

# **Report**

## **Project Yoga Mat**

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### **Overview :**

The Idea of this project is to be able to Interactively do Yoga using a modern Embedded System . The Yoga Mat is a giant grid of Force Sensors . The Force Sensors resistance changes in accordance to the force exerted on it. The greater the force , less will be the resistance . This is used to detect regions on the Yoga Mat where force will be exerted . The Entire Yoga Mat is Divided into regions for the hands , feet and the Middle . Each Yoga Exercise would require different regions to be active .

A HTML 5 Instruction Video would be controlled in accordance with the user Interacting with the Mat . The Video would stop playing until the User steps on the correct regions of the Mat . Additional add ons Include a Breathing Bar which symbolizes the breath rate of a person doing Yoga and a Status Indicator which Indicates where the User steps on the Mat .

### **The Front End :**

Yoga Mat Project

Yoga Mat Project

file:///Users/ashokvaidyanathan/Desktop/index.html

Yoga Exercise Playlist

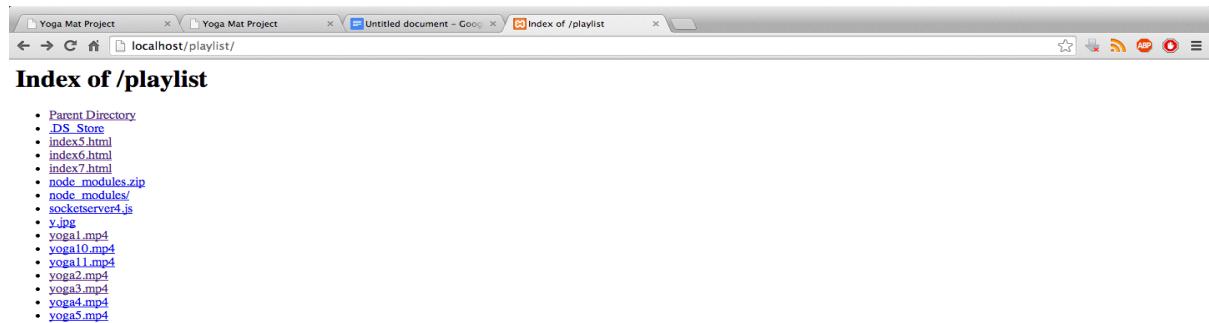
Salutation Pose  
Adho Mukha svanasana  
Vrksasana  
Virabhadrasana

The Yoga Mat Project  
By Ashok ,Smita , Chaitali  
Advised By: Professor Rahul Mangharam



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file:///Users/ashokvaidyanathan/Desktop/index.html#

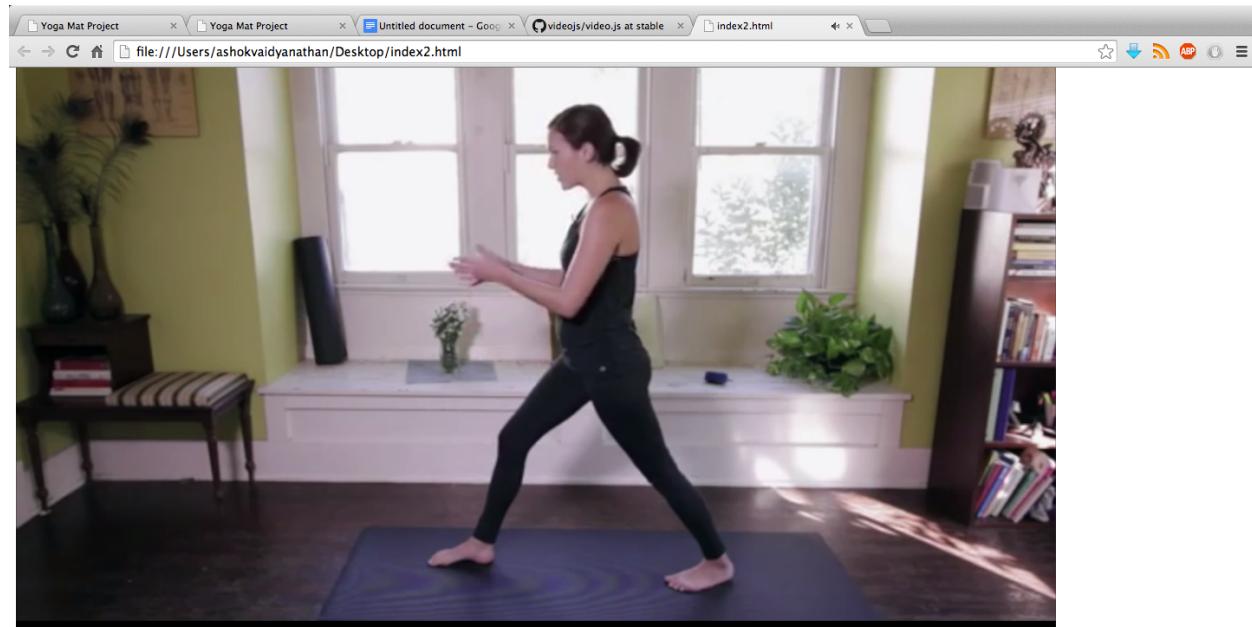
Emphasis was always on User Experience and there is a GUI which serves as an Indexer to all the available Playlist Video . The Videos themselves can be hosted on a Video Server I have used XAMPP to host the Video in a separate folder called PlayLists .



The Videos were Played used VideoJS and VideoJS youtube .

### Video JS Full Library Source

Example of the Video Played with Appropriate Settings in Video JS



Regions Schematic:



Video JS is an open source HTML5 Video Player . The API in Javascript can be used to control the settings of the Video like Screen Size and furthermore , it can be tweaked to get parameters like current time and Javascript Events like Video Paused or Video Finish which can trigger events in the Document Object of the HTML5 Web page.

Example Code for setting the Video configurations using Video JS Youtube :

```
<video id="example_video_1" class="video-js vjs-default-skin" controls
    preload="auto" autoplay="autoplay" loop="loop" width="1200" height="700"

    poster="http://ec2-54-227-116-247.compute-1.amazonaws.com/models/site-templates/images/co
    ver_img/ted_cover.jpg"
    data-setup='{"techOrder":["youtube"],
    "src":"https://www.youtube.com/watch?v=5F56V93lU8k"}'
</video>
```

Example Code for Setting the Video Configurations using Video JS for a hosted Video :

```
<video id="ex1" class="video-js vjs-default-skin vjs-big-play-centered"
    controls preload="auto"
    autoplay="autoplay"
    width="1200" height="700"
    poster=""
    data-setup='{"controls":true}'>

    <source src="http://localhost/playlist/yoga5.mp4" type='video/mp4' />

</video>
```

The Red circles you see are Status Indicators when a person steps on the Mat in the appropriate region . The Mat itself is divided into three regions and each circle represents a Region on the Mat . When a person steps on the Mat the Circle turns green and when he gets off the mat the circle turns red.

Javascript Code has been written that paints and repaints the circles red and black when listening to appropriate Javascript Events.

## NODE JS WEB SERVER

The Node Javascript server listens on ports 7778 and 7777 for the Clients from the Yoga Mat and the Web Client.

The Server listens on port 7778 for appropriate Encoded messages sent from the Yoga Mat depicted as a Binary number from 000 to 111 which depicts whether regions1,region2,region3 are being stepped on .

The Server records each event and sends an appropriate HTTP WebSocket event when it detects each status . The Web Client listens to some of these events depending on the meta data encoded into the Video in terms of XML Time Stamps . By Using the API of VideoJS we can compare the current time of the video with the timestamps in the XML File and change the Entire Yoga Mat into a state Machine

Sample Source Code :

```
io.sockets.on('connection', function (socket) {  
  
    //log address of received connection  
    var address = socket.handshake.address;  
  
    console.log("New connection from " + address.address + ":" + address.port);  
  
    //send out javascript events to clients to indicate mat status  
    if(flag7 == 0)  
    {  
        socket.emit('news7' , {test:"success!"});  
        flag7 = 1;  
    }  
  
})
```

Polling Configurations (Long Polling ) :

After a lot of Tweaking with the polling configurations , the most appropriate long polling have these configurations :

Polling Period : 10 seconds

Socket IO Timeout : 3 seconds

Polling Method : xhr-Polling

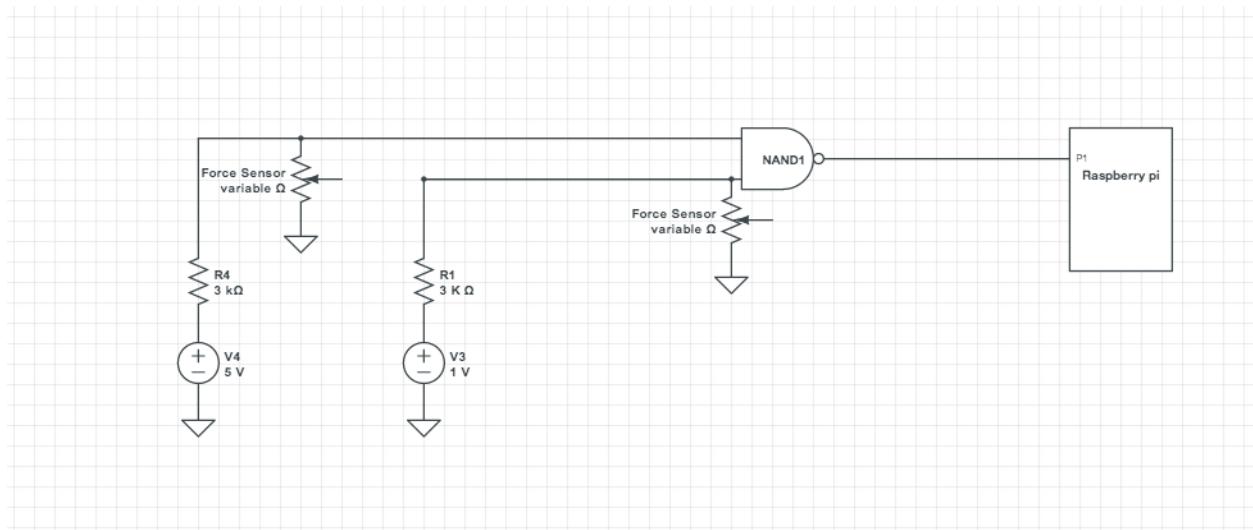
## **Web Client and State Machine :**

The Web Client uses long Polling to periodically poll the server for status updates on when the person steps on the Mat . The Polling Interval is set for 1 second .

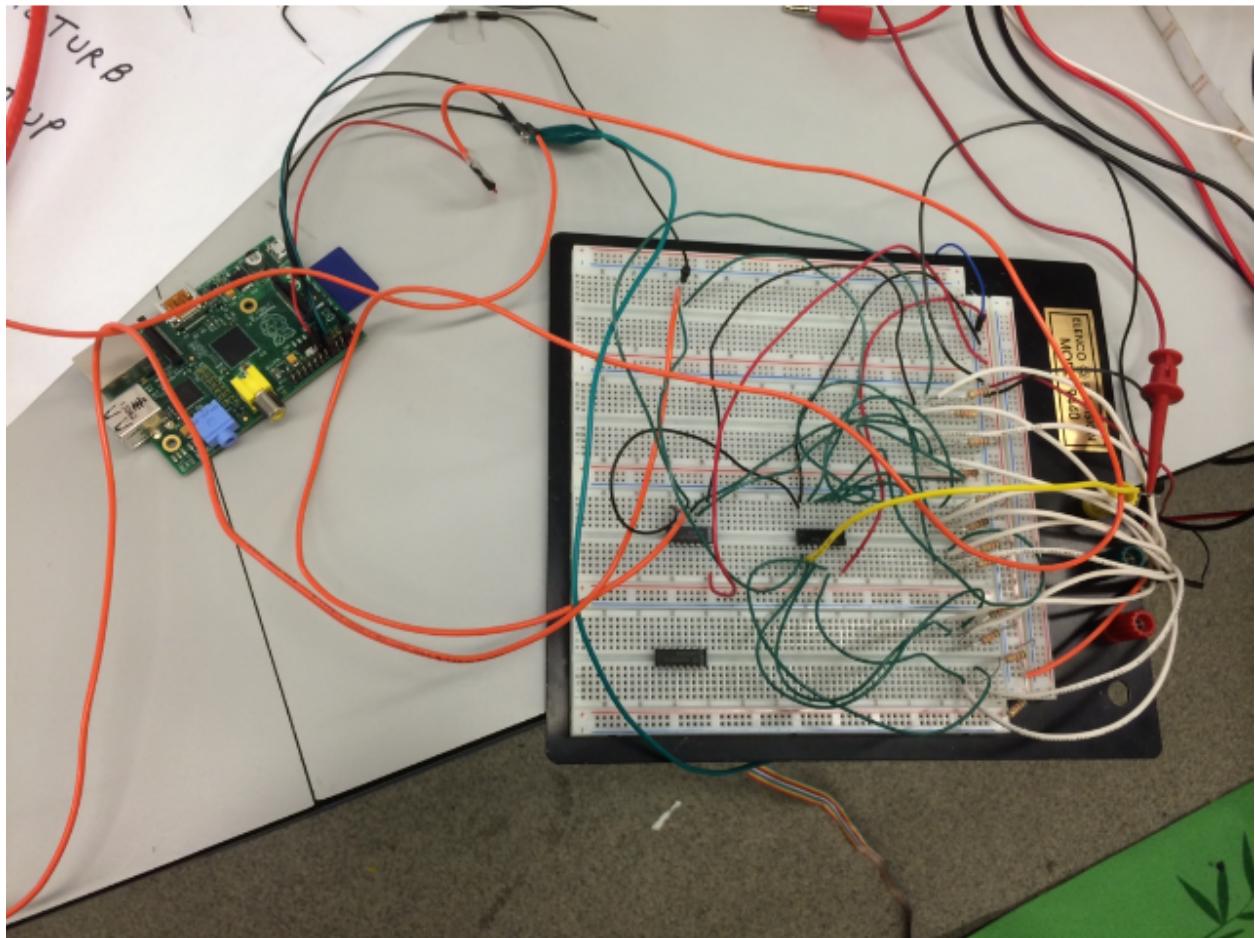
The Web Client can Listen to different Javascript events depending on an DOM Object which is populated using the timestamps in an XML file which can be configured by the User.

## **The Yoga Mat and Pressure Sensors**

Pressure Sensors are connected below the yoga and connected to a Logical Circuit and output of the circuit is fed to the raspberry Pi at Input Pins P9 , P10 , P11.

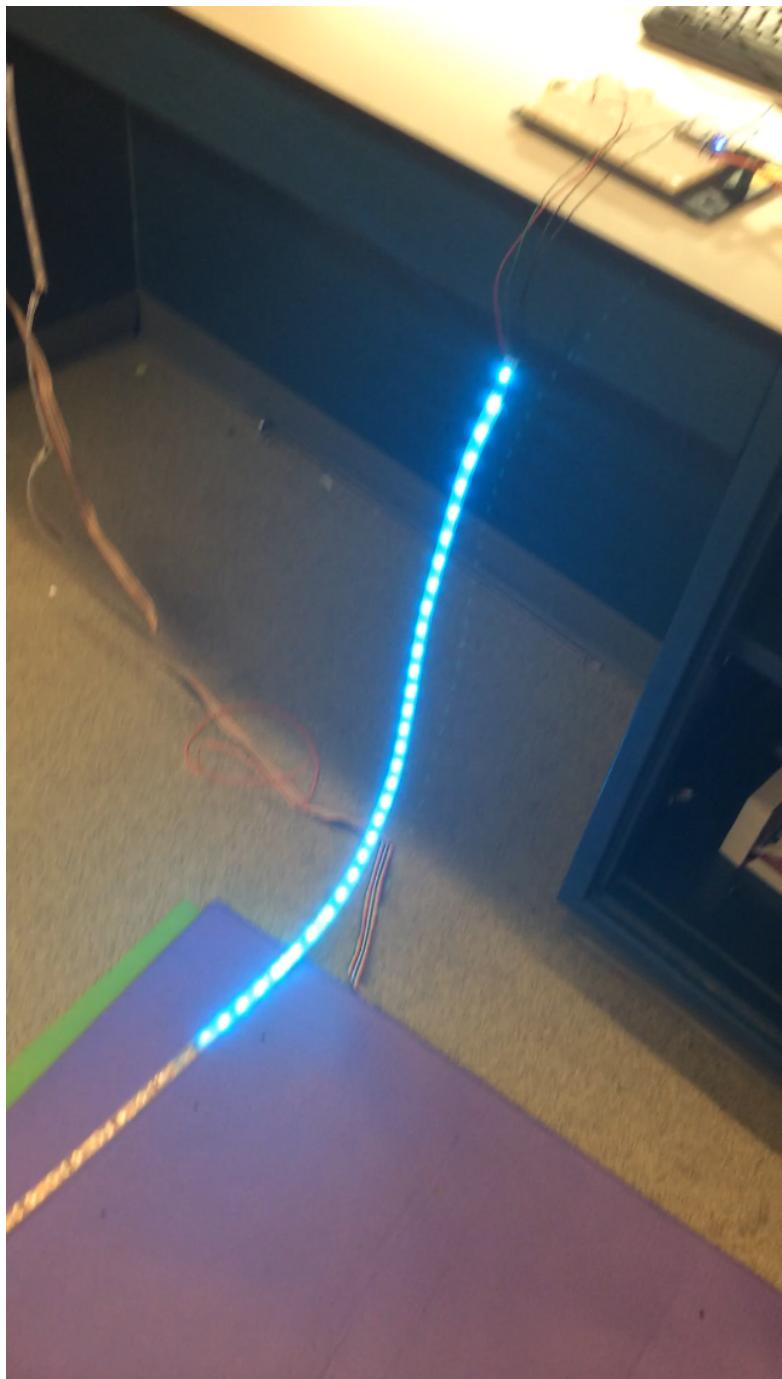


A schematic has been shown. There are several Force sensors from the yoga mat and they are multiplexed using IC 7420 and given to the raspberry Pi and the outputs of the IC 7420 are given to Mbed to control the LED System .



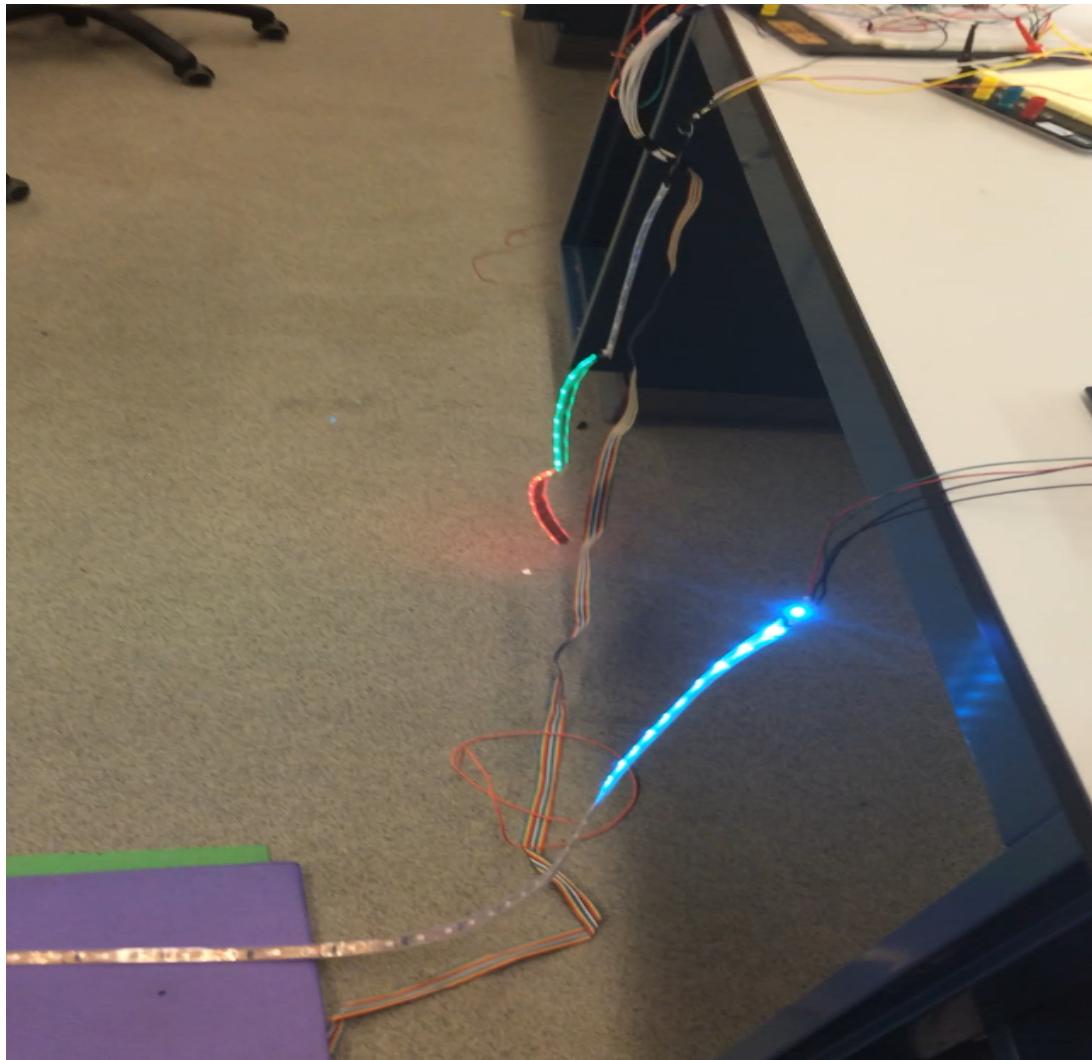
### Breathing Bar

The Breathing Bar is a strip of Addressable LED that is calibrated to simulate a breath rate . An exhalation and Inhalation is calibrated into the breathing bar .

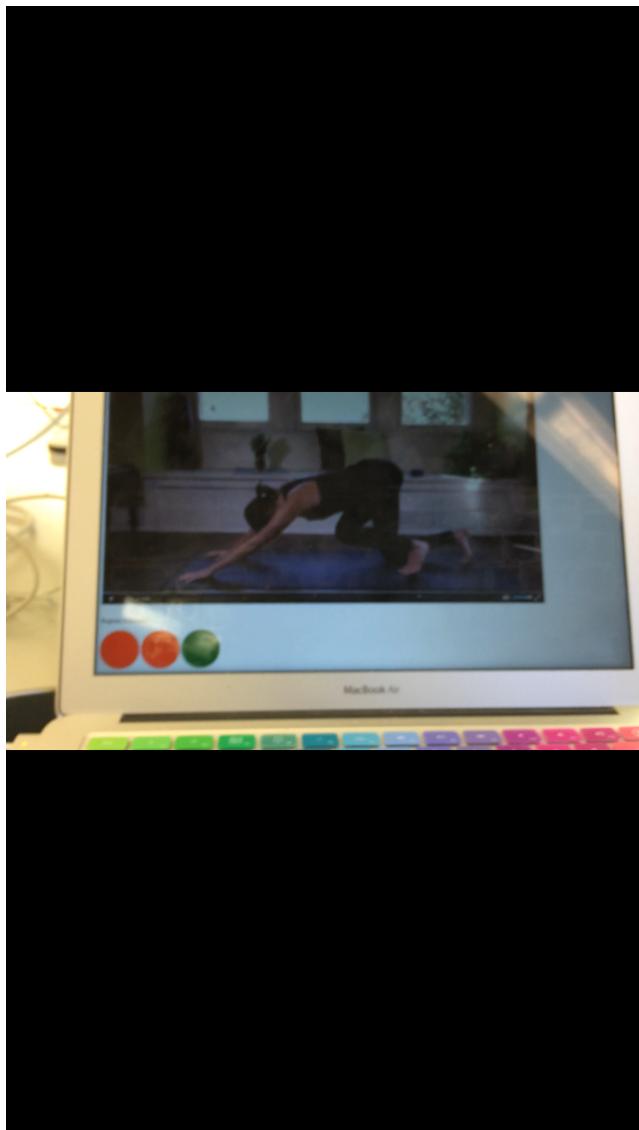


## Status Indicators

Real Time status Indicators are built into the web page and also Indicated using LED Segments .



In this Schematic I am stepping on Region 2 and Region 3 of the Mat.



In this Schematic . I am stepping on Region 3 of the Mat.

### **Special Acknowledgements**

This Project is only possible due to Professor Rahul Mangaram and is designed in mind to be part of Project Interactive TV , the goal is to create an Innovative product that has never been built before and bring Interactive Television to the forefront