life / light

/ interactive materials
/ biodesign proposal

/ suspended living buioluminis-
cent installation

/ interactive system proposal
for AME 410 class/BioDesign
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LIFE LIGHT

**HOW TO VUSUALIZE
THE POWER OF HUMANITY
TO ACTUATE LIFE?**

In the age of antroposcene humans leave irreversable footprint on Earth. However, if we have power to destroy life, we should have the power to trigger life back to existence.

Everything we do, the way we move, the words we say, interact with the living environement and change it.

It is a two-way road: natural world influences us back. This continuous process of mutual influence shifts awareness from antropocentric towards ecocentric values.

The LIFE/LIFE project represents the wide vision of interactive ecosystem in the scale of the artistic installation.
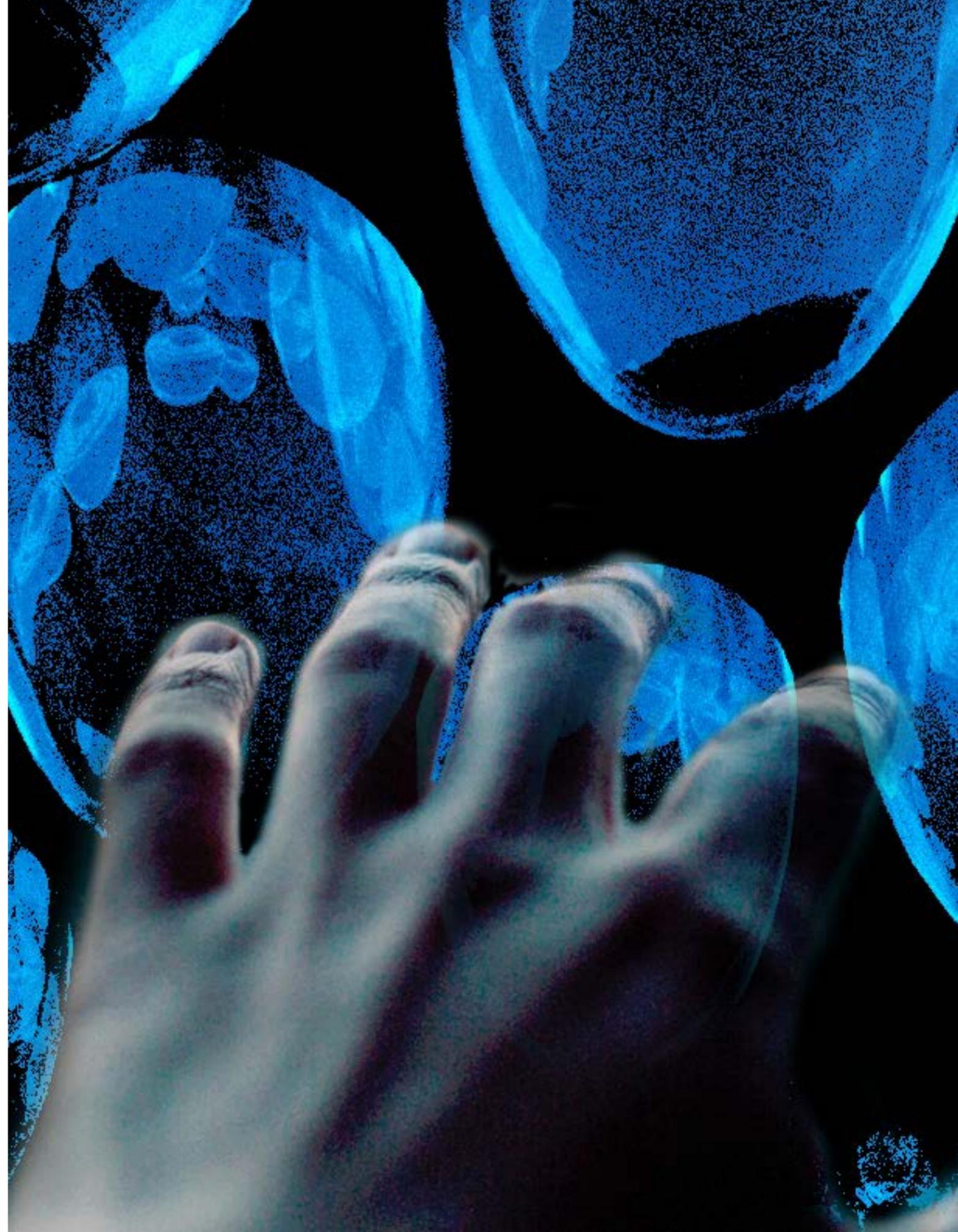
VISION

LIVING ARCHITECTURE

Today we have to adapt our built environments to the constant flux of technological, social and environmental conditions. The more sustainable option is to make our habitat easily adaptable.

There are many ways to create reactive, pro-active cities informed by human activities and environmental changes. One way is the use of computational technologies to gather, analyze the data and feed it to mechanisms that adapt to the environments.

Another way is to utilize special qualities of materials that react to changes around them. By combining these two approaches we can create organically animated, reactive and adaptable habitat.

A city is an ecosystem accommodating many living organisms, but buildings and structures are not among them. A forest would grow and adapt organically, but a city changes through the processes of construction and demolition, both of

them leaving a significant footprint.them leaving a significant footprint.

The idea then is to generate a city as an evolutionary, living matter that adapts organically to specific conditions that change with time. In this case, the performance of space is maximized by utilizing the potential of a situation most effectively.

Our mission of designers is to consider the need in flexible, transformable

environments that can answer social and environmental demand in the most sustainable and humanistic way.

Applying morphogenetic and kinetic strategies would make transformation happen easier with lesser footprint and socioeconomic implications.

It would also raise social and environmental awareness of people.

SUBJECT

BIOLUMINESCENSE

1 – BIOLUMISCENT JELLYFISH IN NATURE
2 – ALGAE GROWING KIT

Biolumnescnese is the ability of living organisms to produce light. For the LIFE/LIGHT project it communicates the animated nature of the organic world.

Bioluminiscence can attract, communicate and illuminate when applied to an artifitial environment.

Bioluminescence is a natural phenomena that holds potential for sustainable artificial lightning systems.

The process to produce the illumination differs greatly between organisms, yet the "cold light" produced is done without wasting energy compared to conventional electrically generate light.

Among organisms that produce light are animals in the open seas as well as fungi, algae, bacteria and various insects.

Bioluminescent organisms are all unique in their own way. We chose Dinoflagellata algae for LIGHT/LIFE due to its natural bioluminescent light triggered by agitation in its environment.

Dinoflagellata Create their own food using energy from the sun which made the algae a great prospect for LIFE/LIGHT as it takes little effort to maintain and reproduce.

OBJECT

INSTALLATION

Experimental space showcases how life is actuated and changed by human activity and influences it back in return.

Installation is found inside buildings. People observe and interact with the piece that raises their awareness of human-nature relationships.

The installation piece hangs from the ceiling and actuates when visitors interact with the surrounding space.
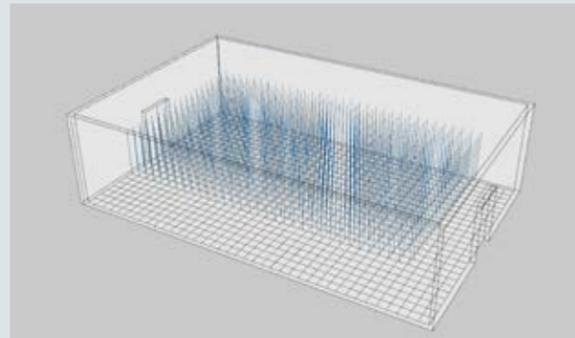
The result is an animated and bioluminated space that is influenced by humans and influences their behavior.
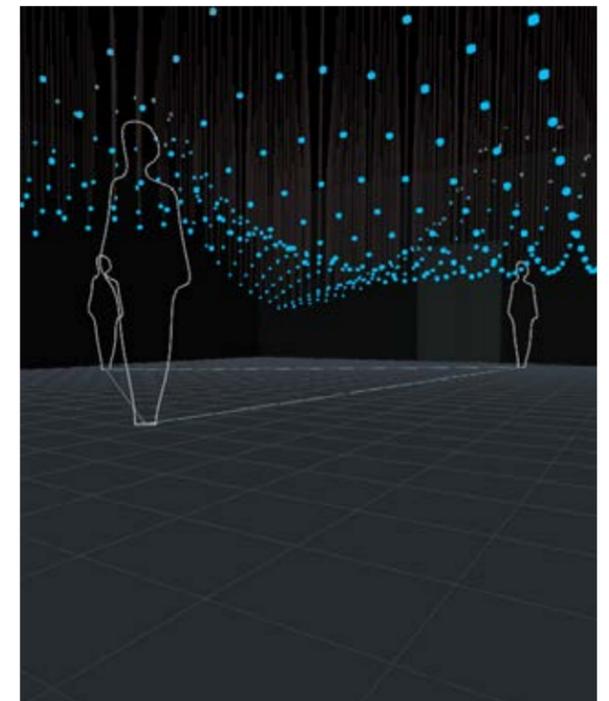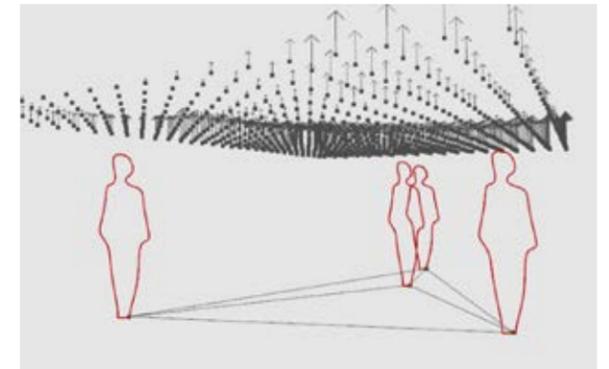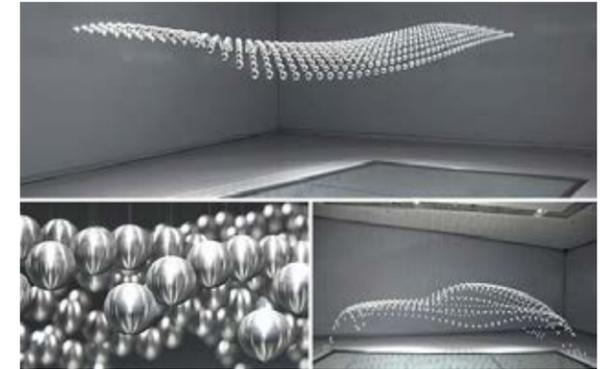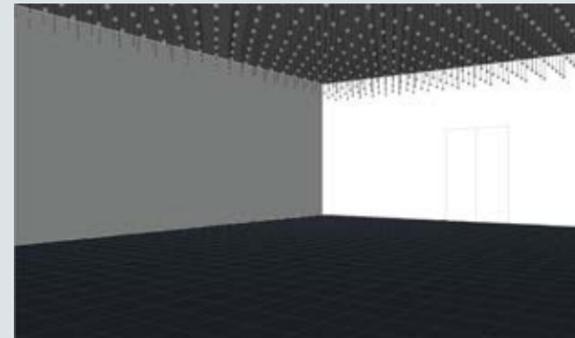
I The LIFE/LIFE installation is prepared by cultivating builuminiscent algae specied in community biological labs.

2 The artpiece is installed in a room. The system consists of a suspended structure, servo motors, strings with hanging algae containers, and sensors.

**3** During the daytime algae containers are pulled upwards to the ceiling and accumulate daylight.
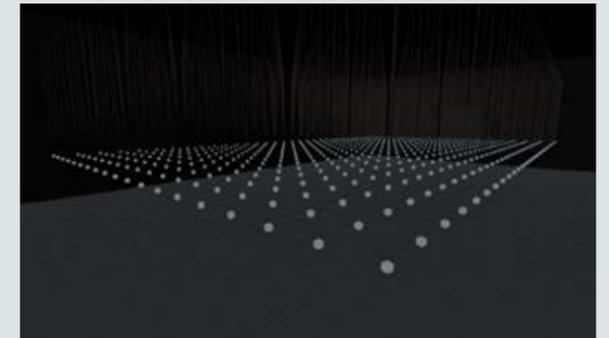
4 During the nighttime containers are pulled down and the interactive system is put into action. The space in its relaxed state would be viewed as low hanging bulbs, in a dimly lit room.
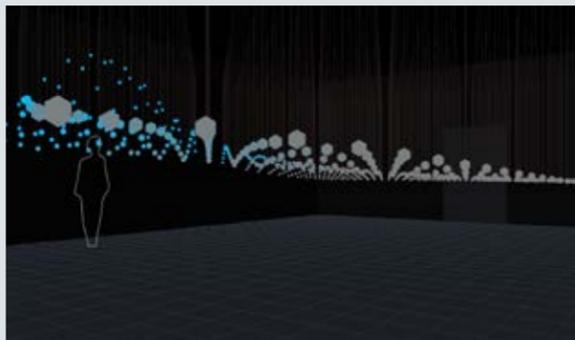
5 When a person eners the room, containes are pulled up, creating a caved environment around a user. The speed of motors is maniputaed by strength of sounds.

6 When moved, algae lights up. It can also be agitated by a user by simply toughing the containers.
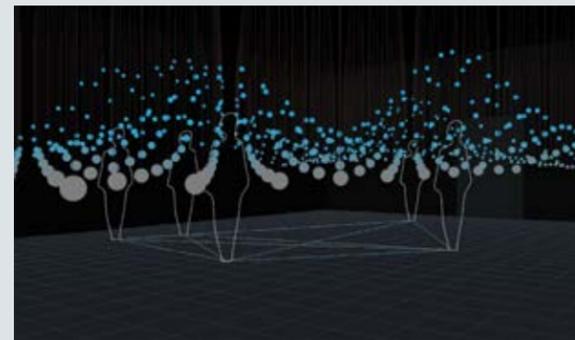
7 When several people enter the room, the enclaves are configured according to their proximity to each other. With light and different space configurations, the adaptable affordances for interactions are created.

8 Algae is treated by the workers during the daytime. However, visitors can contribute to it by participating in algae cultivation.
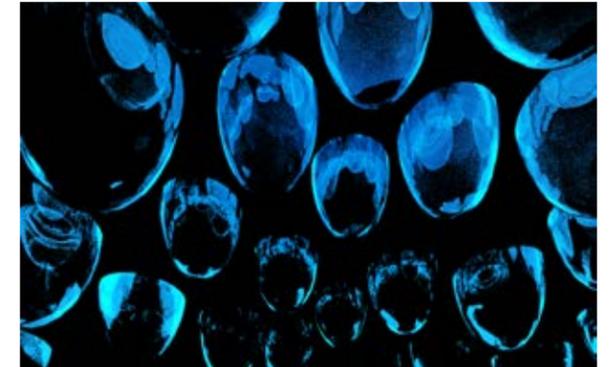
ELEMENTS

ALGAE CONTAINERS

The containers - either a transparent glassware or plastic baloons - store a medium inhabited with bioluminiscent algae cultures.

As living organisms, algae have to be taken care of. Several facts are important for successful cultivation:

- Genus Pyrocystis, can typically be found in tropical waters.

- Culture grows in a 12-hr cycle. Optimum growth temperature is 22 degrees Celsius (70 degrees Fahrenheit).

- In transit, the dinoflagellates may take up to 10 days in growth conditions to recover their bioluminescence.

- A different light cycle will take a few weeks for readjustments.

- Bioluminescence is best observed 1 to 2 hours before the dark cycle begins.

- Dividing cultures will increase bioluminescent glow. It is suggested to be divided every 3 to 4 weeks. This requires adding dinoflagellate medium to the algae in a separate container.

1 - ILLUMINATED BALOONS
2 - TRANSPARENT BALOONS

ELEMENTS

INTERACTIVE SYSTEM

This installation involves the participation of people walking in the space, immediately activating the bio-luminescent algae according to the space being occupied.

Sensory inputs would be calculated through low-res IR sensors that capture motion as well as depth for each person in the space.

The data sets analyzed would actuate servo motors that reel algae bulbs, both disturbing and allowing the algae to illuminate.

Microphones would capture the sound strength in the environment, adjusting the speed of motors accordingly.

The data would prepare and navigate sets of bulbs according to a user without restricting any movement. This actuated network provides interaction while taking in account the users preferred path for moving around the space.
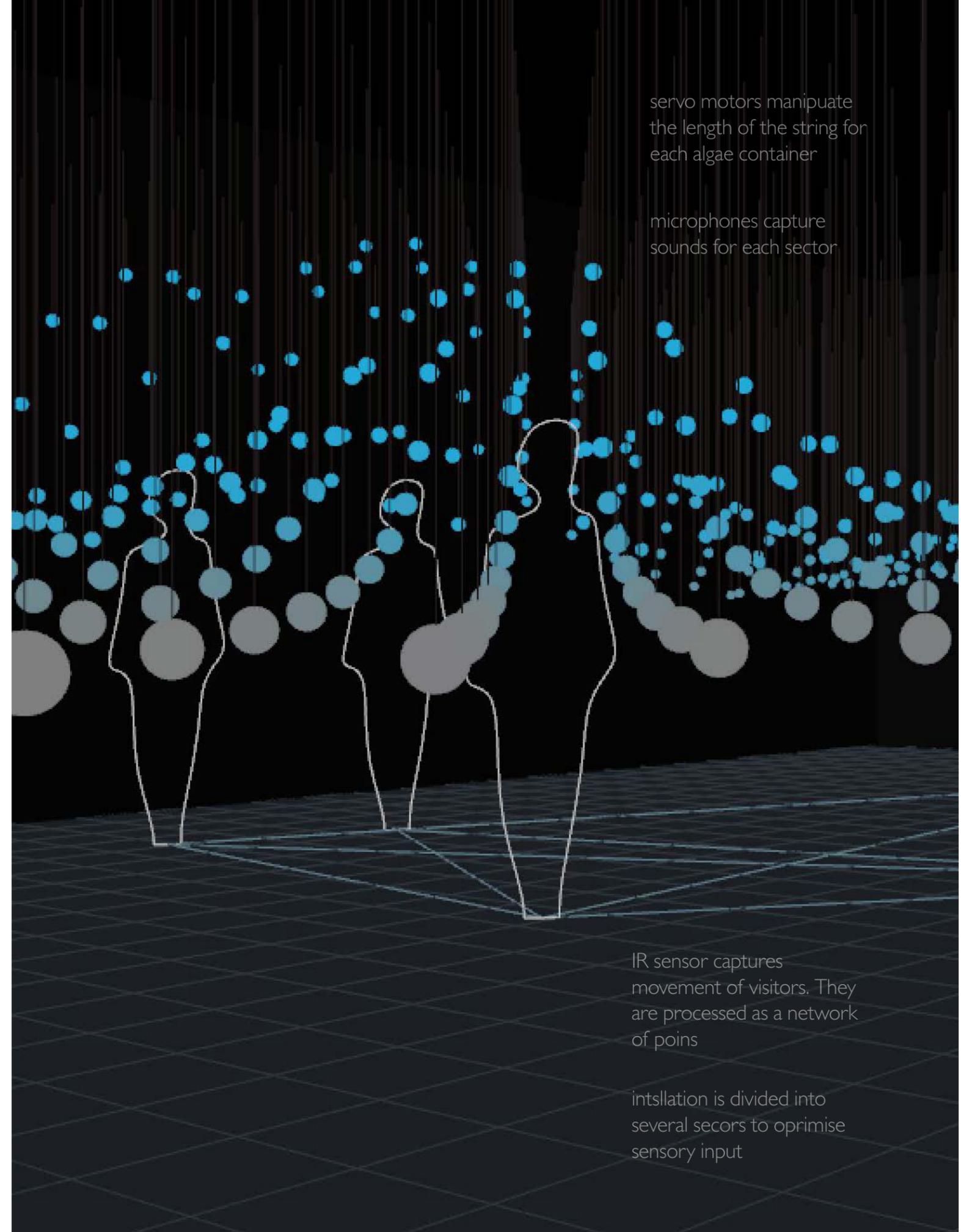
servo motors manipuate the length of the string for each algae container

microphones capture sounds for each sector

IR sensor captures movement of visitors. They are processed as a network of poins

intsllation is divided into several secors to oprimise sensory input

PROTOTYPE

ALGAE & INTERACTIVE SYSTEM

```
#include <Servo.h>

// class used for object oriented programming
class Sweeper
{
  Servo servo;              // the servo
  int pos;                  // current servo position
  int increment;            // increment to move for each interval
  int updateInterval;       // interval between updates
  unsigned long lastUpdate; // last update of position

public:
  Sweeper(int interval)
  {
    updateInterval = interval;
    increment = 1;
  }
//attach pin function
  void Attach(int pin)
  {
    servo.attach(pin);
  }
//detach pin function
  void Detach()
  {
    servo.detach();
  }
//resetting pin position
  void SetPos()
  {
    servo.write(0);
  }
//update method for moving servo in increments
  void Update()
  {
    if((millis() - lastUpdate) > updateInterval)  // time to update
    {
      lastUpdate = millis();
      pos += increment;
      servo.write(pos);
      Serial.println(pos);
      if ((pos >= 180) || (pos <= 0)) // end of sweep
      {
        // reverse direction
        increment = -increment;
      }
```

```
    }
  }
};

Sweeper sweeper1(18); // initialized servo objects and include increments
Sweeper sweeper2(17);
Sweeper sweeper3(16);
Sweeper sweeper4(15);

void setup()
{
  //serial begin and attach function calls
  Serial.begin(9600);
  sweeper1.Attach(6);
  sweeper2.Attach(9);
  sweeper3.Attach(10);
  sweeper4.Attach(11);
  //servo reset position calls
  sweeper1.SetPos();
  sweeper2.SetPos();
  sweeper3.SetPos();
  sweeper4.SetPos();
}

void loop()
{ //if loop for buton press == HIGH, perform the update method until stop, 24 loop iterations
      // used to ensure the current system would not be too conflicting
  if (digitalRead(2) == HIGH) {
    for(int i = 0; i < 24; i++){
      sweeper1.Update(); // maybe add delay between small amounts
      sweeper2.Update();
      sweeper3.Update();
      sweeper4.Update();
    }
  }
}
```
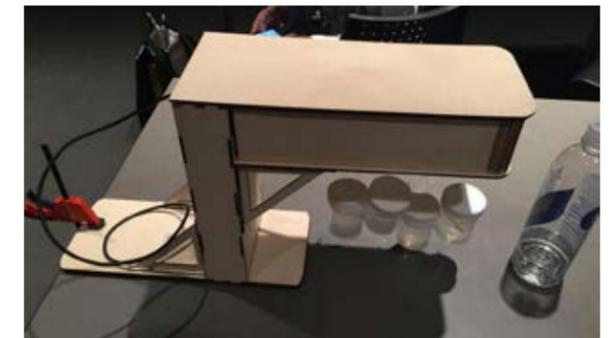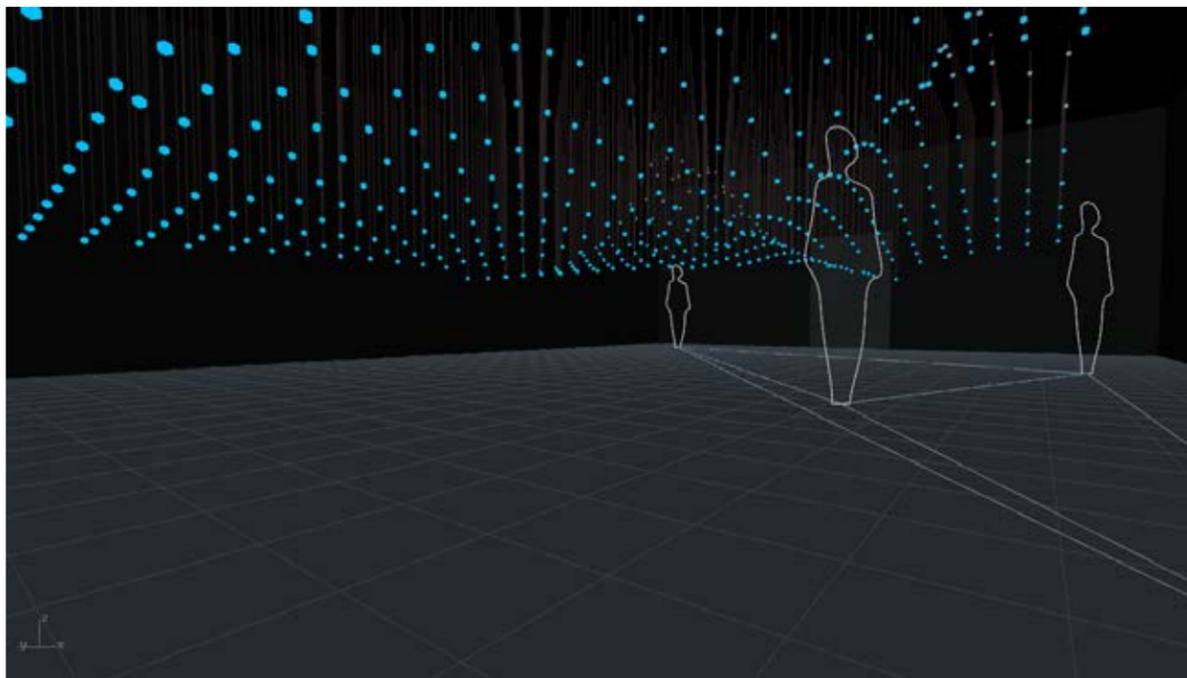

PTOTOTYPE CONSISTING OF

1 – SERVO MOTOR X 4

2 – ALGAE CONTAINERS X 4

3 – ARDUINO

4 – STRUCTURE

VIDEO

INTERACTIVE INTALLATION

https://youtu.be/VpK6F1LjltQ

REFERENCES

SIMILAR PROJECTS & RESEARCH

http://www.iflscience.com/environment/bioluminescent-bacteria-could-light-streets-paris/

The use of Bioluminescent bacteria found in squid to light up the streets, storefronts, and public places.

http://www.projects.science.uu.nl/urbanbiology/articlepagebiolum.html

Bioluminescence for to informing the community about potential of bio-actuation.

http://users.tpg.com.au/newnes/g/gwtun.htm

Showcase of a naturally occurring bioluminescent cave that attracts tourist.

http://inhabitat.com/river-glow-water-pollution-monitor-urban-art-installation/

Bioluminescent algae changing colors due to water pollution.