IMMERSIVE LIGHT EXPERIENCE

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Introduction

- Urban lifestyle – Apartments and workplaces
- Cities – Lack of open spaces to experience light
Natural Light
Why do we enjoy natural light?

- Has multitude of colours
- Fresh and different
- Has unique effect on our senses
- Is living/dynamic
- Is thought provoking/ allows reflection in our minds
- Gives us an immersive experience
Why do we enjoy natural light?

The hues of natural light at different times of the day.
Light in different forms in nature
BACK TO NATURE TO REJUVENATE AND RELAX
Daylight Intensity gives the illuminance (lux) at sunrise, mid-day, noon etc... i.e. at different times of the day. Various colours of the sky and features of landscapes are visible because of light. It forms shadows and helps perceive motion.
RELAXATION

• Relaxation is the most essential key to well-being.
• It helps to alleviate stress which eventually contributes to various diseases.
• Relaxation gives the heart a rest by
  • slowing the heart rate,
  • reduces blood pressure,
  • increases blood flow to the muscles & decreases muscle tension.
**Conventional Relaxation Methods**

**Yoga** - Yoga places great emphasis on deep, rhythmic and effective breathing, allowing the brain to be richly oxygenated and the body to relax.

**Imagery** - It involves using imagery to completely immerse ourselves in a pleasing scene, recreating the sights, sounds, smells, and tactile sensations.

**Physical Relaxation Techniques** – It is a method to consciously tense and relax the muscles to feel the maximum effects of relaxation.

**Meditation** - Relaxing with constant concentration, where the end goal is to achieve a calm state of mind by contemplation and reflection.

**Self-Hypnosis** - Unlike meditation, in self hypnosis, optimistic statements are used to manage stress, build self-confidence and bring in positive thoughts.

**Music** – Listening to soothing music is quite helpful for relaxation.
Other relaxation Methods

Mood Lighting – Sensory Deprivation Chamber and Phoenix Hospital Lighting, Arizona
Light and Relaxation

Results from Research Papers:

“Dim colour is more pleasurable and induces a relaxing feeling for clients”
- Arefan Atlier, 2011, 'Interior light effects on human mood and social behaviour- LITERATURE REVIEW’

“Preliminary experiment results show that low color temperature with low illumination intensity of LED lighting enhances relaxation level and high color temperature with high illuminance improves attention level”
- Chan-Su Lee, ’The effect of visual stimuli of LED lighting by color temperature and Illuminance control on attention and meditation level of mind’, Yeungnam University, Korea, P1-16

• Use of Light therapy for alleviating Depression
• Light’s effects seem to only occur if the light source is above or at face level, not below
**COLOUR AND RELAXATION**

Results from Research Papers:

“Certain wavelengths of light may have specific impacts - example, blue light may improve cognitive performance “

  
  *Blue light improves cognitive performance. J Neural Transm 2007; P457–460*

“Red is a bright, warm colour that evokes strong emotions; Red is also considered an intense, or even angry, colour that creates feelings of excitement or intensity. Red stimulates the physical and adrenalin. It raises blood pressure, the heart rate and respiration.’’

“Blue calls to mind feelings of calmness or serenity. It is often described as peaceful, tranquil, secure, and orderly. Blue is often used to decorate offices because research has shown that people are more productive in blue rooms……”
“Green is restful, soothing, cheerful and health-giving. Green is thought to relieve stress and help heal. “

With regard to colour healing, it is suggested that colour can be used as a treatment tool in conjunction with the seven chakras of the body. The chakras are considered to be energy centers within the human body. Under the colour-chakra theory, a colour is linked to each of the seven chakra and these colours are associated with body functions and dysfunctions within each chakra area.
Experiences involve us in being in situations and reflecting about our involvement in these situations. 

*Immersive experience* is a part of the many experiences that people have.

*Immersion* is a metaphorical term derived from the physical and emotional experience of being submerged in water. *Being immersed* gives a feeling of submergence and engrossment.
Instance 1· Immersiveness in Nature
Goes on treks to forts and likes discovering old ruins on weekends and feels like a ‘hero of that story’. The smells of the earth, the breeze, the sway of grass envelops him and he feels mesmerized by the play of light and shadow. A feeling of ‘renunciation’ comes while experiencing the dusk in its purple-orange haze...
Instance 2: Immersiveness in Pattern

Interviewee talked about how involved she got watching the pattern in the waves on a ferry ride to the Elephanta caves. ‘The crest and the trough formation was beautiful especially with the streaks of sunlight shimmering on the tips.’
Instance 3: Immersiveness in Random
Interviewee was attending the ‘Evening Aarti’ in Benaras and found himself captivated by the flickering of the flames of the diyas that float on the water. He talked about the way the floating diyas moved in the water...sometimes clustering and then separating...the randomness was immersive...
Instance 4: Immersiveness in games
Interviewee stated 'I have been playing this game for a year (temple run and paper plane) and I’ve never seen what’s the end of this game like...I want to know what’s so special about getting to the end...playing this game involves me completely.'
**Instance 5• Immeriveness in technology**

Interviewee was amazed with ‘Microsoft Surface’. He mentioned that ‘it was the first time a table top application was so interesting and engaging in different ways. It responded to your weight if you bent on it, recognized any object you kept on the surface, and multiple touch options’...
Elements of Immersive Experience

Mentioned are the keywords that were selected from the experiences that were shared by different users. From these words the elements of Immersive Experience were derived:

• The sensory cues
  - feel (breeze, temperature)
  - smell (earth, grass, rain)
  - touch (surfaces),
  - sight,
  - sound

• The effect of colours

• A sense of motion

• The perception of scale

• Interaction and engagement for a certain period of time
Combining light, Relaxation and Immersiveness

<table>
<thead>
<tr>
<th>Relaxation</th>
<th>Low Level</th>
<th>Medium Level</th>
<th>High Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Blue/Violet</td>
<td>Yellow/Green</td>
<td>Red/Orange</td>
</tr>
<tr>
<td>Intensity</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Motion/Movement</td>
<td>Slow</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Music/Sound</td>
<td>Calm/slow/string instruments/deep bass</td>
<td>Fast/has beats(percussion instrument)/high pitch</td>
<td></td>
</tr>
</tbody>
</table>
To design an immersive light experience that is derived from the elements of natural light which helps urban professionals to relax in a personal space.

From the data gathered and optimized, the colour, illuminance and motion factor of the light will be utilized to help achieve relaxation through music.
**User and Usage:**

User - The target user would be urban working professionals from age group of 22 years and above who experience a lot of work and travel related stresses during the day. They need relaxation and tranquility to de-stress themselves for better performance and productive work.

Usage - This product will allow the user to have a personal space to relax. Hence it can be used in homes and in public spaces (like recreational rooms in offices or as a relaxation space in airport).
IDEA GENERATION

The following Ideas were generated to bring in the elements of light, relaxation and immersiveness together.

1: Experience of a Summer night in forest with simulation of fireflies
2: Experience of flotation with lights with interactivity using sound and touch
3: Kaleidoscope effect of lights in an immersive cocoon- formless light
4: Streak of lights- lights that change colour and glow with hand gestures (sound could be involved)
5: Experience of a waterfall that enhances the bathing experience- ripples effect highlighted with lights as water drops
6: Imitate the motion of fishes in a bath tub with lights
7: Motion sensing balloon that lights up when it senses activity and then fades off
IDEA - Experience of a Summer night with fireflies

STEP 1:
- SENSOR AT THE ENTRY
- INITIALLY FIREFLIES ARE ON THE GROUND

STEP 2:
- AS THE FOOT FALLS ON THE SENSOR, THE FIREFLIES MOVE UPWARDS GRADUALLY TO REMAIN SUSPENDED IN THE AIR EBBING & GLOWING
IDEA - Experience of waterfall
**IDEA - Fishes in Bathtub**

- Enhance the bathing experience!
  - Create imaginary light fishes that sense the human position and moves around. Fishes are purely created by projecting lights.

**IDEA - Floating Lights**

- Hanging/suspended glowing lights that are motion sensing also!
  - They glow when motion is detected.
  - The floatation of lights allow it to be moved around from room to room (like floating candle).
**IDEA- Immersive Cocoon**

**Technology Exploration**
- Light projection,
- Interactive lights - ebb and glow of fireflies
- Relaxation chair material for sensorial experience
IDEA-Experience of flotation with lights

Technology Exploration -
Response of Light with Sound
Increasing Interactivity
IDEA- Kaleidoscope effect of lights in an immersive cocoon - formless light

Technology Exploration -
Response of Light with Sound
Increasing Interactivity
Projection mapping
**IDEA** - Streak of lights - lights that change colour and glow with hand gestures

**Technology Exploration** -
Motion sensing
Proximity Sensors
CONCEPTS AND SIMULATION

Of the Ideas that were generated, they were evaluated in terms of timeline feasibility, highest Immersive experience and whether they conform to the project brief. The first and the second idea were then selected for further explorations for concepts.

CONCEPT A : Experience of flotation with lights
CONCEPTS AND SIMULATION

CONCEPT B: Immersive Experience of a cocoon. Here the coloured lights will be synchronized with music for helping the users to relax. The top of the structure will have modulating glow of optical fibers to simulate the effect of ‘stars’.
CONCEPT A: DETAILS

Connection for elec. Conn.

Tempered glass with one side mirror

Pump for water inlet and outlet

Led lights

Mirror

8-10 liters of water storage space

Submersible pump for water recirc.
The prototype was first tested without the effect of water. A strip of LED was placed between a mirror and a glass with one side mirrored to simulate the effect of flotation.
Set up is a testing prototype for the dynamic effect of flotation. This is where water flows between the mirrors and is constantly re-circulated using the submerged pump.
CONCEPT B: IMMERSIVE EXPERIENCE OF A COCOON

- The Immersive Cocoon is located in the user’s house.
- The Stressed User, after returning from work wishes to relax and hence approaches the cocoon.
- The User sits and enters the cocoon as shown in the following slides.
- The interior of the cocoon is made of soft white cotton which allows air to circulate. There is a plush cushiony surface on which he can sit and relax.
- There is a USB port which is to the right of the user (input port) to which he connects his cell phone.
- Immediately a soft warm yellow glow fills the entire cocoon.
- In the cell phone an application asks the user about his stress level (3-min/5/8-max) on a scale of 10.
- After the user selects his level, the lights moderate into colours and a soothing music accompanies the lights. Further into the music the lights moderate on the basis of the users stress levels. The more stressed he is, more of blue, violet hues are generated as per previous research reference to calm him down.
- The ceiling of the cocoon has tiny lights ebbing and glowing to simulate the effect of stars.
- After the music stops, the cocoon goes back to the original glow.
- An option of reading light is included if the user wants to relax by reading a book.
MOOD BOARD FOR FORM EXPLORATIONS

Figs: Cliff Swallow’s nest, Erica marifolia, woolen strands, butterfly cocoon, maize, pink waxbells, weaver bird’s nest, nubuck leather bag, yellow flower
Ref: http://hedgeandgardens.typepad.com
http://www.the-beautiful-things.com
CONCEPT B : EXPERIENCE TRIAL AND ERGONOMICS

A rough mock up model was made to simulate the immersive effect with blue light
A user survey was conducted with 10 different users for ergonomic study.
RESULTS FROM ERGONOMIC STUDY

Users were asked to indicate their level of comfort in an enclosed space by which the average height for the structure was determined.
RESULTS FROM ERGONOMIC STUDY CONT’D...

• From the study, the minimum height of the structure was selected as 1100 mm.
• The diameter covered by the umbrella was 900 mm, and the finalized dimension was 800 mm to include the form factor as well.
• The maximum dimension for a person sitting erect was found to be 880 mm and according to the referred anthropometric data book, the maximum height for 95% male is 900mm.
• The height from the ground referring to the data book was considered as 500 mm (75% combined)
• The opening area width is considered to be 550mm (95% women)
DIMENSIONS FROM STUDY AND BASIC STRUCTURE

Ref [7] for dimensions
## CONCEPT EVALUATION

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Concept A</th>
<th>Concept B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Space</td>
<td>Not defined</td>
<td>Defined</td>
</tr>
<tr>
<td>Ergonomics</td>
<td>Visuals are below eye level</td>
<td>Visuals are above and at eye level</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Difficult due to water/leakage</td>
<td>Easier</td>
</tr>
<tr>
<td>Posture</td>
<td>Sitting/Standing</td>
<td>Sitting, Inclined Sitting</td>
</tr>
<tr>
<td>Immersive Experience</td>
<td>Good</td>
<td>Better</td>
</tr>
</tbody>
</table>
FINAL CONCEPT : B

Outer structure of cane/bamboo weave to be explored

Front view

Cushioned surface

Top view
DETAILS OF THE WIRING AND INSIDE STRUCTURE

- Wiring for sound system
- Wiring for LED
- Diffused light at the top
- LEDs fixed at the base diffuses lights upwards
- White cloth (soft, noise-reducing layer)
- Optic fibre installation units
- For ease of maintenance

[Hand-drawn diagram with annotations]
The basic structure has been explored in CAD to visualize the form which is constrained by the dimensions obtained in the ergonomic study.
DETAILS OF THE WIRING AT THE TOP OF THE STRUCTURE

Steel wire rope for suspension

Wiring for LEDs which are place on a convex structure to give diffused light and it is not visible to the human eye directly!

White matte micro polyester jersey fabric (attached by Velcro) that allows air circulation and which is removable for maintenance.

Diffused light at the top

Optic fibre installation units
FORM EXPLORATIONS
FORM EXPLORATIONS
FORM EXPLORATIONS
MATERIAL WEAVE STUDY IN BAMBOO

Star weave

Star weave

One by two Weave

Diagonal Weave

Cane and Bamboo Mixed Weave

Basket Weave
# PART COST DETAILS FOR PROTOTYPE

<table>
<thead>
<tr>
<th>Part</th>
<th>Qty.</th>
<th>Cost(Rs.)/item</th>
<th>Total(Rs.)</th>
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</thead>
<tbody>
<tr>
<td>10 mm dia MS rod (10 ft)</td>
<td>10</td>
<td>192</td>
<td>1920</td>
</tr>
<tr>
<td>Bamboo Strips (cut to 6mm width)</td>
<td>240</td>
<td>5/strip</td>
<td>1200</td>
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<tr>
<td>Foam Material(47” dia)</td>
<td>1</td>
<td>1700</td>
<td>1700</td>
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<tr>
<td>White cotton cloth</td>
<td>20 m</td>
<td>40/meter</td>
<td>800</td>
</tr>
<tr>
<td>Led with controller</td>
<td>1</td>
<td>950</td>
<td>950</td>
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<tr>
<td>Welding of parts</td>
<td></td>
<td>2500</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rough Estimate</td>
<td></td>
<td></td>
<td>9000</td>
</tr>
</tbody>
</table>

(Other Overhead Charges not included)
PHOTOGRAPHS
PHOTOGRAPHS
REFERENCES:


[7] Indian anthropometric dimensions for Ergonomic Design Practice, Debkumar Chakraborty

Image references:

Ref: https://www.google.co.in/?BwZFU=natural+light
Ref: http://webecoist.montastic.com
https://www.google.co.in/forms+of+light
http://www.breathslim.com/proper-breathing-blog
www.psfk.com/publishing/future-of-light
THANK YOU