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A Mobile Application to Promote the Idea of Recycling

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Abstract: *Technology is changing the way we interact with the world; it has revolutionized the way people purchase commodities by eliminating the need of physically visiting shops and making it possible to do the same without having to leave their homes. This paper aims to explore the idea of reapplying the same concept in order to transform the way how people dispose their goods and to promote better ways of the disposal of recyclable waste for individuals. The proposed application employs Image Processing using Convolutional Neural Networks (CNN) and Global Positioning System (GPS) capabilities of mobile devices in order to create a link between recycling centers and users. Furthermore, The application makes it possible for users to book pickups and provides the users with monetary compensation for their goods using Image Processing to identify the material, estimate the weight and relay the offer made by nearby recycling center with the pickup date and time.*

Key Word: *Image Processing; Convolutional Neural Networks (CNN); Global Positioning System (GPS)*

I.INTRODUCTION

Recycling can be defined as the process of converting waste products into products of practical use and value. The nation generates approximately 62 MTs (million tons) of waste with an annual growth rate of 4%. It is also found that India generates 70 million metrics of municipal solid wastes. Out of it, only 20% is recycled and the rest ends up in landfills and oceans affecting humans, and marine life, along with destroying the environment. This necessitates the enforcement of a solid waste management system.

According to the Un-Plastic Collective (UPC) study, India produces 9.46 million tonnes of plastic waste per year, with 40% of it remaining uncollected. India also generates about two million tonnes of e-waste annually, which makes plastics and electronics two key components of waste generation. However, these waste generation components, have a huge potential to be capitalized into channels of high revenue generation. In 2020, more than 80 billion worth of paper waste and paper pulp was imported to India. On the other hand, only 20% of paper waste is being collected, segregated, and recycled while the rest goes to landfills. The same applies to glass and metal waste.

Waste generation is on a constant incline based on the world's population and economic growth. This has significantly affected human health, lifespan, and ecology. The overuse of limited natural resources, and the harming of the Earth in the process of mineral extraction have far exceeded limits. The recycling rate are continuously increasing; however, studies indicate that humans will be creating more waste than ever before. Some difficulties associated with recycling include the significant expense involved during the separation of recyclable waste from non-disposable waste. Machine learning is the utilization of Artificial Intelligence (AI) that provides a framework to take as a structural improvement of the fact without being programmed. Machine learning concentrates on the advancement of programs that can obtain the information and use it to learn to make future decisions without human intervention. [Erkinay Ozdemir, et al., 2021] The classification and separation of materials in a mixed recycling application in machine learning is a division of AI that is playing an important role for better segregation of waste.

The application "E-Recycling" provides following services:

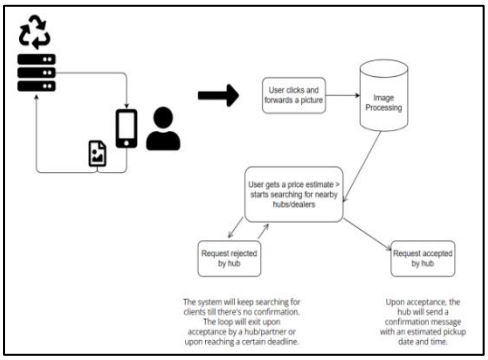
i. Allows the users to locate and send pickup request to nearby recycling centers using Google's Maps SDK for Android.
ii. Allows the users to upload images and use Convolutional Neural Networking to implement an algorithm which will detect and classify the different materials in the images and their approximate weight (This data will be shared with recycling centers who will send in a price estimate, and pickup date and time).

II.MATERIAL AND METHODS

Application Details:
Application Name: E-Recycling
Programming Language(s) Used: Java, Python, HTML5
Database Specification: MySQL
Platform: Android

Hardware Requirements: Smartphone/ Internet Connection
Supplementary Software: None
Price: Free

Working:



The application allows its user to upload image(s) of items to be recycled and determines the material and subsequently whether or not it can be recycled or not and the price it may fetch. This is achieved using a neural network model trained with Tensor Flow Serving.

Tensor Flow is a machine learning system, developed at Google, that operates at large scale. Tensor Flow uses dataflow graphs to represent computation, shared state, and the operations that change that state. [Martin Abadi et al., 2016]. Tensor Flow Keras will be used to build and train a neural network model that will classify the images based on the material and calculate the approximate weight and price for them. This data will be shared with the recycling centers nearby, which will either decline the request or accept and submit an approximate date and time for pickup. The system will confirm the pickup from the center with the lowest waiting time and notify the user.

The proposed application, "E-Recycle" is designed to make it easy and convenient for individuals to recycle their household goods from the comfort of their own home. By using the application, users can schedule pickups for their recyclables, track the progress of their pickups, and receive updates on the status of their recycling efforts.

The application will provide users with a simple and intuitive interface that allows them to schedule pickups for their recyclables, detect the types of recyclables they want to dispose of, and track the progress of their pickups. Users will be able to select from a range of pickup options, including same-day pickup and scheduled pickups, and will receive notifications when their pickups are scheduled and when they are completed.

The application will also provide users with information on the types of materials that can be recycled, as well as tips and best practices for recycling at home. Users will be able to view their recycling history and track their progress over time, and will be able to share their recycling efforts with friends and family through social media.

III.RESULT

The E-Recycle application has the potential to significantly increase the convenience and accessibility of recycling for individuals. By providing users with a simple and intuitive way to recycle from home, the application can help to increase recycling rates and reduce the environmental impact of waste.

The application will also provide users with valuable information on the environmental benefits of recycling and will offer tips and best practices for recycling at home. This can help to educate and engage users in the recycling process and can encourage them to adopt more sustainable behaviors.

If recycling were made online, it could potentially increase the convenience and accessibility of recycling for individuals and businesses. Online recycling platforms could allow users to schedule pickups for their recyclables, track the progress of their pickups, and receive updates on the status of their recycling efforts. This could make it easier for people to recycle, particularly for those who live in areas with limited access to recycling facilities or who have difficulty transporting their recyclables.

Online recycling platforms could also make it easier for businesses to recycle, as they could schedule pickups and track their recycling efforts more easily. This could help businesses to reduce their environmental impact and meet their sustainability goals.

There are also potential drawbacks to online recycling. One concern is that online recycling platforms may not be accessible to everyone, particularly those who do not have access to the internet or who are not comfortable using online services. In order to ensure that online recycling is inclusive and accessible to all, it may be necessary to provide additional support and resources for those who may face barriers to using these platforms.

Another potential concern is the potential for fraud or misuse of online recycling platforms. In order to prevent abuse and ensure that recyclables are properly processed and disposed of, it may be necessary to implement strong security measures and oversight.

Overall, while online recycling could offer many benefits, it is important to consider the potential drawbacks and to ensure that these platforms are developed and implemented in a responsible and ethical manner.

IV.CONCLUSION

In conclusion, online recycling has the potential to increase the convenience and accessibility of recycling for individuals and businesses. By providing users with a simple and intuitive way to recycle from home or at work, online recycling platforms can help to increase recycling rates and reduce the environmental impact of waste.

However, there are also potential drawbacks to online recycling, including the potential for inaccessibility and fraud. In order to ensure that online recycling is inclusive and responsible, it will be important to consider these issues and to implement strong security measures and oversight.

Overall, online recycling has the potential to offer many benefits, but it is important to ensure that these platforms are developed and implemented in a responsible and ethical manner. By considering the potential impacts and challenges of online recycling, we can work to maximize the benefits and minimize the risks of this innovative approach to waste management.

The proposed online recycling application, "E-Recycle" has the potential to significantly increase the convenience and accessibility of recycling for individuals. By providing users with a simple and intuitive way to schedule pickups for their recyclables, track the progress of their pickups, and receive updates on the status of their recycling efforts, the application can help to increase recycling rates and reduce the environmental impact of waste.

In addition to increasing the convenience of recycling, the E-Recycle application has the potential to educate and engage users in the recycling process through the provision of information on the environmental benefits of recycling and tips and best practices for recycling at home. This can help to encourage more sustainable behaviors and can contribute to the overall sustainability of the community.

However, it is important to consider the potential drawbacks of the E-Recycle application, including the potential for inaccessibility and the need for strong security measures and oversight. By addressing these issues, the E-Recycle application can be developed and implemented in a responsible and ethical manner, ensuring that it has a positive impact on the environment and the community.

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