The Coolhunter Lamp

Ferran Altarriba Bertran
University of Southern Denmark
Kolding, Denmark
ferranaltarriba@gmail.com

ABSTRACT
This paper presents the details related to the concept design and the technical development of a one-week design project consisting of the creation of an interactive lamp.

Author Keywords
Interaction Design, Product Design, HCI

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The *Coolhunter Lamp*[1] loves to examine the world for inspiration. It wanders rotating around in 180º in the search of interesting colors to learn from in order to become better at lighting up spaces. When it *sees* an interesting color, it learns about it and adds it to its unique color composition.

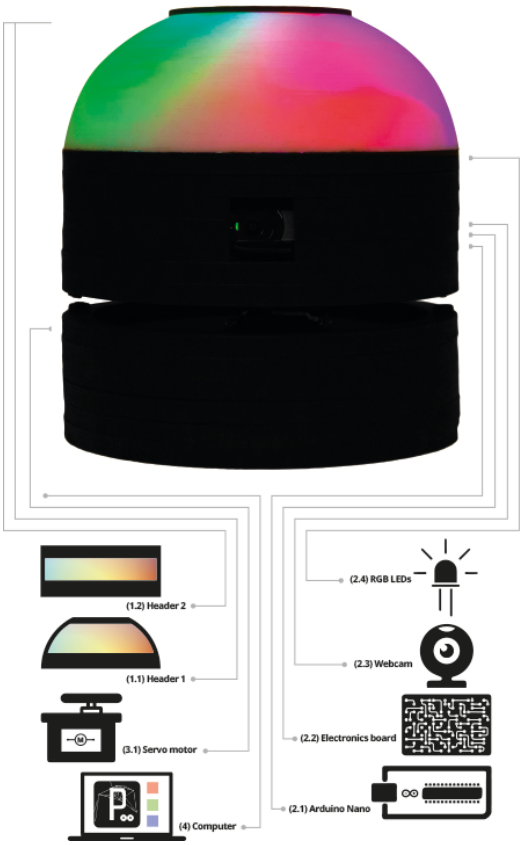

Figure 1: The *Coolhunter Lamp*'s components

[1] A demonstration video can be found on the following link: https://www.vimeo.com/149176338

TECHNICAL DETAILS
This prototype of the *Coolhunter Lamp* presents the core functionalities of the product. It wanders rotating in 180º around its center until it sees an either red, green or blue element through its camera. When it does, it stares at the element and changes its light to that color. Afterwards, it changes back to both its initial wandering state and its previous color gradient, but it adds a small portion of the identified color to the gradient. As a result of multiple iterations of this process, then, the lamp's light gradient will turn into a representation of its colour findings. The development of this prototype of the *Coolhunter Lamp* implied three main technical challenges[2].

Mechanical Structure

The construction of a cylinder-shaped mechanic structure capable of 180º rotation around its center. This structure has three parts: a static bottom, a rotating middle, and an interchangeable header. Parts and are made out of MDF and painted with matte black paint; part has two variations: one is 3D printed with translucent white PLA and the other is made out of transparent acrylic with an inner layer of translucent paper for light diffusion.

Electronics

The assembly of an Arduino Nano (Figure 1, 2.1) powered electronics circuit (Figure 1, 2.2) that performs two functions: rotating parts and with a servo motor (Figure 1, 3.1), and lighting up 10 RGB LEDs (Figure 1, 2.3) that change dynamically. The whole electronics circuit was built in a modular basis, so that any component could be plugged and unplugged easily at any time, without having to solder.

Computer Vision

The capture and analysis of a video thread coming from a webcam (Figure 1, 2.4) inside the lamp. The webcam captures images from the lamp's PoV which are later processed inside a Processing sketch (15fps, 320x240. The Processing sketch uses Computer Vision techniques to analyze every frame and decide wether the lamp is looking at a red, green or blue element. Based on this information, the Processing sketch runs the behavior of the lamp: it determines its both movement and color behavior.

[2] A document with the detailed blueprints and the links to the open-source code and structure files can be found on the following link: http://www.ferranaltarriba.com/docs/coolhunterlamp/specs.pdf

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Arduino-Processing Communication

The communication between the external computer (Figure 1, 4), acting as a brain, and the Arduino Nano inside the lamp, acting as actuator. The Processing sketch sends a string (3 color values*10 colors + a rotation value) every time there's the need of a change in the lamp's behavior.

INSPIRATIONAL REFERENTS

A few inspirational referents were considered during the development of this design concept. Some have to do with the aesthetics, while others are related to the interaction style this project explores. In terms of aesthetics, the first referent is Star Wars' R2D2 robot. This lamp resembles the rotation movement R2D2 does, and that's why one of the headers (Figure 1, 1.1) presents a spherical shape.

Figure 2: R2DR (George Lucas, 1977)

The second referent is Olafur Eliasson's 'Your rainbow panorama' architectural piece at the ARoS Kunstmuseum in Aarhus, Denmark. This is linked to the second header (Figure 1, 1.2) that can be used with the *Coolhunter Lamp*.

Figure 3: Your rainbow panorama (Olafur Eliasson, 2011)

The interaction styles explored in this concept are influenced my one of my previous pieces of work consisting in a series of multiplayer games to be played by attendees at multidinous events such as concerts or conferences. Users were given light pointers that with which to control the game collectively by pointing with different colors to the stage.

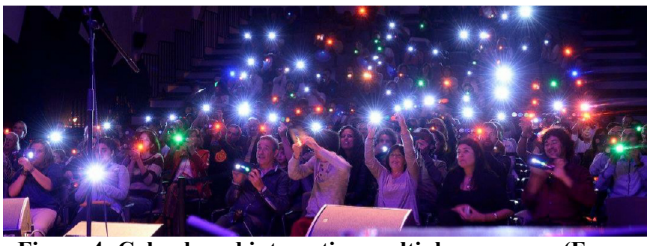

Figure 4: Color-based interaction multiplayer games (Ferran Altarriba Bertran, 2015)

Academic research has also been a referent to this project. The research done at the Human Sensing Laboratory (Carnegie Mellon University, Pittsburgh, US), where I did a one-year research assistantship, inspired me about the creation of human-aware technological devices that can understand people's behavior. Other academic literature was also used as a referent for the development of this concept [1, 2].

CONCLUSION

Further work on this project should focus on four key areas. First, improving the color detection algorithms, probably through the use of the OpenCV library. Second, integrating all the components inside the lamp by executing the code on a Raspberry PI instead of a laptop. Third, re-designing both the structure and the electronics so that instead of a rotating cylinder the lamp is a rolling ball that moves freely around space. Last, but not least, experimenting with other interaction styles than color recognition, such as people detection, mood analysis, etc.

REFERENCES

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