1. Top half is smart glass in tiles
VOLTAGE CONTROL
high visibility = clearer glass
high air temperature = clearer
luminance = less clear
Gaussian distribution controls which tiles are activqaed

2. Ramp is cloaked for those who are on the ground level.
VOLTAGE CONTROL
number of occupants: starting at 12 completely cloaked

3. 2 meter wide walkway of seismic material
ALWAYS ON
simulated seismic activity
every 10 tiles activates seismic activity

4. superlens uses a microscope placed somewhere
ALWAYS ON
people can place objects under it

5. negative refraction stream running along side the path on the bottom
VOLTAGE CONTROL
water temperature: higher = faster
direction controlled by humidity: less than 50% is clockwise etc.
barometric pressure: higher = faster

higher human temperature = more flow

6. acoustic metamaterials on one quarter of the dome (deaf walls)
ALWAYS ON
input = sound inside

a. fog machine
VOLTAGE CONTROL
clarity of glass

b. artificial earthquake generator
location of occupants - easily accomplished with pressure plates

c. microscope, people can put things under - interactive
people can place objects under it

MAT200A Project Proposal: Metadome

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Motivation:
"Sight, hearing, smell, taste and touch – they are to appeal to all the senses, these new materials, from which innovative product design and architecture are emerging. And even more than that. If the new products are really to become objects of desire for as many customers as possible, then the combination of these sensory experiences must awaken positive feelings in us: fascination and passion, the surprise of the unknown, or a sense of familiarity and security. As varied as are the demands made on products and buildings today, the choice of materials must be made with appropriately comprehensive awareness and care. Specialist publications on the topic and databases of new products are enjoying a hitherto unknown boom, but how do designers and materials specialists manage to get together?"
Cosmoworlds, November 2007.

Project description:

Human perception of traditional materials has been shaped by multiple legacy factors. Substances such as wood, clay, glass have been around since before the mankind and our means of handling them as well as our emotions when being surrounded by such materials are influenced by civilization and culture we belong to. For many purposes materials developed in the modern age, such as plastics, have substituted the traditional ones. Still, structural properties of those materials do not radically challenge our perception. Recently, materials have been developed that exhibit properties not readily available in nature. These materials called metamaterials show tremendous potential for technological advancements. They can influence electromagnetic waves in the way which allows creation of ultra strong microscopes, invisibility cloaks and high gain radio antennas. A subclass of them, so called acoustic metamaterials, can guide sound waves in a fashion which contrasts the traditional materials' physics.

However, the early stage of the metamaterial development, which we are in right now, does not provide much intuition behind the human perception of metamaterials. We speculate that novel properties of these materials will result in radically different human experience when the ubiquitous contact is finally made. Moreover, we feel that the lack of cultural and societal boundaries will result in the primal emotion when we start interacting with metamaterials.

As an early, yet comprehensive empirical analysis of human - metamaterial interaction we propose the metadome. The metadome is a flexible arts installation and a testbed for metamaterials research. It is envisioned as a spacious dome that hosts an abundance of interactive metamaterial content. The metadome is equipped with numerous sensors that keep track of the user behavior. The user actions are then transferred to the dome representation through electric stimuli that change the properties of the material which the user interacts with, essentially creating an emotional feedback loop.

The metadome is not a single user space. Through their interaction with the flexible environment the users indirectly impact each other's experience. Moreover, the structure is envisioned as an integral part of its immediate surroundings. The building walls will allow a level of transparency, while the acoustic metamaterial insulation can extend the aural perception of space for the people within the building.

In this project we sketch the initial research directions towards the metamaterial-human interaction understanding. We will outline the metadome, a facility for the direct, interactive contact with metamaterials and define the key concepts needed for the structure realization. We plan to present the metadome through audio and video simulation of the metamaterial behavior. Finally, we will investigate the use of data from sensed human reaction to steer the future technical research on metamaterials.

Activity plan:

Activity	Start Date	End Date
Gathering and examining related work on (meta)materials (Liskov) dome architecture (Fuller), sensing (Richards), artwork (Denes); Defining the proposed work's position in relationship to the existing work.	10/19	10/22
Metamaterial affordances: isolationg physical properties that are going to be harnessed in the project.	10/20	10/23
Project Concept PPT Presentation: metadome content, architectural overview, general shape of Metadome (geodesic dome, torus, etc.), position the project in the research area	10/23	**10/26**
Sensing and sensor placement; development of the user feedback concept; synthesize received data	10/26	11/01
Sound deployment definition; acoustic metamaterials; drone design elaboration	10/26	11/01
Project Stage I Presentation: Metadome website 1.0 – content (project description, motivation, resources, descriptive artwork); design and implementation	10/30	**11/02**
Presentation feedback analysis and project restructuring	11/03	11/04
Research on cultural and social aspects of the project; related work analysis	11/05	11/10
Sound and 3D modeling tool selection and training; initial Metadome model	11/07	11/12
Project Stage II Presentation: Metadome website 2.0 – a fully functional website with the full project description and visualization of the metadome (a 3D model), sociological context of the work, budget sketch	11/12	**11/18**
Presentation feedback analysis and project restructuring	11/18	11/19
Finalization of spatial layout of the dome, its position in the environment	11/19	11/20
Scenario definition – expected use cases	11/20	11/22
Final presentation: Metadome experience – a case study. An audio-visual demonstration of the metadome concept.	11/23	**12/06**

Resources:

- Knowledge: digital libraries, news articles, course materials and previous projects, UCSB library,
- Tech: web server, work stations (high end PCs), software (TBD), drafting studio
- Skills: web design, drawing, 3D modeling and animation, sound synthesis and analysis

References:

[1] Wikipedia – Metamaterial http://en.wikipedia.org/wiki/Metamaterial
[2] Albert A. Lysko, "Metamaterials: A New Frontier in Electromagnetics for Engineering Applications"