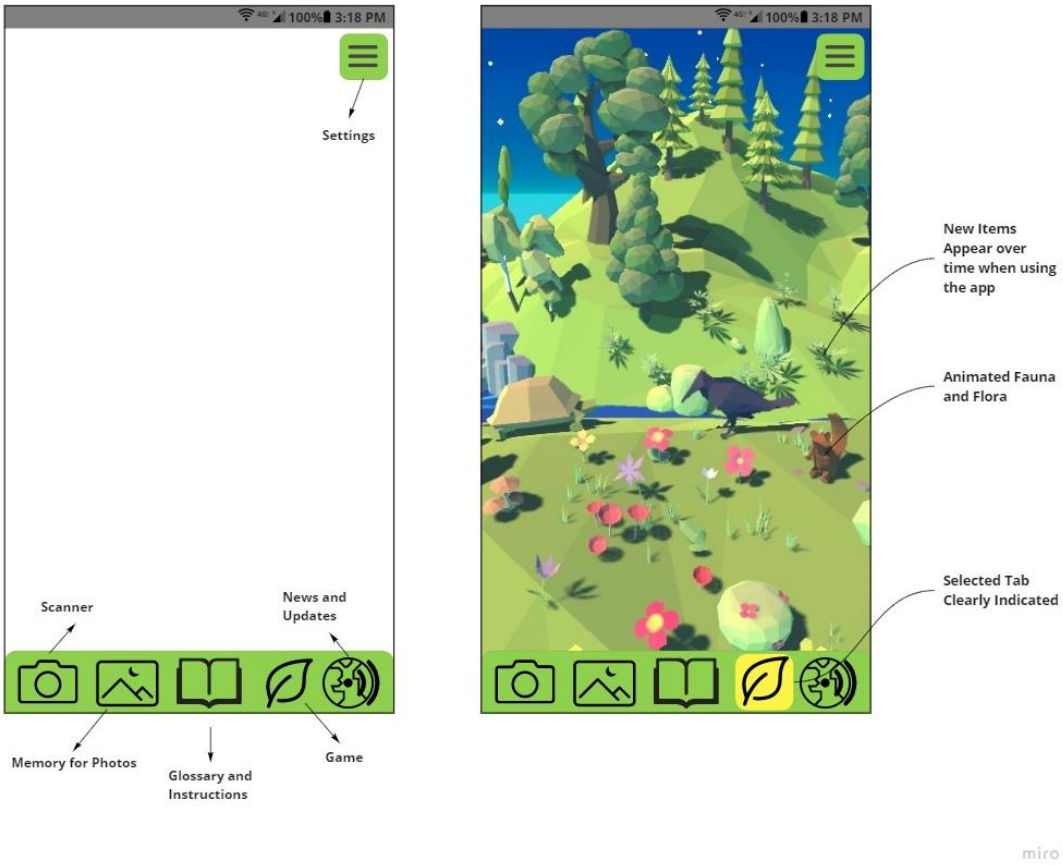


Figure 7: General User Interface (Left) and Game Element (Right)

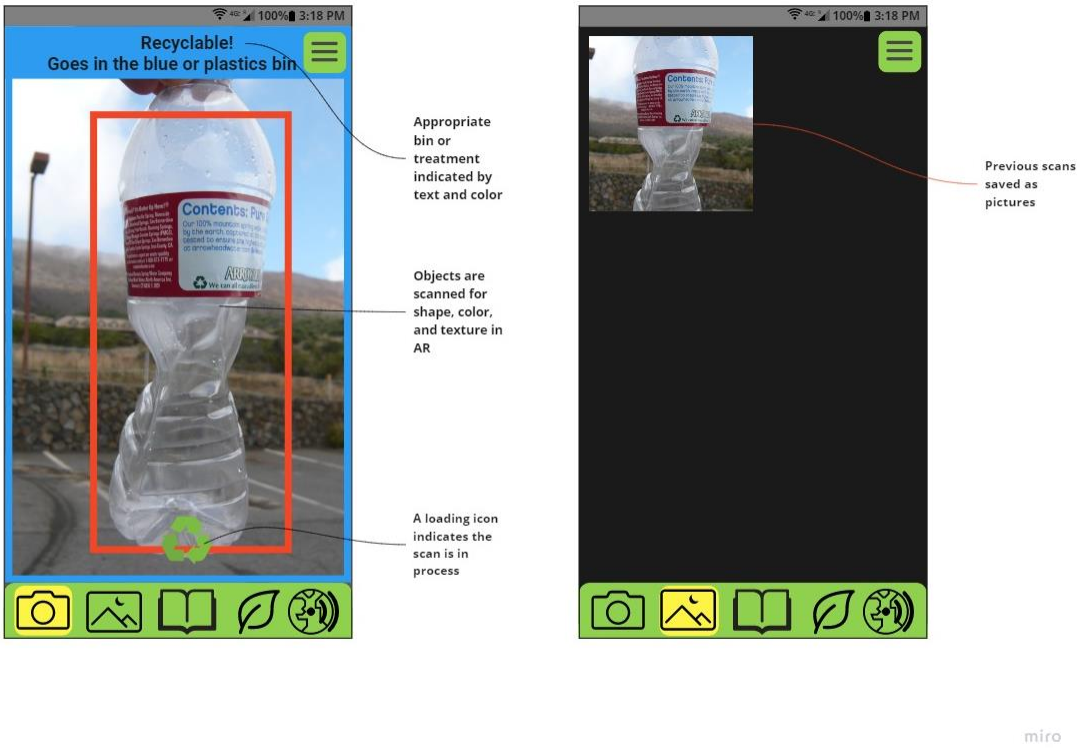


Figure 8: Scan Element (Left) and Image Save Feature (Right)

Note. The bottle picture is Public Domain: File:Plastic bottle at 9000 feet, sealed at 14000 feet.png - Wikimedia Commons.

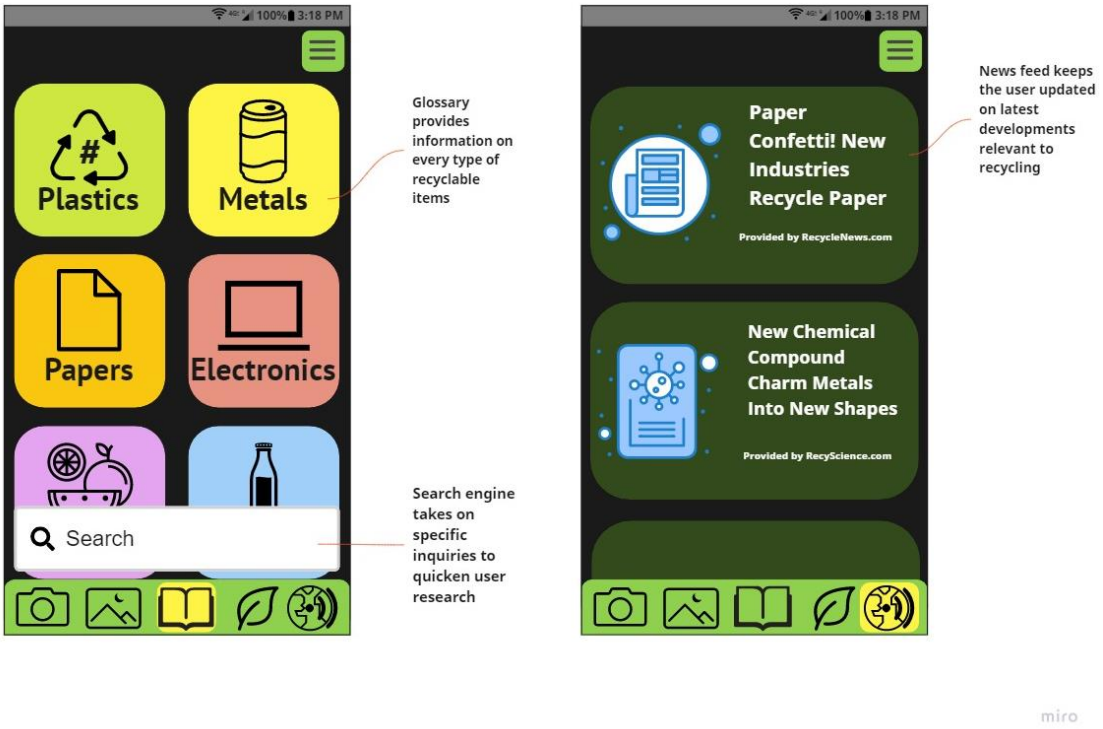


Figure 9: Glossary Feature (Left) with Search Bar and News Feed Element (Right)

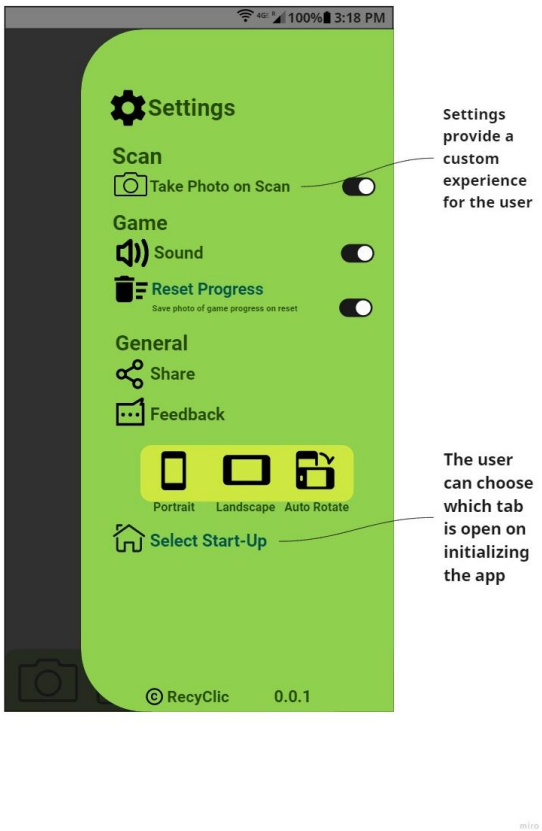


Figure 10: App Settings

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(2) Dev, B. (2018). Automatic waste Segregation using image processing and machine learning. *International Journal for Research in Applied Science and Engineering Technology*, *6*(5), 2617-2618. doi:10.22214/ijraset.2018.5428

(3) How to create model targets from 3d scans. (n.d.). Retrieved February 22, 2021, from https://library.vuforia.com/articles/Solution/how-to-create-model-targets-from-3d-scans.html

(4) Photograph. (2009, July 2). In Wikipedia. Retrieved February 21, 2021, from File:Plastic bottle at 9000 feet, sealed at 14000 feet.png - Wikimedia Commons