How can we introduce interfaces to recreate the positive impacts of nature, Indoors ?

Nature has many proven benefits, mainly impacting people's health. However, these benefits are not always accessible, especially for those who live in big cities, so I wanted to look at how we can bring the benefits of interaction with nature into the indoors so that people can have interim solutions for when they cannot access the great outdoors. I also wanted this opportunity to bring nature indoors to convey the data of the outdoors in a more physical and visually stimulating form instead of numbers on a page. Therefore, as an avid surfer residing in London, I thought I would focus on bringing the sea indoors and conveying surf reports visually, as well as by-product - the positive impacts on mental health.

I was mainly inspired by the current movement and research surrounding nature-based interventions. The "biophilia hypothesis", which explains that humans have evolved to have an affinity with nature, goes on to explain 'Attention Restoration Theory' and 'Stress Reduction Theory' which provide insight into the mechanisms through which spending time in nature might affect human health. Attention Restoration Theory suggests that the mental fatigue associated with modern life is associated with a depleted capacity to direct attention. According to this theory, spending time in natural environments enables people to overcome this mental fatigue and restore the capacity to direct attention. Then, Stress Reduction Theory describes how spending time in nature might influence feelings or emotions by activating the parasympathetic nervous system to reduce stress and autonomic arousal because of people's innate connection to the natural world.

Furthermore, I wanted to look into the idea that the sound of the sea/wave machine creating brown noise can help people with ADHD focus, as per optimal arousal theory. Dr Joel Rigg of the Centre for ADHD Research explains that "the reason it is hard for people with ADHD to pay attention is that they are not alert enough." By this logic, then, their brains need a certain amount of extra stimulation compared to folks without ADHD to get into "interested" mode. "What the brown noise is supposed to be doing is subtly raising that arousal, thus making people with ADHD more alert and more focused. I then looked at a study aimed at verifying the effects of nature sounds on attention and physiological and psychological relaxation. The attention results had no significant difference; however, the scores were slightly higher when hearing natural sounds. However, the oxyhaemoglobin concentration and heart rate were lower, and parasympathetic nerve activity was enhanced when hearing nature sounds, suggesting that participants felt more comfortable, relaxed, and

had a positive mood state when they heard nature sounds. This suggests that hearing nature sounds may be an effective way to relieve stress in everyday life.

The tech world has also harnessed this research to create synthetic interfaces which help use nature/ eco-therapy to improve consumers' health, such as the Company 'Lumie' was formed off the founder's interest in circadian rhythms, early studies into dawn simulation and how light therapy could be used to mimic natural daylight hours. Creating alarm clocks that used a sunrise simulation through bright light, which mimics natural light, which in 2015 was proven as an effective treatment for seasonal affective disorder.

In addition, I was further inspired by Ken Kawamoto's 'Tempescope' a visual display for the weather using an Arduino Uno, an air pump, water pump, LEDs and a live weather API so the user can adjust their cube to display weather from their chosen place, I thought this was a brilliant way to visually illustrate the data for those whom maybe are not as good at decoding integer into physical information, such as children, it was also a rather close comparison for my idea of making a wave tank display surf forecast APIs.

I researched a few wave tank examples controlled by Arduinos; I decided to create a model that had a servo motor controlling a laser-cut hinge arm to create the movement instead of a stepper motor, which I had less experience with. I started by buying a long acrylic storage box to create the main tank of my wave tank to avoid cracks and leakages out of a self-fabricated acrylic tank.

I then laser-cut two arms out of thin wood to create a pin-joint that, when controlled by the servo motor, moved the square of acrylic that pushed the water forward to create waves; I then created a small gutter for this acrylic wall so that its movements were move controlled I just created this by super-gluing two thinner strips of acrylic to the base.

Then I tried some practice tests to create waves before I tried to bring in an API to control it to check the basis worked; initially, it was a bit underwhelming and 'splish, splashy' as well as the screw would undo itself from the arm joint due to the movement so I replaced it with wire which was more resilient, and the code was a bit dodgy as sometimes the servo would start pulling the acrylic wall out of its gutter then change to pulling it in instead of pushing it out.

I then realised that waves shape and size are mostly impacted by the structures of the bay under them, so I researched the structure of the bay under one of my

favourite surf spots, Croyde Bay, and mimicked that using two prisms to create a 'sand shelf'.

I then tried to combine the code with an API of Croyde's wave height create some statements that controlled how far the servo pushed the wave depending on the API data, in result making the waves bigger or smaller; I found trying to get the board to be controlled by a JSON really difficult to code, I followed many different tutorials and couldn't get all the codes and JSON to work together with the Arduino, so to exhibit the interface I used my original Arduino code which makes the servo work but not based on the data from the JSON, I also uploaded my broken code.

Once I got this all working, I thought back to how this would help relax people and bring the benefits of nature indoors, and although it made the lovely crashing wave sounds, I decided it was a pretty ugly mechanical box, so I decided to source some model train decorative materials to make a case for the wave machine that made it look more natural.

In reflection, I felt it was an interesting interface; although a lot of the interaction was subconscious by the user, I felt if I could've got the code working, it would've s served its purpose of exhibiting data while also having a calming impact. I slightly underestimated how complicated combining the dataset and the motion of the motor would be, as well as the stress of having water and electronics close by, and I felt I could've put in many more systems to make sure that the electronics wouldn't get wet.

I also wish I'd had some more time to get the API and Arduino working together and maybe conduct some user testing/ studies to see how different people interact with the model.

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