Lumos

Affective Stress-Reducing Environment for Children's Hospital Rooms

A Speculative Project

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Healing Environments & Stress in Hospitalized Children

How can hospital design affect clinical outcomes?

When a child is admitted to the hospital, it is a very stressful experience for both the child and the family. Creating a healing environment can reduce stress, improve one's ability to cope with pain, and aid in healing. Creating positive distractions through the design of environmental features, such as soothing colors, natural light, and pleasant sounds, can effectively reduce stress. Research

Using Patient-Centered Design and Evidence-Based Design (EBD), which focus on the experience of the patient and prioritizes qualitative care through rigorous research, creating Healing Environments has become a focus for the healthcare industry. Article

Lighting to Aid Healing

Case Study

Light therapy is used to regulate the body clock, as it is often difficult to adjust sleeping patterns in hospitals. Light is also used to aid in depression care, and reduce anxiety. Different colors can induce varying levels of calmness. A device like an image-scope can be used to detect the most ideal color for inducing a state of calm in different individuals [Research1]. Pulsating background lighting can support stress recovery[Research2].

Some Notes on Color :

White walls often present in hospitals are cold, harsh, and may cause anxiety.

Red is a high-energy color that spikes a child's blood pressure and contributes to stress and aggression.

Orange encourages creativity and may help with depressive moods.
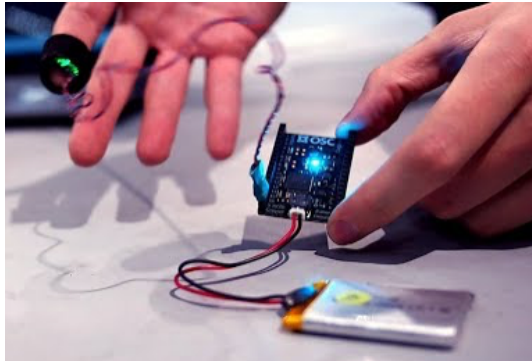
Warm earth tones can reduce anxiety.

Blue hues are known for slowing down the heart rate, reducing respiratory rhythm, and encouraging calm and focus.

To create a calming environment, avoid primary colors, and stick with muted, pastel shades.
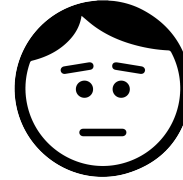
What is Lumos?

Lumos is a responsive lighting system to be used in combination with medical devices in patient hospital rooms. Utilizing input from pulse sensors and the time of day, the lighting system adapts to the patient's physical needs. Lumos can unobtrusively create a calming light environment when the patient is stressed, or if the child wishes to engage with Lumos, it can interactively generate a dynamic light show to provide positive distraction for the child, helping to ease a painful procedure, or help pass the time during a long hospital stay.

Lumos utilizes pulse monitors found in most hospitals, and creates a calming pulsing light pattern shown to help regulate heart rate and breathing patterns, and aid in the reduction of anxiety. Lumos could also be integrated with other biosensors or utilize computer vision to recognize facial expressions and generate responses.

When a child is first admitted to the hospital, the child has the option to choose her/his favorite color from a selection of calming colors, adding a personalized touch to the room.
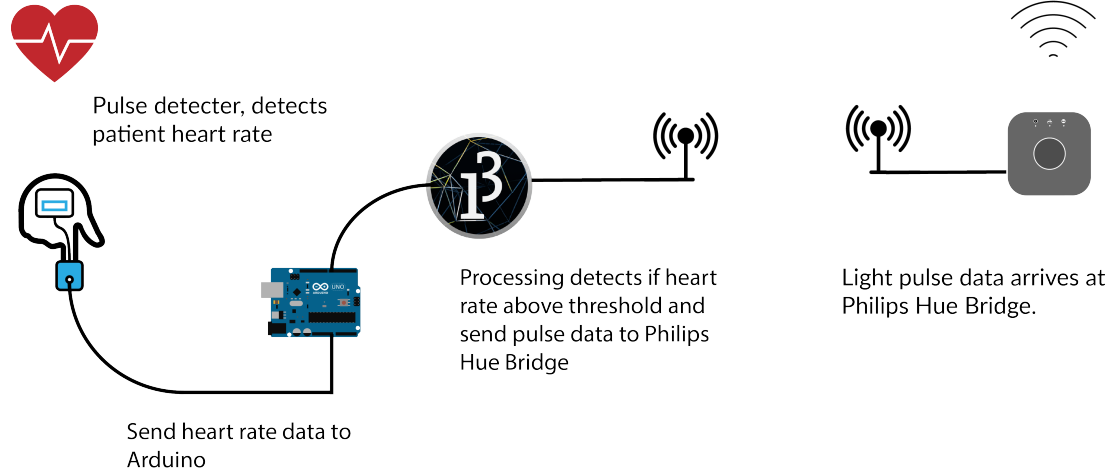
User Flow Model

Patients, especially children, can get stressed out in Hospitals

Lights start pulsing when stress levels go beyond a certain threshold

Patient gets visual cue for the pattern in which they need to breathe for calming down

Data Flow Model

Philips Hue pulses with 5 seconds high and low interval.

Pulse detecter, detects patient heart rate

Processing detects if heart rate above threshold and send pulse data to Philips Hue Bridge

Light pulse data arrives at Philips Hue Bridge.
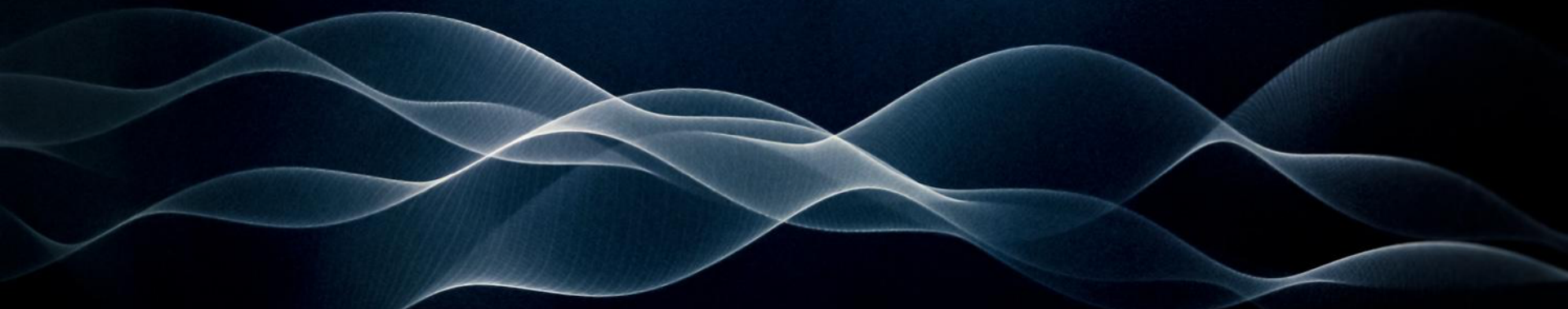
Send heart rate data to Arduino

Why Focus on Kids?

A note on Child Life in Pediatric Hospitals

When a child is admitted to the hospital, a child's personal agency is taken away, and social and educational development is put on hold. Child Life Specialists are an integral part of a Pediatric Hospital, who work to help children understand the medical procedures, regain a sense of personal agency, provide educational activities, and aid in reduction of stress for both the patient and family.

Lumos is a part of this relationship between the child and her/his hospital environment and staff. The responsive system could become a game they can play to engage with hospital staff, family, and to create a personalized space that can feel comforting to the child. An element of Lumos's speculative development could help Lumos learn to recognize a particular child's patterns, needs, and likes, and can become a sort of "call and response" system that is integrated into the larger Patient-Centered Design philosophy of the pediatric hospital care system.

Possible Iterations / Expansion of prototype concept

Harmony : A Sound Healing Environment

Specific vibrations and tones have been said to have a calming effect on the body. The field of Sound Therapy is contested, and has not been clinically proven, but many studies have been done on music's effect on the brain. Many people use sound machines such as white, pink, or brown noise to aid in sleeping or focus. While in the hospital, many unknown and often disconcerting noises are present, from medical machines, hospital staff, beepers, neighboring patients, or noisy bed adjustments.

We propose to create a vibration / sound element as a companion to Lumos, to aid in creating a healing environment.

Research:
Article
Article
Peer Reviewed Research