Ethical and Environmental Analysis

Year: 2022 Semester: Spring Team: 08 Project: Gimbal Vehicle

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Assignment Evaluation:

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| **Item** | **Score (0-5)** | **Weight** | **Points** | **Notes** |
| **Assignment-Specific Items** | | | | |
| **Environmental Impact** |  | x6 |  |  |
| **Ethical Challenges** |  | x6 |  |  |
| **Writing-Specific Items** | | | | |
| **Spelling and Grammar** |  | x2 |  |  |
| **Formatting and Citations** |  | x1 |  |  |
| **Figures and Graphs** |  | x2 |  |  |
| **Technical Writing Style** |  | x3 |  |  |
| **Total Score** |  | | |  |

5: Excellent 4: Good 3: Acceptable 2: Poor 1: Very Poor 0: Not attempted

Comments:

*Comments from the grader will be inserted here.*

1. Environmental Impact Analysis

Our project has two parts, Controller and Vehicle. Controller part has two joysticks, an antenna, a 10cm \* 15cm acrylic board on the surface serve as a cover for the PCB. Under the acrylic board, it has a 9V battery clip,9V alkaline battery capacitors, resistor, MCU, and an on-off switch. Vehicle part is made from steel, brass. Also, it mounts a PCB in the vehicle body.

For the environment impact, Our project concern at all three stages of its life cycle: manufacture, normal use, disposal/recycling.

Starting with the manufacturing stage, the main consideration will be the manufacture of PCB, acrylic board, and vehicle Body. During the manufacturing process of the PCB, many kinds of pollution will produce. Throughout the various stages of the PCB manufacturing process, a huge variety of chemicals are used. Copper, organic matter, and ammonia are the primary contaminants of PCB board pollution caused by the design and fabrication of PCB boards. Copper is the most important pollutant in the wastewater of PCB boards because the composition of the routing on the PCB boards is formed by removing extra copper from the conductor layer. Ink is used to cover and protect portion of the copper foil during the fabrication of circuit designs, copper etching, and circuit soldering processes. It will be drained, resulting in a large amount of high-concentration organic materials.

To reduce the environmental impact of the PCB manufacture, the permitted amount of chemicals to be dumped into the environment is listed in IPC standards. A good board should have nearly no post-manufacturing emissions or residues that could be harmful to the user. Heavy metals like lead are banned from practically all electronic products due to pollution, in order to reduce the hazardous effect.

The second environmental impact caused during the manufacturing of acrylic board. Compare with other material, acrylic board has many advantages, it has high tensile strength, can be recycle… Although it has many advantages, it still causes some environment impacts.

* Acrylic materials are non-biodegradable.
* Acrylic is not renewable. Although it recycles nicely, but this recycling process emits a lot of gas as well.
* Carbon dioxide, carbon monoxide, formaldehyde, and other chemicals are released during the manufacture of acrylic. This is extremely damaging to the ecosystem.
* Acrylic is a nonrenewable material manufactured from petroleum and other hazardous chemicals.

In conclusion, we can lower the environmental impact of the acrylic manufacturing process on such a large scale in this way. It is also critical to recycle acrylic trash in order to reduce pollution.

The manufacture of the Vehicle body will cause the last main environmental impact. Steel mainly makes the Vehicle body. The main pollution is produced through primary and secondary steel production. Therefore, it is not likely to reduce the environmental impact from ours.

Then, during the normal use stage, our product does not have large environment impact. The only consumption will be the 9V alkaline battery. Alkaline batteries can be recycled, but because of their low metal content, recycling programs are hard to come by, and in many cases, our customers might have to pay to have them recycled. To solve this problem, our customers can replace alkaline batteries with rechargeable lithium ion or nickel metal hydride batteries, which can last two to three years. Also, Today's batteries are composed of safer materials and don't contain the toxic compounds that were once included in them, thanks to the Mercury-Containing and Rechargeable Battery Management Act of 1996(https://www.epa.gov/sites/default/files/2016-03/documents/p1104.pdf). This means it can be safely (and legally) disposed with ordinary garbage.

Besides the battery, our product is not going to consume large power, which means it will not require frequent charging.

Finally, during the disposal/recycling process, all the materials can be safely recycled. For the PCB of both parts, the copper part of the board is completely recyclable as a metallic material. The components of the board can also be reuse if they are not damaged. For the acrylic board of the Controller part, because acrylic board is non group seven plastic, it is complete recyclable.

1. Ethical Challenges

For the ethical challenge, if our users do not misuse our product, there will be no ethical problem at all. Our product is designed for filming purpose, it has a controllable gimbal, and a drivable chassis. However, there are some potential usages that might harm others.

First, we expect our user to mount a camera on the gimbal, but not a gun or something that might harm others. To solve this problem, when we design our product, we use servos that have little strength that can only lift a small camera but not some destructive weapons.

Another problem will be harmful material on PCB, such as Lead in the solder paste.

To solve this problem, we design a package that can isolate the PCB so that our user cannot touch the PCB directly.

3.0 Sources Cited

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