

A STEP TOWARDS SUSTAINABLE EARTH: FOOTPRINT CALCULATORS USING PYTHON AND ADOBE XD

¹Dr.N. Satheesh, ²Dr.G.Govinda Rajulu, ³ C.Yosepu

*Dept. of CSE
St. Martins Engineering College.
Hyderabad, India.*

ABSTRACT

Identification, calculation of plastic footprint using a calculator followed by self-assessment and an action plan on a planner enabling the user to reduce his/ her contribution towards plastic footprint on the earth is an idea proposed to reduce the ecological deficit on earth. Using a mobile application to create self-awareness and to sketch an action plan helps in cutting down the usage of plastic by an individual. This in turn leads to the collection of a database related to geographical zones that enables us to identify and categorize different zones into Green Plastic Usage Zone (Within ideal limits of plastic usage by the residents), Orange Plastic Usage Zone (on the threshold outside green zone) and Red Plastic Usage Zone (seriously high usage of plastic by the residents of the zone) thereby enabling governmental intervention under environmental experts' supervision toward conversion of all zones into GPUZs (Green Plastic Usage Zones). Furthermore, using data science tools to compare and contrast successive results in the trial conversions of zones helps in drafting and implementing environmental laws that refrain individuals from contributing consciously or unconsciously to ecological deficit. The entire idea is backed by thrives with technology at its heart moving from individual to community in the creation of a sustainable earth free from any deficit.

Keywords: Ecological Deficit; Plastic Footprint; Footprint calculator; Footprint Planner; Mobile App

1. INTRODUCTION:

Environmental pollution leading to adverse climate change is becoming so intense that the normal Environmental processes are being digressively affected. International Organizations such as the United Nations Organization (UNO) are now aiming toward a sustainable earth as evident in its agenda for Sustainable Developmental Goals (SDGs) 2030 [1]. Many environmentalists and Non-Governmental Organizations (NGOs) are taking up this as a global challenge. The earth has the capability of healing itself from these environmental hazards but with certain limitations. When we humans irretrievably contaminate the resources around us earth loses its capacity to heal itself which in turn has a negative impact on human survival. Therefore, we should have an action plan towards stepping up the sustainability of earth. **Footprint** is a method used to measure human demand on Natural capital [2]. Whenever, the Ecological Footprint of an area exceeds the bio-capacity, ecological deficit occurs [3]. Ecological deficit occurs only when the earth is not able to absorb waste and generate new resources. One of the main reasons for this is the usage of non-biodegradable materials such as Plastic. To avoid systematic failures in consumption, disposal and recycling of plastic, environmentalists came up with a standardized plastic footprint measurement tool. Python is a well-known programming language used for a myriad of purposes. This can be used to illustrate the idea of calculating plastic footprint caused by an individual. Development of a Mobile Application will help in regular tracking of the users' plastic Footprint as it is handy. Adobe XD can be used to develop a User – Interface (UI) to show how the mobile application works.

2. RELATED WORK:

Wilhelm Schickard invented the mechanical calculator in the year 1642 [4]. After many years, Blaise Pascal also invented an improvised mechanical calculator [5]. But then, electronic calculators surpassed mechanical calculators as they are more easy to use and are portable. They perform operations ranging from arithmetic to the more complex ones. While early 1960s witnessed the first electronic calculator, 1970s saw the devices that can be carried around in pockets emerge [6]. We observe interactive calculator programs such as dc and hoc on early UNIX, calculator functions in almost all Personal Digital Assistant (PDA) type devices [7]. Calculators represented an estimated 41% of the world's general-purpose hardware capacity to compute information in 1986 which diminished to less than 0.05% in 2007 [8].

On a bird's view we can conclude that an electronic calculator has a Power Source, Keypad, Display panel and a Processor chip. A printing calculator, in addition to a display panel, consists of a printing unit which prints results using ink onto a roll of paper. The contents of a processor chip are shown in the table 2.1 [9].

Table 2.1: Contents of a processor chip in an electronic calculator

Unit	Function
Scanning unit	When a calculator is powered on, it scans the keypad waiting to pick up an electric signal when a key is pressed

Encoder unit	Converts the numbers and functions into binary code
X register and Y register	They are number stores where numbers are stored temporarily while doing calculations. All numbers go into the X register first; the number in the X register is shown on the display.
Flag register	The function for the calculation is stored here until the calculator needs it
Permanent memory (ROM)	The instructions for in-built functions are stored here in binary form. These instructions are programs, stored permanently, and cannot be erased.
User memory (RAM)	The store where numbers can be stored by the user. User memory contents can be changed or erased by the user.
Arithmetic Logic Unit (ALU)	The ALU executes all Arithmetic and logic instructions, and provides the results in binary coded form.
Binary decoder unit	Converts binary code into decimal numbers which can be displayed on the display unit.

Having traced the path of the evolution of calculators used for arithmetic and other complex computations, we will move forward to comprehend and analyze the applications of the Plastic pollution footprint calculator. The plastic pollution footprint calculator helps us in estimating the total yearly consumption of plastic products in an area to analyze our past consumption [10]. This calculator primarily evaluates an individual's use of plastic items that are designed for a short-term usage and are scheduled to be discarded approximately within 30 days of the original purchase date [11]. In addition to these short-term usage items, user may also want to evaluate his/her usage and disposal of long-term usage items made of plastic such as consumer electronics, vehicles, furniture, construction material and clothing. The calculator does not address those items as these need to be addressed on a large scale from the industry end and not from the individual end [12].

3. METHODOLOGY

The Plastic Pollution footprint calculator will be made available as a mobile application. The mobile application aims to present an easy to use set of features to estimate the user's daily usage of plastic followed by an analysis of the usage as compared to acceptable standards. In addition to this, the Planner facility helps user in cutting down the usage of plastic to reach the acceptable standard zone. The mobile application functions on a back end programming written either in Java or a cross-platform programming language such as Kotlin. Nevertheless, for the current purpose of illustration, Python is used. Adobe Inc. developed and published Adobe XD which is a vector-based user experience design tool for web applications as well as mobile applications available for macOS and Windows . It is a prototyping tool specially made for interaction designers and has been used to illustrate the functioning of the mobile application's User Interface (UI).

3.1 Illustration of back-end programming of the Mobile Application:

The user must give his Personal Details such as his/ her name and location. He must enter his location which will be saved as a string data type. In the mobile application, we will have a widget on the application that enables the user to allow geo-tagging. Using file input/ output operations we can save the personal details and the location of the user into a text file. All the

plastic items that are required to calculate the plastic footprint calculator are divided into two charts. The former consists of plastic items that are being disposed on almost every day and the latter consists of items that are usually being disposed on a monthly basis. Figure 3.3.1 shows the division of parameters into the two charts.

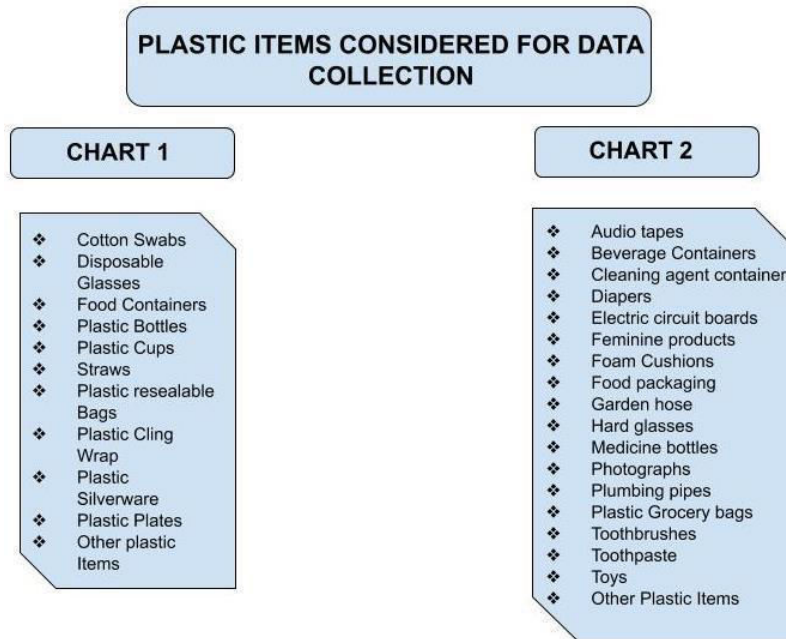


Figure 3.1.1: Division of Plastic items considered for Data collection

3.1.1 PLASTIC FOOTPRINT CALCULATOR:

The user has to supply the numeric input of the number of plastic items listed in Chart 1 of the figure 3.3.1 he uses on a daily basis. Consequently, he has to supply the number of plastic items mentioned in Chart 2 he uses on a monthly basis. After a few arithmetic operation, the application yields the Plastic Footprint of the user. Simultaneously, the plastic footprint of the user will be written into the text file where we have already written the personal details and the location of the user. It is essential to close the text file at the end of the program. After we run this program a few times, we can open the text file only to see the list of users who have run the program, their personal details, location and his/ her plastic footprint. The figure 3.1.2 shows the source code of the Plastic footprint Calculator.

Furthermore, there is an option to seek help from the technical team in case of any problems while using the app. In addition to this, the application also has options to give feedback and a user guide. The entire-user data will be saved into a secured database by the server.

4. RESULTS & DISCUSSION:

Current trend of human psychology is to use technology enabled solutions for any grievance big or small. It is with this observation that the current idea of Plastic footprint calculator and Planner has been evolved. While the calculator facilitates objective technology-driven introspection of an individual's usage of plastic thereby creating an awareness regarding the immediate need to cut down its usage; the planner takes the user forward in effective, practical and feasible plan to reduce the usage of plastic bringing down individual contribution to plastic footprint integrating the 4Rs into it.

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The plastic footprint calculator yields it's value as : 5141  
>>>
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Figure 4.1: Output of the Plastic footprint calculator for a user

The user interface created using Adobe XD is simple, attractive and easy to navigate.



Figure 4.2: User Interface of the Mobile Application

- ❖ Image 1 shows the UI for the load_page
- ❖ Image 2 shows the UI for the Login page
- ❖ Image 3 shows the UI for the Homepage
- ❖ Image 4 shows the UI for Plastic Footprint Planner

5. CONCLUSION & FUTURE SCOPE:

The data gathered as each user fills in different fields under Plastic footprint calculator as well as planner in the mobile application will be gathered and collated under a centralized database. The data so gathered is filtered and segregated based on geographical zones with an assessment report on the particular zone being a Green Plastic Usage Zone (Within ideal limits of plastic usage by the residents), Orange Plastic Usage Zone (on the threshold outside green zone) and Red Plastic Usage Zone (seriously high usage of plastic by the residents of the zone).

The database so gathered will be forwarded to the local municipal authorities following which moderation with environmentalists and experts from industry to conclude on an action plan to deal with conversion of a OPUZs (Orange Plastic Usage Zones) and RPUZs (Red Plastic Usage Zones) into GPUZs (Green Plastic Usage Zones) will be taken up.

Successive compare and contrast studies of the success rate in the implementation of the above Conversion Action Plan (CAP) will be taken up in the technology interface of data science. The results so collated would be put up to the environmental wing of Legal Cell, Government of India to propose and draft environmental protection laws – Penal Codes to be executed in the country after dew approval from concerned authorities.



Figure 4.1: Geo-tagging

REFERENCES:

- [1] Sustainable Developmental Goals: <https://sustainabledevelopment.un.org/?menu=1300>
- [2] Ecological Footprint: <https://www.footprintnetwork.org/our-work/ecological-footprint/>
- [3] Ecological Footprint: <https://www.footprintnetwork.org/our-work/ecological-footprint/>
- [4] History of Calculators: <http://calculatorhistory.net/>
- [5] Calculator – Wikipedia: <https://en.wikipedia.org/wiki/Calculator>
- [6] Calculator – Wikipedia: <https://en.wikipedia.org/wiki/Calculator>
- [7] Calculator – Wikipedia: <https://en.wikipedia.org/wiki/Calculator>
- [8] “The World’s Technological Capacity to Store, Communicate, and Compute Information” Archived 2013-07-27 at the Wayback Machine, Martin Hilbert and Priscila López

(2011), *Science*, 332(6025), 60–65; see also "free access to the study" Archived 2016-04-14 at the Wayback Machine

[9] John Lewis, *The Pocket Calculator Book*. (London: Usborne, 1982)

[10] Plastic Pollution Primer and Action Toolkit – A book by Earth Day Network

[11] Plastic Pollution Primer and Action Toolkit – A book by Earth Day Network

[12] Plastic Pollution Primer and Action Toolkit – A book by Earth Day Network

[13] Adobe XD – Wikipedia https://en.wikipedia.org/wiki/Adobe_XD