ILLINOIS INSTITUTE OF TECHNOLOGY
RESEARCH IN ARCHITECTURAL ROBOTICS
PROFESSOR BRETT BALOGH
ANTONIO JORGE DE OLIVEIRA NETO

THE INTELLIGENT CHAIR: RETHINKING EVERYDAY OBJECTS TO MAKE THEM MORE EFFICIENT

ABSTRACT

This is a final report over a summer research project directed by Professor Brett Balogh at the Illinois Institute of Technology in 2016. We were encouraged to design a project that would relate architectural design and robotic thinking in order to develop new concepts and encourage creative thinking. The purpose of this project is to make people think more about their surroundings and the objects from their everyday life. The goal is to open people's minds about the wide range of possibilities they have based on the environment they're in. Here we propose a chair that knows when someone sits on it, so it starts a timer and then warns the person that he/she is sitting for too long. Using basic components that can be found online we expect to create a simpler version of what a commercial version of this chair would be, only for prototype purposes.

Keywords: Architecture. Robotics. Chair. Rethinking objects. Design. Coding.

1. CONCEPT

The main idea behind our concept was to make people understand that change is not too far from them, and that it is totally doable. We can make our everyday life more efficient by rethinking the objects that we work with the most, and that is the main idea behind every big invention.

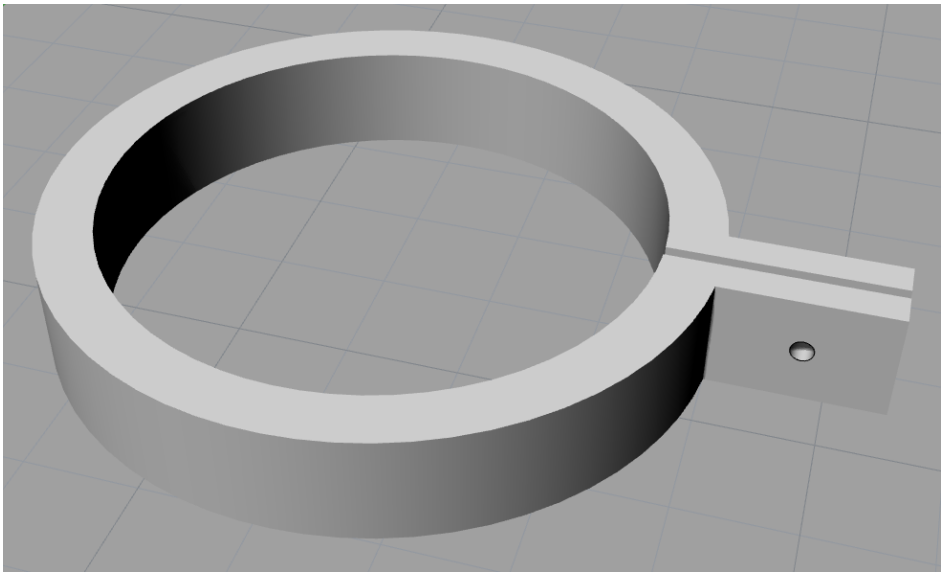
Here we thought of using a chair, an object that everyone uses every day, and making it respond to people's interaction. In this case, we wanted the chair to make people more active. Since most of the people spend a lot of their days sitting in a chair either working or studying, we wanted the chair to count the time that someone spends sitting to make them know that they're sitting for too long, so that this person knows that it is time for her/him to take a break, drink some water or take a walk.

2. MATERIALS AND METHODS

The first way that we thought of making this chair was using motion sensors, or weight sensors in order to make the sound board triggers a sound as soon as it senses someone. But then some problems started to appear. For example, a weight sensor may sense someone that weigh a certain weight but not someone who weighs a different one. And a motion sensor would maybe trigger the sound every time someone passes in front of it, or let's say when the person sitting would move their legs. So we had to think a little bit more on how we would make this idea possible.

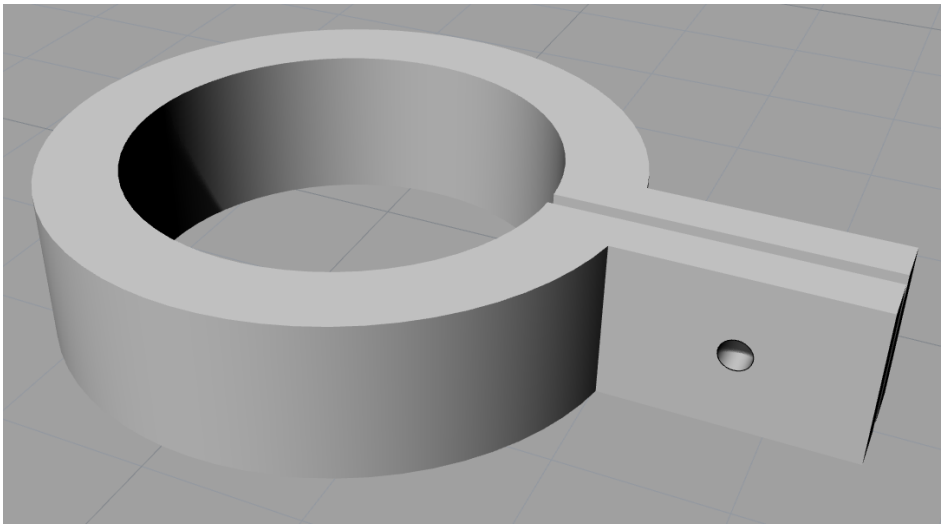
So after talking to Professor Brett Balogh we came to this final concept that is based on a switch. Now we are going to use the central portion on the underside of the chair to develop a hook on Rhino and then 3D print it. One for the smaller part and other one for the bigger part of the center of the chair *(Images 01 and 02)*. These two pieces will be designed in a way that they can be attached to the chair after being printed. Also, the design will allow fasteners to be put between their openings so that we can tighten these pieces to the center of the chair to make them move every time someone sits.

Image 01 – 3D design of the bigger hook



Designed by Antonio Oliveira with Rhinoceros 5 (2016).

Image 02 – 3D design of the smaller hook



Designed by Antonio Oliveira with Rhinoceros 5 (2016).

Between these two pieces will be a switch *(Image 03)* that will turn on when someone sits and then it will trigger an initial sound to make people know that the chair is on. After being turned on, a photon (that will work as the brain of the project, carrying its code) is going to start a timer to count the time that the person is sitting, and when it hits a certain time it will trigger a new sound to make people know that it's been a long time since they sit *(Image 04)*.

Image 03 – Detail of the switch

Image taken by Antonio Oliveira (2016).

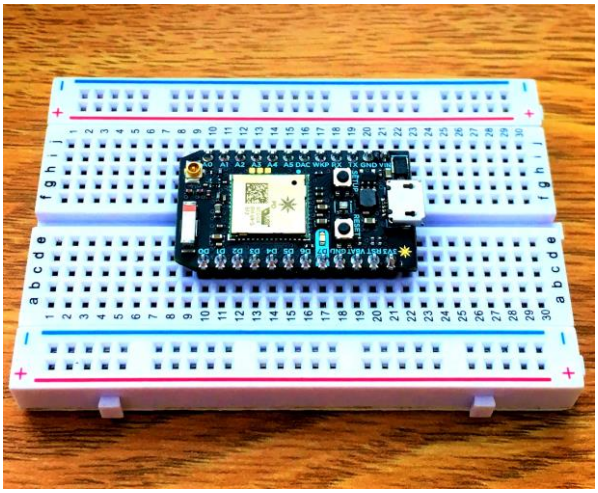


Image 04 – The Photon

Image taken by Antonio Oliveira (2016).

In the end we hope to have a chair with two 3D pieces attached to a switch that is going to be connected to a photon. This photon will be connected to a sound board and a little speaker all powered up by batteries *(Image 05)*.

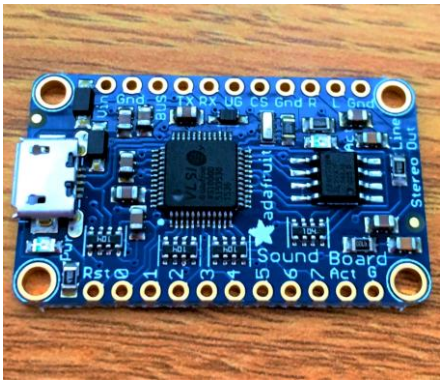


Image 05 – The soundboard

Image taken by Antonio Oliveira (2016).

3. OUTCOMES

Unfortunately, the final prototype didn't come up exactly as it was planned. The 3D printed pieces were too hard after the printing process, and the little space in between them to attach them to the chair was too little. In the end, one of the pieces broke while being attached to the chair *(Image 06)*.

We then tried attaching the bigger piece in the smaller part of the chair with tape and it did work, but a different problem came up. The movement that was provided by the chair when someone sits on it it's not exactly how we thought it would be. We wanted the chair to bounce down and then bounce a little bit up when someone seated

on it, in a way that it would press the switch and then release it right after. But what happened was that the chair would bounce down but it wouldn't bounce back up after someone seated. So the switch button was being pressed without being released, thus making the first sound triggers endlessly *(Image 07)*.

Image 06 – Printed 3D pieces (smaller one broken)
Image taken by Antonio Oliveira (2016).

Image 07 – The chair with the hook and the electronic parts.
Image taken by Antonio Oliveira (2016).

The good part is that the soundboard along with the photon, the battery holder and the speaker worked pretty well with the code. If the button is pressed it instantly will trigger the first sound and set the timer. And then, after the timer finishes counting it will trigger the second sound, so people would know that is a sign for them to get off the chair *(Image 08)*.

Image 08 – Final soundboard
Image taken by Antonio Oliveira (2016).

4. CONCLUSIONS

We can here see that what was idealized can be perfectly done. The code for it is not impossible, and the design problem is not that hard too. While experiencing the prototype we were able to see how these little changes in our everyday life can make a huge difference. Here specially, a chair, an object that everyone uses every day, have this potential to make a difference.

Sad to say that we did not have more time to rethink the 3D piece in a way that it wouldn't keep pressing the button thus triggering the first sound. But we hope that this is not an end, instead it can be just the beginning. We will keep on thinking about our surroundings, and hope that this article can make someone think about their everyday lives in a new way too.

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