Eco Footprint - Understanding my impact

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Introduction
Nowadays, the environment is one of the most talked topics in the entire world. Sea levels are rising, there's tons of plastic in the ocean, the world is getting warmer, levels of CO2 emissions are increasing every day, among many other problems that ultimately lead to a degrading state of the world. Cities have a major ecological impact [6] and today's society still ignore these problems that won't be paid in their generation. Green habits are only respected by unrepresented small groups of people that try to keep the longevity of this planet. We believe people can do better without radical changes in their lives, if they make the small effort of paying attention to some of their behaviours and actions that are done in a daily basis. If people could, for instance, figure out the amount of water wasted during their morning shower, their usage of unnecessary lightning, or even the food that is wasted and put on the trash, people would be more aware of how their ecological behaviour and change it for better. Our ultimate goal is to make use of technology to bring people to the attention that they can do better, not only to the environment but also to their wallets.

Proposed solution

Approach

It's all about the garbage can

To calculate (and, consequently, improve) the ecological footprint of a user or a household, many variables could be tracked. Water, electricity, gas, natural gas, driving, waste, just to name a few [2]. For our project, our group decided to focus on the garbage that is produced in households. We believe that the waste that we produce is one crucial point of world destabilisation; starting with the plastic that we consume leads up in the oceans, the food we waste, the general rubbish that ends up in polluted landfills - all of this starts in our garbage can. Inspired by other projects [3, 4], We propose sensors installed on the lids of the garbage and recycle bins. Those sensors combined with the size of the garbage bin can estimate the total volume of produced waste. From the values collected from the garbage and recycle bins, we intend to calculate a metric that shows the user's garbage footprint.

Self-awareness & Peer pressure

Our solution to show that metric to the user is based on the ambient orb which can deliver information that is "simple, continuous, easy to understand" [7]. A simple LED colored light, placed in a strategic position (such as the kitchen) is more than enough for a person to understand how good or bad is their ecological footprint. The light would be accordingly adjusted: red if a user is doing little for the environment (in our case, if the amount of garbage produced is above the average), green if the user is fully committed (if the amount of waste is below average), or yellow (if it's somewhere in between). This ambient light can increase self-awareness by delivering important information without being intrusive. We also envision a portable ambient light that can also help spreading awareness and encourage a positive change in behavior, being highly transparent by exposing data to a community and studying its effect on motivation [7].

Mobile Application

We want to develop an App that should not only allow the interaction between the user and the system, but also to give the user an in-depth analysis of their ecological footprint, so they can act upon their behaviours.

Contributions

Our main goal is to give users a better insight of how good or bad are their ecological behaviours and promote group discussion as motivation for behavioral changes [1, 5, 8]. Our project makes the following contributions:

1. An investigation of how users behave while dealing with a technological device that portrays social aspects such as peer pressure and self awareness
2. A system that conveys useful and accessible information to every user, even those that are not tech savvy
3. Research into how technology can lead to changing people's ecological day to day habits, and how that change can influence our world for good

Materials

In order to put in practice and assemble our idea, the following materials will be required:

- **Garbage can (3 to 4 units)** - each garbage can has built-in sensors that determine the amount of volume present; these values are then sent through Wi-Fi
  - 2x AA batteries
  - 1x Battery holder case

  - 1x HC - SR04 Ultrasonic Distance Sensor
  - 1x Jumper Wires
  - 1x Arduino Board
  - 1x Feather HUZZAH w/ ESP8266 WiFi
  - 1x Garbage container with a lid
- **Light bulb (indoor use)** - the light bulb acts as an 'ambient orb', and it is placed in a convenient place to the user to grant self-awareness
  - 1x Xiaomi Mi LED Smart Bulb Yeelight Wi-Fi
  - 1x Small lamp - IKEA's Fado
- **Portable LED (outdoor use)** - when not in home, users can track their eco footprint on the go with a portable LED that can be attached to a keychain or the back of a smartphone
  - 1x Adafruit Mini Skinny NeoPixel Digital RGB LED Strip - 60 LED/m (1m)
  - 1x Lithium Ion Polymer Battery - 3.7v 150mAh
  - 1x Adafruit nRF52840 Feather or equivalent
  - 1x Breadboard-friendly SPDT Slide Switch
  - 1x JST-PH Battery Extension Cable - 500mm

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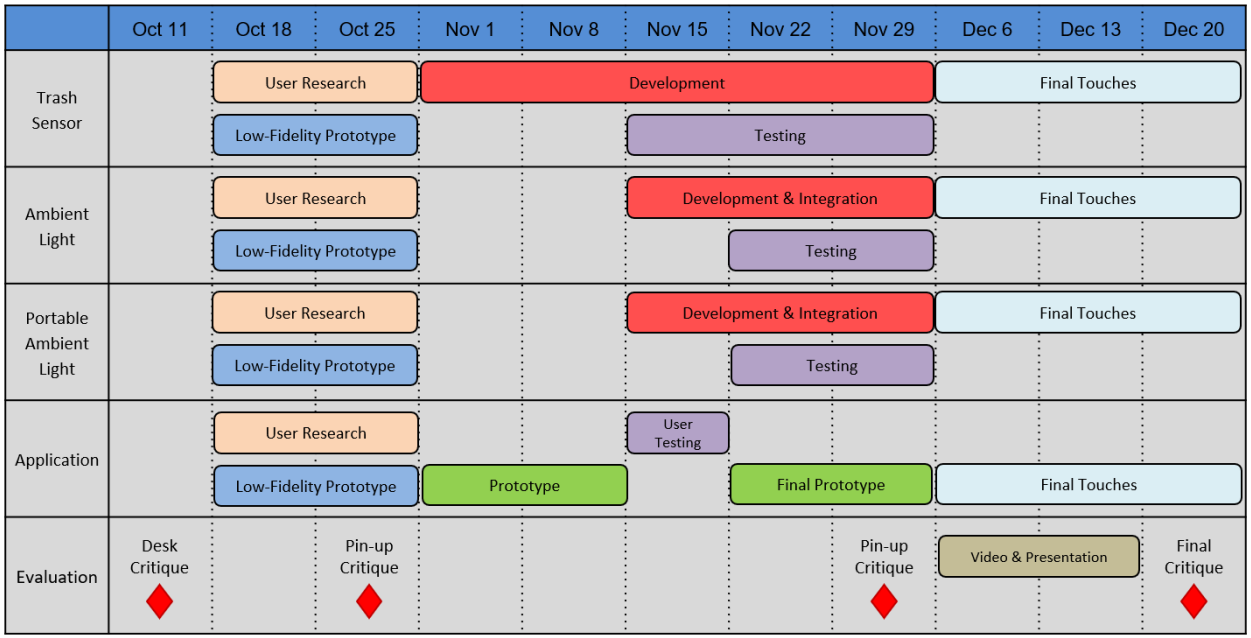

Figura 1: Work schedule.