GNG 1103 Project Deliverable F

Universal Recycling Sorting

Prototype 1, Feedback, and Prototype Testing

Submitted by

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1. Introduction

The project of “Waste Management” was a project assigned to the teams by the client Mitch Bouchard. Mitch Bouchard is part of a family business in the field of mechanical part supply. This project has a goal of improving the quality of recyclables and decreasing waste in landfills by creating a system to assist people in sorting their recyclables properly. Though many individuals believe that recycling is enough to make a change in the world this is not the case when looked at on a large scale. Many recyclables are missorted and end up in landfills and/or shipped overseas to countries that have more room for landfills than Canada does. In fact, many people do not know how to recycle and opt for throwing everything into the garbage instead resulting in further pollution in our environment. Creating a product to help people learn and understand how to sort their recyclables and garbage easily could help in the big picture of managing and reducing the amount of waste on the planet.

Previously the team was tasked with identifying and developing the client’s needs and wants, the problem statement, a list of metrics and some benchmarking of similar products on the market. The client’s needs were identified during the client meeting in the form of statements, these were then used to develop a list of needs and wants for the product (user friendly, cost effective, determines eligibility of items to be recycled, determines items respected disposal location and that the product is versatile and can be used by a wide variety of people) the need and want statements would guide the team in creating a product that would meet the client’s expectations. From these needs and want statements a problem statement could be developed: A need exists for people to reduce waste in landfills by creating a user friendly, cost-effective product that helps customers and users to recycle correctly and efficiently. Once the problem statement was defined metrics were determined to express the client’s needs in the form of attributes that are measurable. Benchmarking was done to explore other products on the market that may meet the client’s needs and wants then target specifications and determined a set of design criteria were determined. Then a brainstorming session was held to identify the main subsystems and concepts for them, a final design idea was also determined. Finally, The prototyping and testing phases, analysis of the systems critical components, a detailed design of the system as well as the bill of materials (BOM).

This report has the focus on reporting on the development creation and testing of the first prototype. A stopping criteria was also defined and an analysis of the feedback from the testing is also included.

2. Analysis of Critical Subsystems

The main page of the app has three buttons, each button will take you to its corresponding function. The three buttons are Scan, Calendar, and Points.

The Scan button will take the user to the camera and they will take a picture of the item they want to scan. Under the Scan code we will integrate tensor flow into it in order to determine the material that we are scanning.

The Calendar button will take the user to a calendar that users can input their respected garbage and recycling collection days. At the moment, the calendar function does not work it will be a focus for a later prototype.

The Points button will take the user to a page where they can see and track how many points, they have earned by recycling so far. The user can also view and win prizes on this page.

We chose a basic color scheme to go with the theme of recycling which is green/blueish green. The color scheme and general appearance of the app will change throughout the different prototypes.

3. Prototype Development

The prototype is built using HTML, CSS, JavaScript. TensorFlow is imported and used to recognize the object. 2 different directories —Calendar and Points — are available and can be reached by clicking on the Navigation Bar buttons. System work with a Conventional Neural Network (CNN). It compares the edges, the colour of the objects within its object library. The main directory is “Scan”, which is also available on the navigation bar. When clicked, the website reaches the user’s devices webcam.

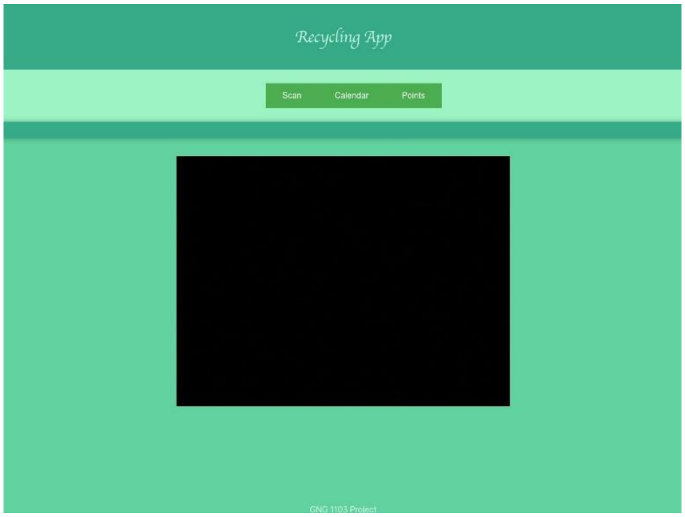


Figure 1: Scan route of the website. Accesses the camera of the device. It can be accessed by either adding /Scan to the URL or by basically clicking to Scan button

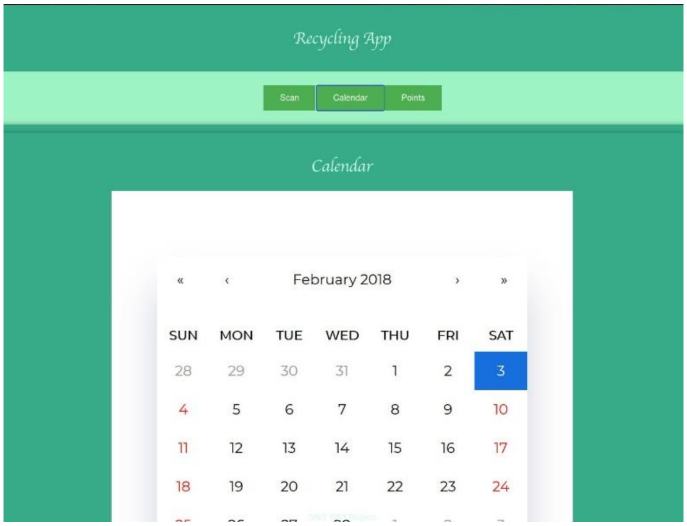
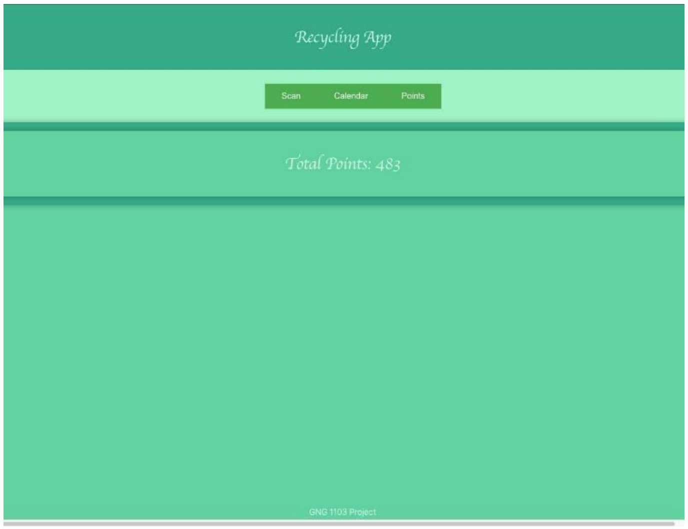


Figure 2: Calendar route of the website. It can be accessed by either adding /Calendar to the URL or by basically clicking to Calendar button.



Total Points: 483

Figure3: Points route of the website. Shows total points of the user. It can be accessed by either adding /Points to the URL or by basically clicking to Points button

4. Prototype Testing

Prototype testing is done to ensure that the prototype fulfills the function that it is created to accomplish. This is done in order to ensure that the product will respond to the problem statement and meet the client's needs and wants. To ensure accurate testing a set of stopping criteria were defined, both alpha and beta testing are preformed, and the results are analyzed.

4.1. Stopping Criteria

The stopping criteria is criteria that must be met in order to stop iterating on the prototype development and testing. This set of criteria will be set based on the critical assumptions and features being tested as well as on the client's needs and wants in order to ensure that all important factors and requirements of this prototype are being met.

Table 1: Stopping criteria and assumptions or needs being tested

Assumption or need being tested	Stopping Criteria "Unit"	Stopping Criteria	
The program can be used to create an application and open the camera	Binary (yes/no)	Yes	
The application is user-friendly	Qualitative (scale of 1-10, 10 being perfect and 1 being terrible)	Acceptable value	Ideal Value
		7	10

The critical assumption being tested in this prototype was that the program could be used to create an application and that it could open a camera. This was a critical assumption because if the camera cannot open objects cannot be scanned by the user rendering the concept useless. The stopping criteria for the critical assumption was a binary yes/no criteria, if the program can be used for the intended purpose (Yes) then this criterion is met.

The client needs and wants to be tested in the first prototype was the user-friendliness of the app interface. This would entail testing the ease to navigate and understand the main menus of the application. The stopping criteria for the client needs and wants will be determined by the target specifications. As this need had a high importance the stopping criteria must reflect this. The stopping criteria for this component was therefore a ranking from 1-10 (for testing purposes), with 10 being perfect and 1 being terrible, where the acceptable value is 7 and the ideal value (if time permitted for more iterations) for the stopping criteria would be 10.

4.2. Testing Analysis and Results

Our App currently only has 1 main working feature as of this time which is the camera. The main feature does work, and it uses the phone camera to actually see the pictures. Also, the app is really user friendly and is easy to navigate all the feature. When the user opens the app all the features are displayed Infront of the user and they can choose on which feature they would like to use.

4.3. Feedback from Testing on Prototype

Some beta testing was performed to test the users experience with the app interface. This was done by asking friends and family members to look at the interface and test the critical assumptions. Their feedback is outlined below:

Table 2: Feedback from Beta Testing of the prototype:

Names	Rating out of 10	Feedback	Recommend to a friendly (yes or no)
Joe	8	The software works fast, and It can open the camera. I really like the app.	yes
April	6	The camera is a bit slow, and the quality of the camera seems deteriorated	no
Mark	9	Perfect app for the current stage in the app development I think this app will be very successful	yes
Linsay	7	The app looks very nice and its relatively quick in transitioning from screens.	yes
Emma	8	Overall, the app is very nice, and it successfully opens the camera, I had a good user experience.	yes

Overall, the interface was well received, the users performing the beta testing all gave a good ranking and on average it met the stopping criteria. There were a few minor issues outlined with the camera portion, but this could also be a result of the user's camera.

During the alpha testing within the group there were no errors experienced with the final version of the prototype and all the group members were satisfied with the outcome of the prototype and the testing.

5. Conclusion

After making a detailed design of the app we started our first prototype. For the first prototype we wanted to set up our app interface as well as the buttons to switch in between scenes so that we have a basic outline of the app. Once our prototype was made, we tested our prototype and received feedback from our peers about the app. For the next prototype we will integrate our feedback and ensure it meets all their concerns.