

# Portfolio



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<http://www.suneetsharma.in>

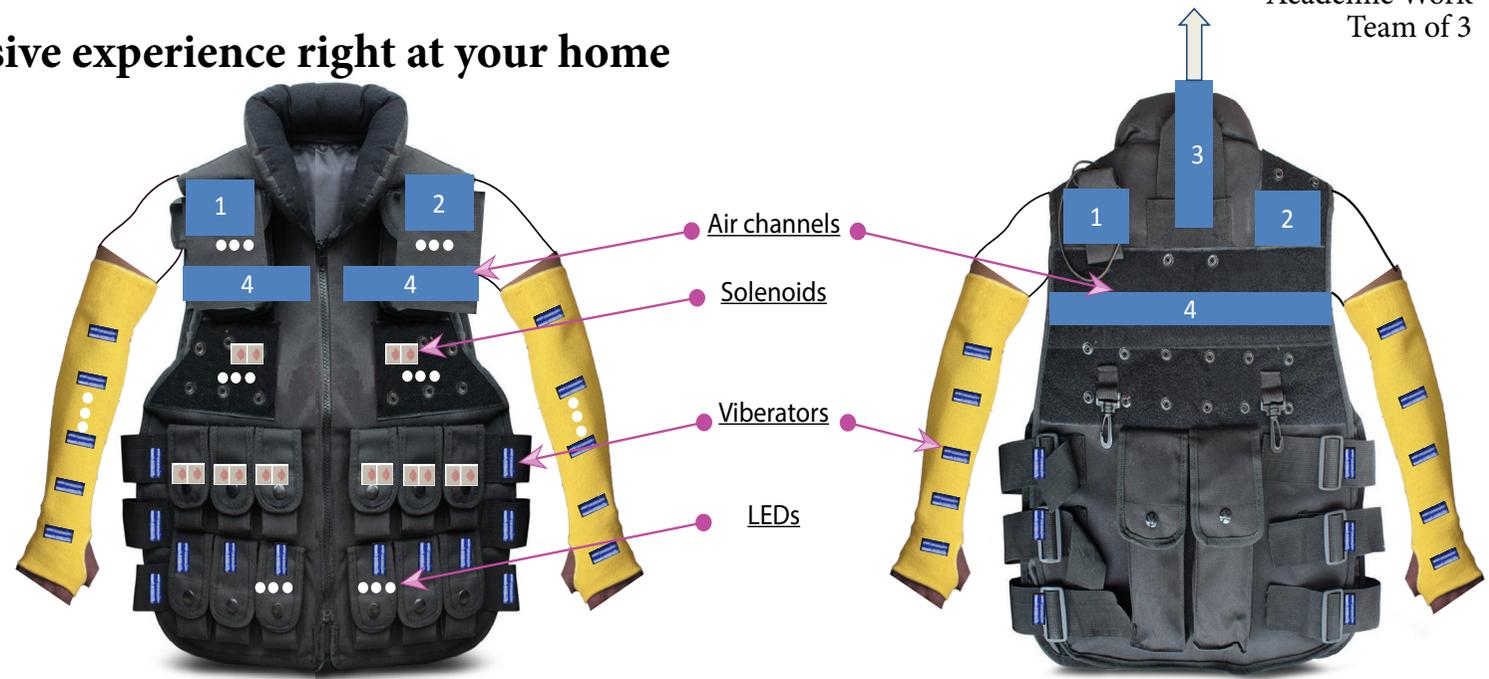
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# Vest bringing immersive experience right at your home

Imagine!  
Explosions rattle you, the blades of your attack chopper thump in your chest, warmth of hugs mesmerize you, tickling sensation makes you laugh, and chill at your back air warns you for creepy danger ahead. It is the next generation of environmental realism.



- Actuators:**  
 38 vibrators  
 12 solenoids  
 07 Air cuffs  
 24 LEDs  
 (81 - total)

Vest provides 4D immersive cinematic experience by reading closed caption file, coming from the media into pinpointed high-definition feedback that allows you to feel the on-screen action and environmental factors.

## System components: Hardware



Vest



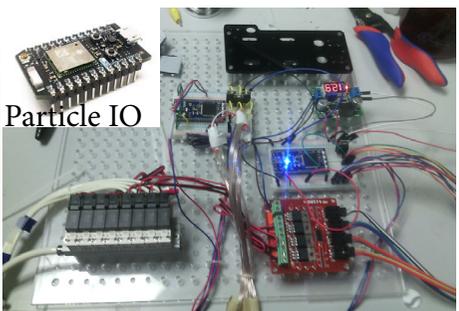
Sleeve



Soft molded Air channel



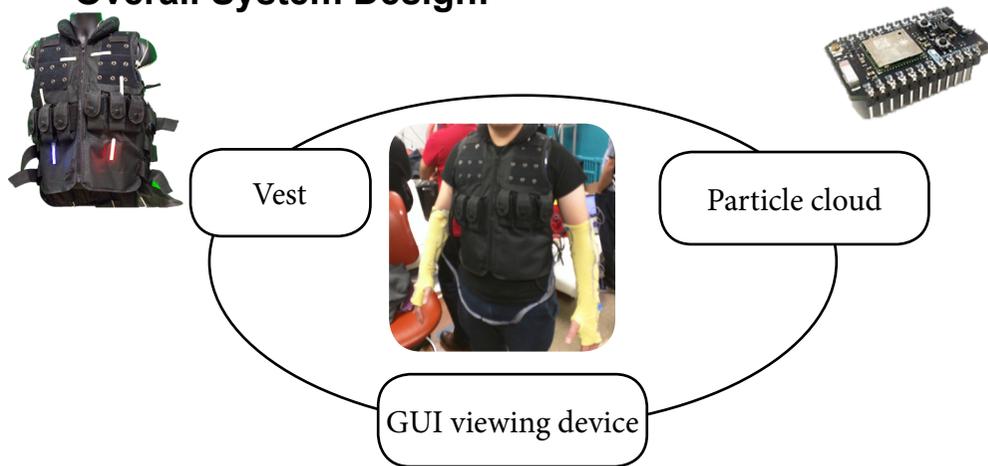
Air cuffs



Fluid Control board

# Vest next generation of environmental realism

## Overall System Design:



First user interface uses zone mapping to allow you to click on the image in the left to feel various sensation by sending command to the particle cloud.

Second interface does much of the same thing, but only in a per-programmed manner, which uses the time stamped video to send the same commands, but only for our per-programmed sensations.



The responses coming back from the particle cloud which highlight the active areas on the right side in both interfaces actually come from a particle cloud service that is similar to an RSS feed which we have programmed to describe what the particle is doing and for how long it is actuating.

## Software:

Two graphical user interfaces

- Java script
- HTML5

Embedded System (micro controller - particle IO)

- C++

Networking

- Able to be commanded from the cloud

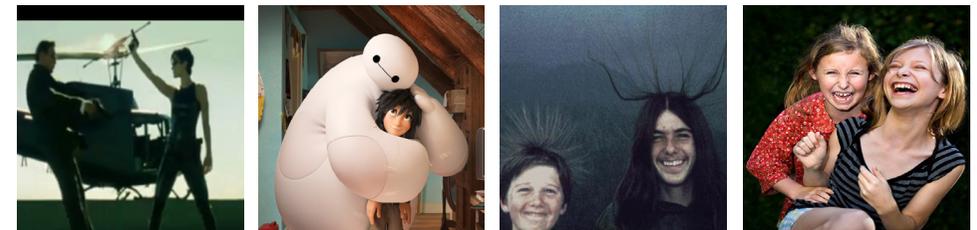
Time stamping Video (created closed caption)

- HTML5
- JSON: Java-script Object Notation.

## Interaction:



Different part of the vest is actuated depending upon the running media content to create various sensations like shooting, hugging, tickling etc.



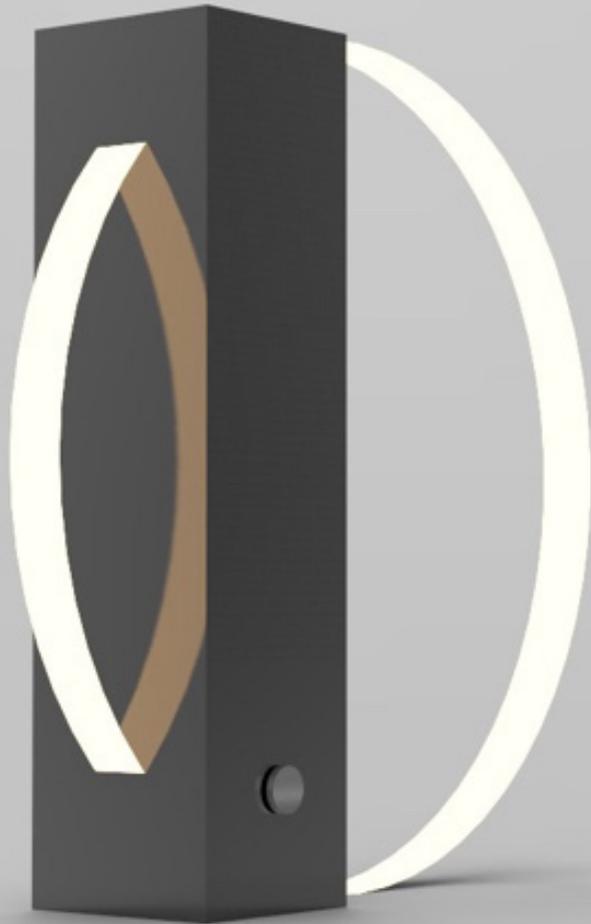
## Step by step blog:

<https://ese519vest.wordpress.com/>

## Demo videos:

<https://www.youtube.com/playlist?list=PL3bkrh9dozctFggMvQX77dXTphh06zyGP>

# aura mindfulness product



Mindfulness bedside companion, that progressively wakes you up and delivers dynamic mindfulness content to a user every day.

## Approach & problem

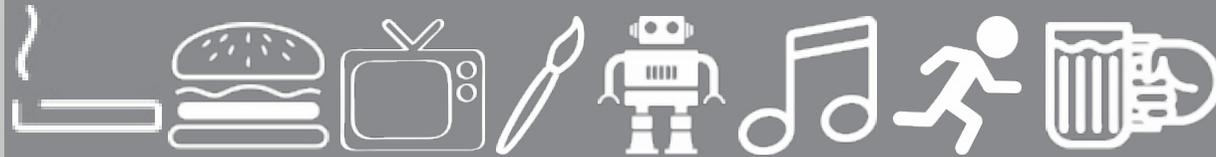


AcademicWork  
Team of 2

As we were need-finding, we noticed that people have a lot of stuff but this stuff isn't making people any happier instead making them more anxious and more distracted than ever before. We want to make a product that makes people more mindful, and changes the way they see the world.

## Primary research

First we approached students and professionals to understand their daily routine, what they do when they are stressed, and activities which makes them happy or mindful or helps in behaviour change.



People mostly shared things which brings sort term extrinsic happiness, which is ephemeral. To get deeper sense of meaning we interviewed spiritual leaders, academics, Yoga gurus and mindfulness scientists, to figure out what we should focus on.



Personal meaning



Mindfulness



Behavioral change

## Secondary research

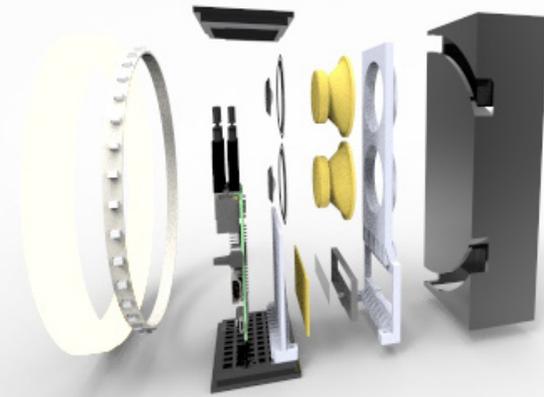
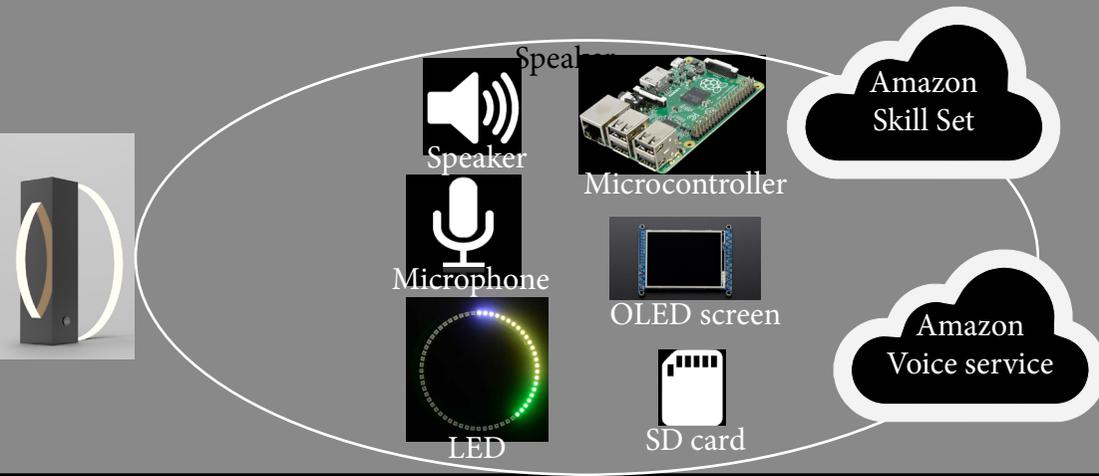
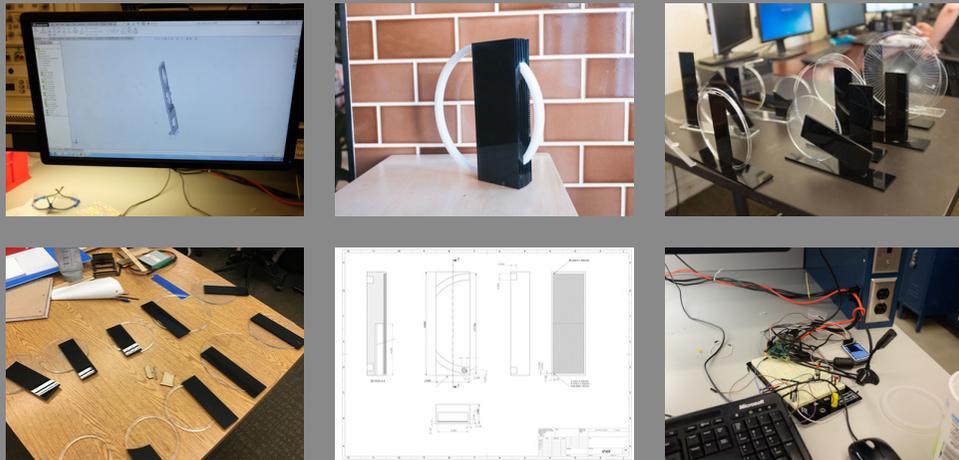
Now we did a deep dive in happiness literature to understand the difference between short term happiness and long term fulfillment.

I.e. flow (mihaly csikszentmihalyi), man's search for meaning (victor frankl), happiness hypothesis (jonathan haidt), learned optimism (martin seligman), mindful work (dan gelles) and search inside yourself (chade-meng tan). Apart from it we followed various religious texts such as hinduism, buddhism, and judaism as well as various blog threads.



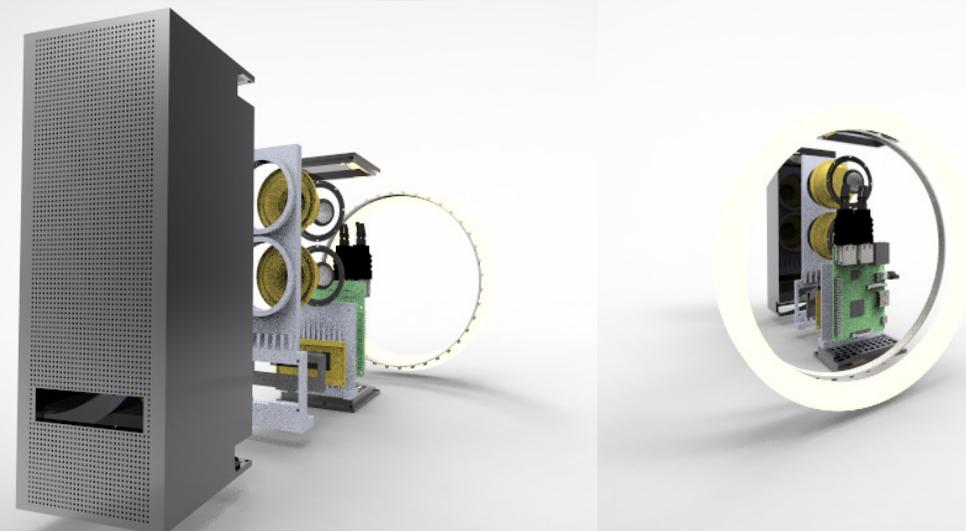
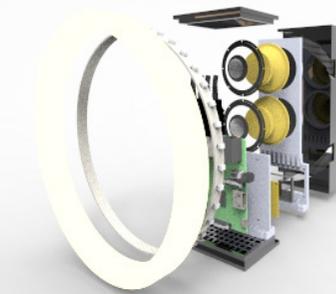
## Testing and Prototype:

- Our prototype has two speakers, a Raspberry Pi 3, a capacitive touch sensor, a microphone, and a ring of LEDs.
- The Raspberry Pi is running the Amazon Alexa Voice Services API.
- To prototype the form, we CNC machined a solid aluminum block, and 3D Printed an internal frame to house the electronics.
- For content and the alarm functionality, we are building our own Alexa Voice Skill written in Javascript.
- We're partnering with content providers, like Whil for the guided meditations.
- We've designed injection molds so that we can manufacture at scale.



## aura

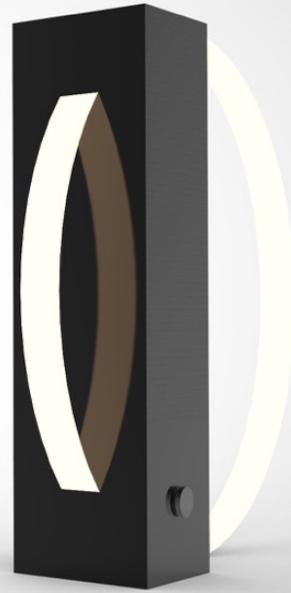
Mindfulness bedside companion, that progressively wakes you up and delivers dynamic mindfulness content to a user every day.



## Interaction

Just tap and talk.

- Tap the base.
- Controlled by voice.
- Hidden screen.



## 2. Mindful Moment = Positive Thoughts

### Level One

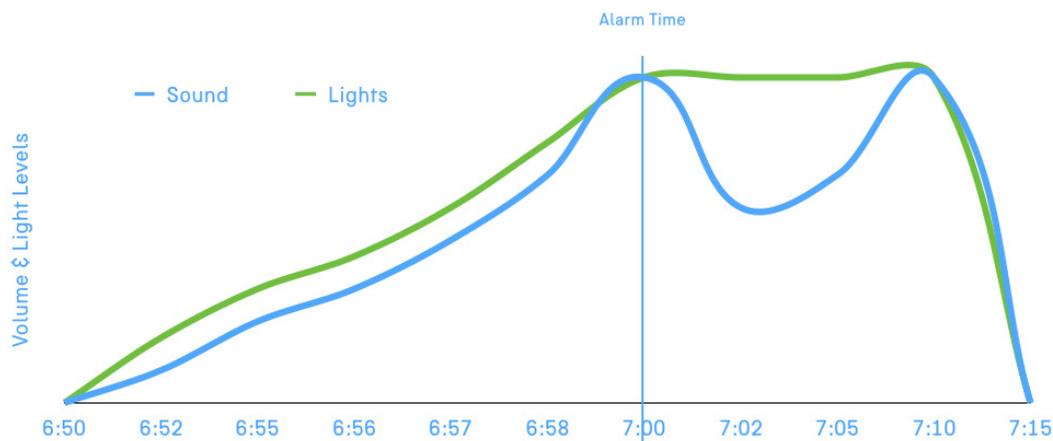


- 30-90 seconds quote of the day.
- General 'wisdom' category.
- New bit every day.



## 1. Ease People Out of Bed

Use **lights** and ambient **sound** to gradually wake somebody up.



## Beyond the Alarm

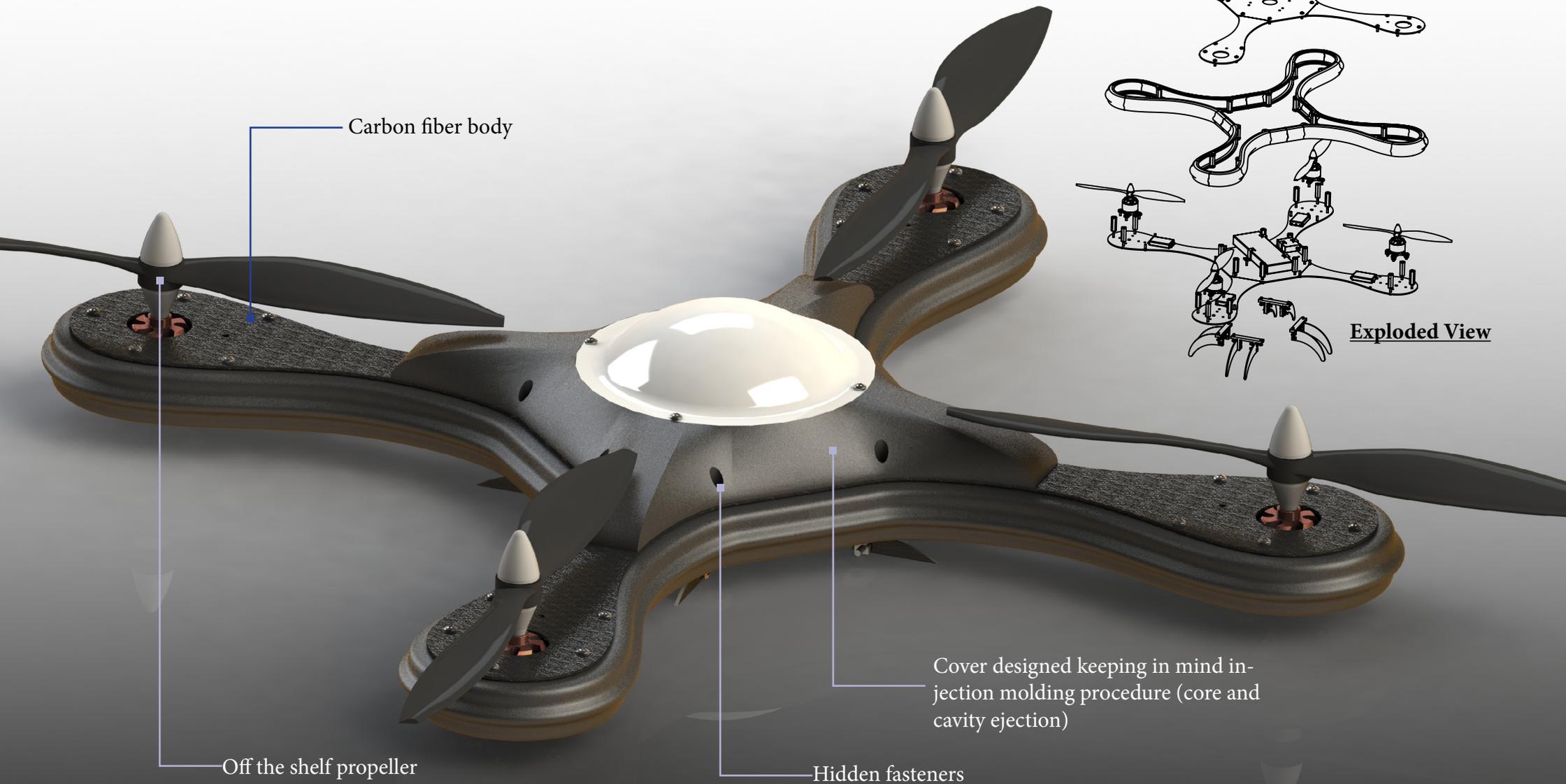
### Level Three



- 5-10 Minutes
- More robust content.
- The idea here is to scaffold users into a daily meditative practice.
- Content is provided by a partner like Headspace or Whil.

# Quad Copter

Aerodynamically designed Quad copter using off the shelf components.



# Quad Copter

## Design Details

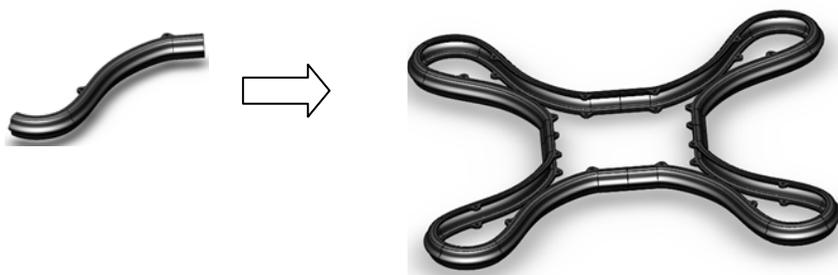
- Cover is made keeping in mind injection molding process, simple core and cavity ejection for all the plastic parts even though having complex curvatures.



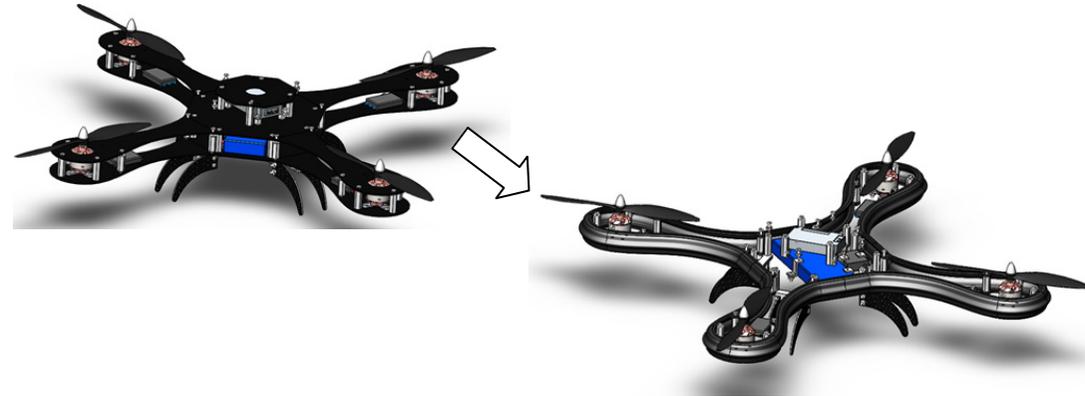
- Below part needs side core for the hole which could be drilled in the post processing to keep the overall process simple.



- 8 Body parts joined together to make the whole assembly simple and easily moldable.



- Cover is attached to the main frame by means of standoffs and doesn't impact the working of quad copter. Cover is removable and could be easily removed and assembled independently without disturbing other components.



- Frame is made of carbon fiber to keep it light which is laser cut to the shape.



- Brackets are the only machined part in the whole assembly which is also very simple to cut in to the shape. Attachment is made of carbon fiber to keep the overall weight light.



# Demand Response advisor



Demand Reponse advisor is a Data-Driven Modeling and Control tools for Cyber-Physical Energy Systems.

DR-Advisor provides a model based control with regression trees algorithm (mbCRT), which allows us to perform closed- loop control for DR strategy synthesis for large commercial buildings. It as well acts as a recommender system for the building's facilities manager and provides suitable control actions to meet the desired load curtailment while maintaining operations and maximizing the economic reward.

## My Responsibility:

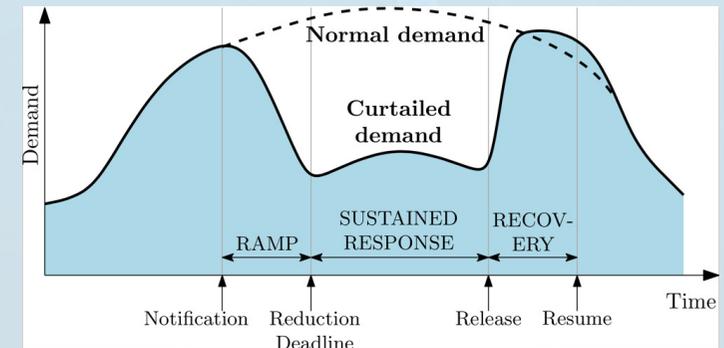
I am involved in experience design and implementation, including **UI/UX** and **server-side communications** for DR-Advisor, a revolutionary web based machine learning solution that enables smart, prescriptive responses to fluctuations in enterprise energy prices.

Singularly responsible for dashboards/visualization, controls & measures, interaction design and server-side communications. The solution provides smart power consumption predictions and control actions for meeting the required load curtailment while balancing economic reward and user comfort parameters.

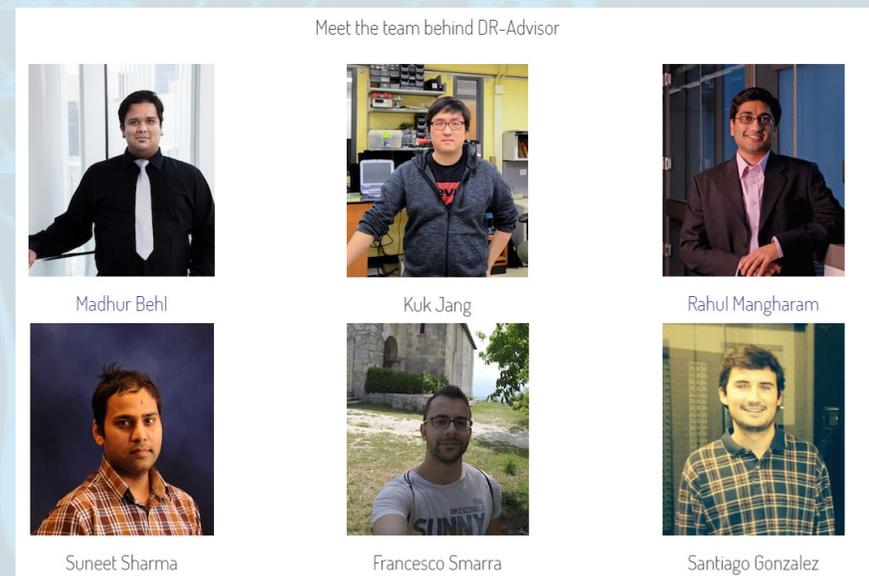
## Awards:

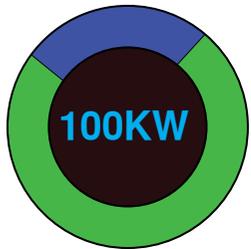
- DR-Advisor achieves 92.8% to 98.9% pre- diction accuracy for 8 buildings on Penn's campus.
- DR-Advisor ranked 2nd in Ashrae's benchmarking data-set for energy prediction in comparison to other data driven methods.
- DR-Advisor is the winner of the \$50,000 top prize at the 2016 Allegheny Cleantech University Prize.

<http://mlab.seas.upenn.edu/dr-advisor/>

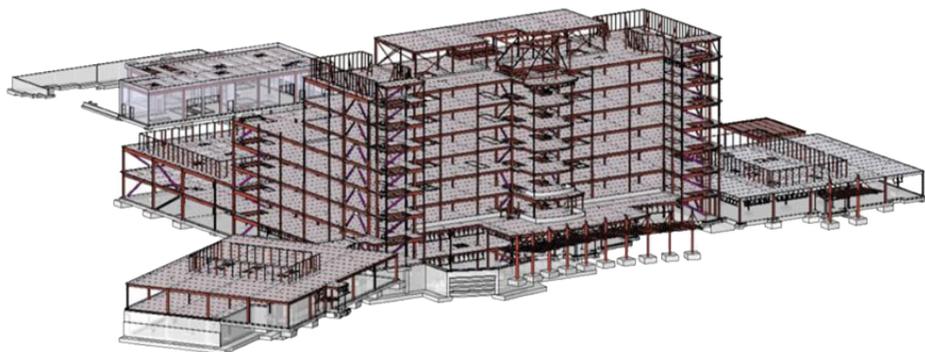
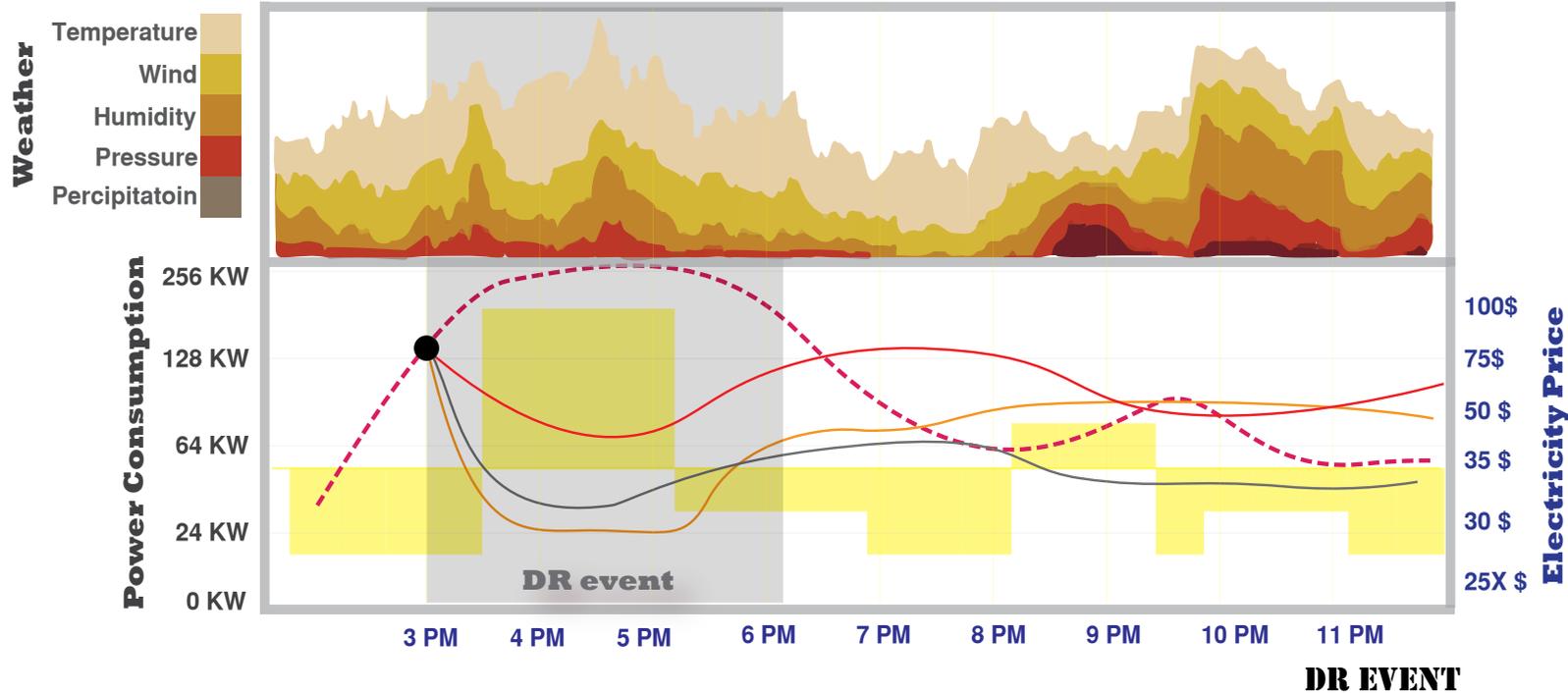
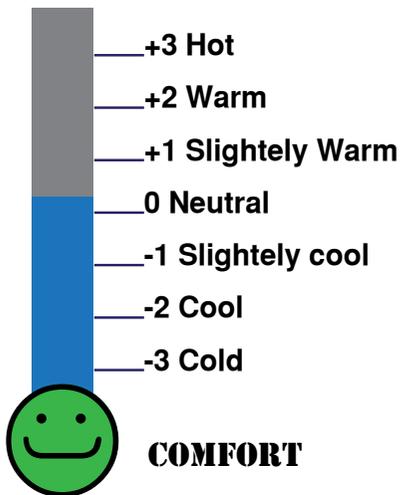


DR programs involve a voluntary response of a building to a price signal or a load curtailment request from the utility or the curtailment service provider (CSP). Upon successfully meeting the required curtailment level the end-users are financially rewarded, but may also incur penalties for under- performing and not meeting a required level of load curtailment.



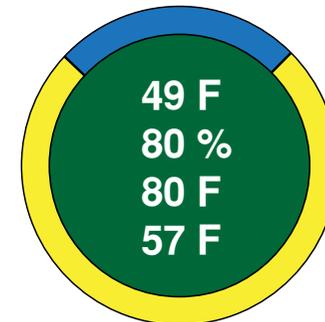


**TARGET CURTAILMENT**



**BUILDING INFORMATION**

Chilled Water	49 F
Lighting Level	80 %
Zone Temp	80 F
Supply Air	57 F



**CONTROL**

# Water purification system



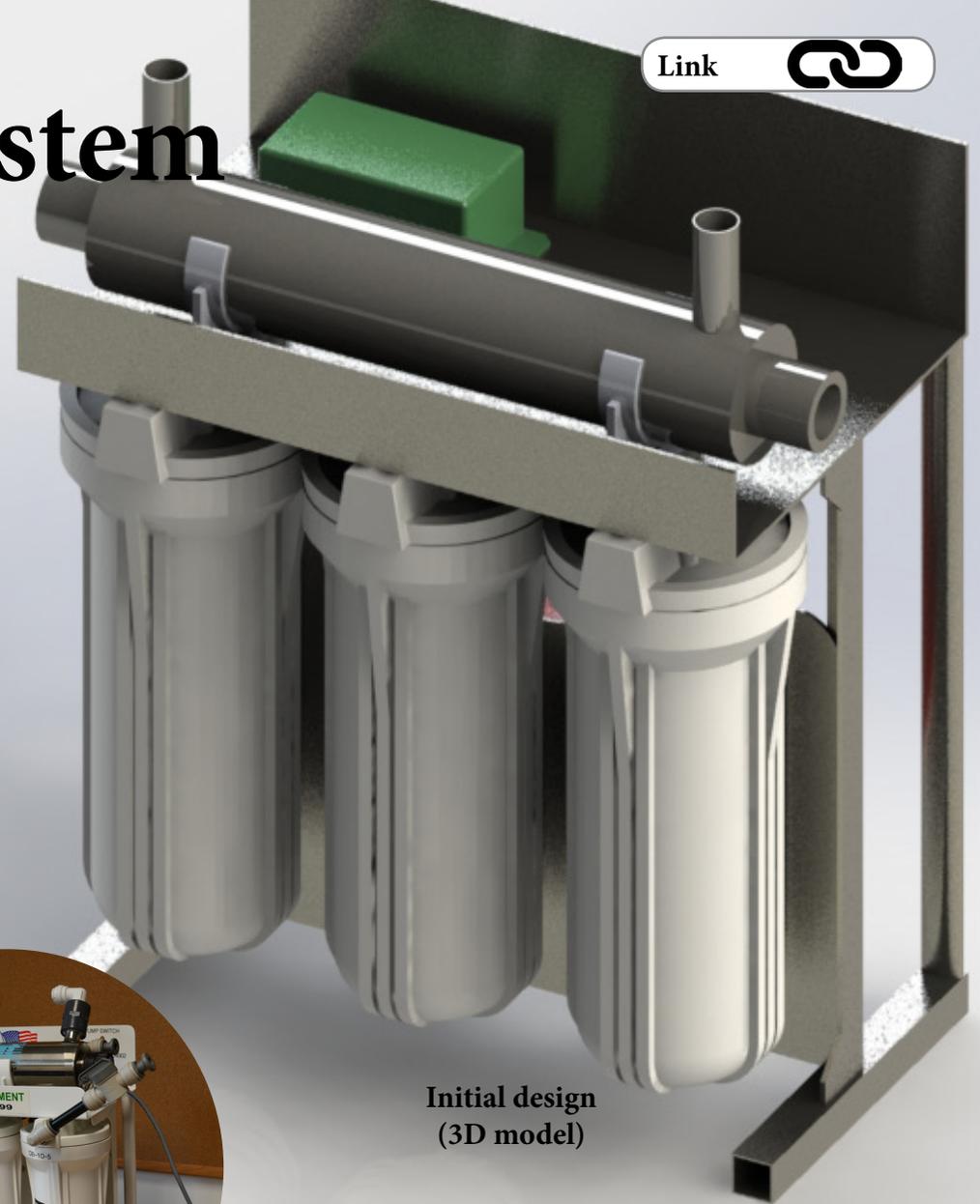
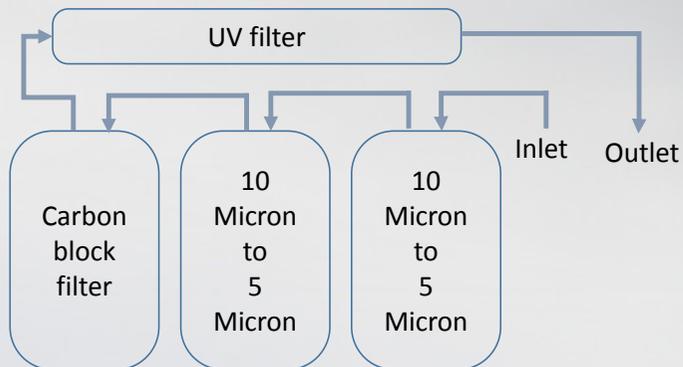
<http://oneworldenvironment.com/>

Voluntary work at One World Environment, which is a NGO focused on developing and deploying water technologies that meet the unique requirements of the developing world.

## Problem Statement:

Developed a space-efficient, rugged, modular and innovative design, one that is easy to assemble, disassemble, and maintain.

## Block Diagram:



Initial design (3D model)



Initial working prototype

## Present Developments:



### When to change the filter:

Very simple App where you store update the information when you have changed the filter, It sets the reminder at the predetermined interval and prompts user to change the filter.

User takes the snapshot of the filter when prompted to change the filter and App updates the expiry depending upon the condition at that time.

App also helps to troubleshoot the system as well gives step by step assembly instruction in local language.

Exploring alternate system with pressure gauge, which will notify user on changing filter by measuring the pressure difference.



New
60 Days
45 days
30 Days
15 days
10 Days
5 Days
Change

### Ergonomics and Safety:

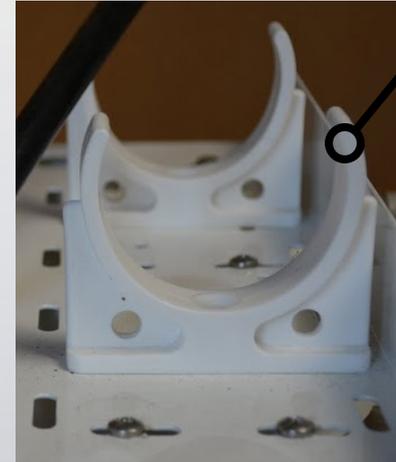
Exploring alternative compact forms which could be easily transported and assembled on site.



### Off the grid:

Affordable off the grid solution.

## Features:

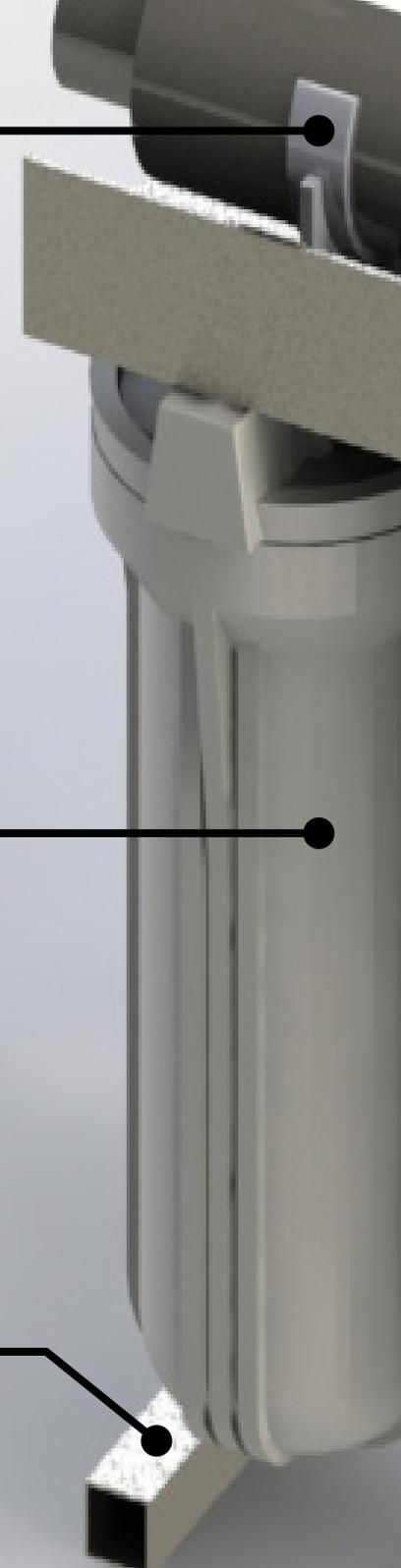


Ease of assembly: Clip interface



Easy access to filter, only 1 tool required one system is in place for maintenance.

Off the shelf parts, assembled using standard fasteners.



# Rehabilitation gym

Research Assistant

<http://www.med.upenn.edu/rehabilitation-robotics-lab/>

Link

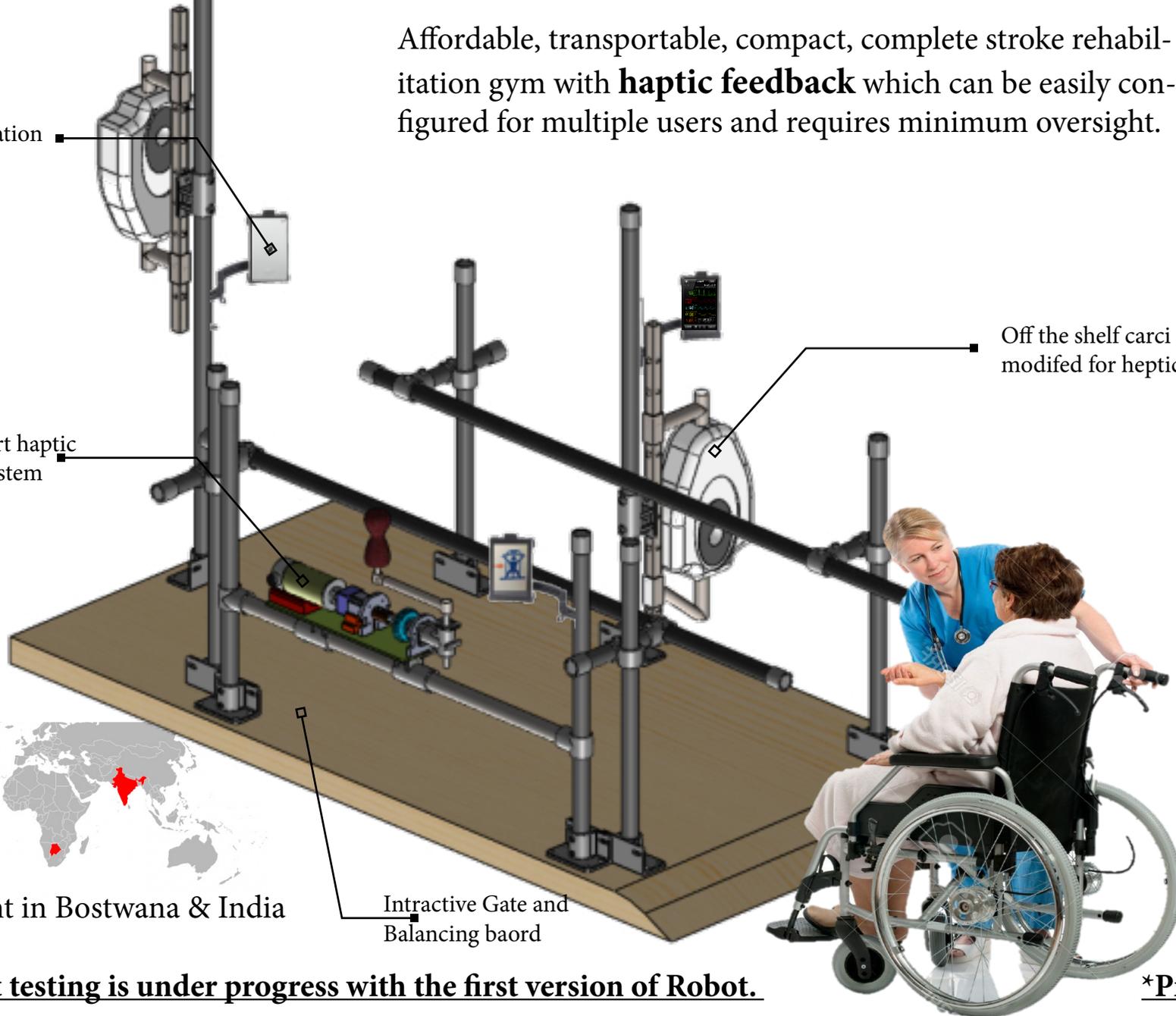


Affordable, transportable, compact, complete stroke rehabilitation gym with **haptic feedback** which can be easily configured for multiple users and requires minimum oversight.

Telerehabilitation

State of the art haptic theradrive system

Off the shelf carci system modified for heptic feedback

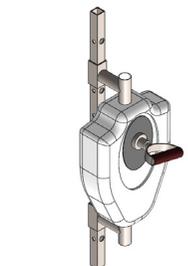
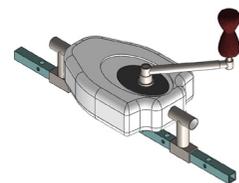
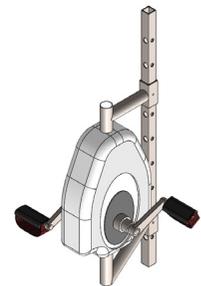
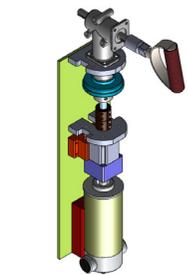
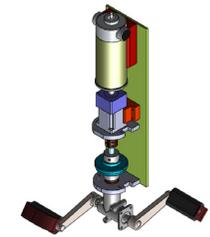
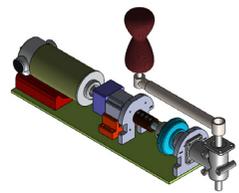


Deployment in Bostwana & India

Intractive Gate and Balancing board

\*Subject testing is under progress with the first version of Robot.

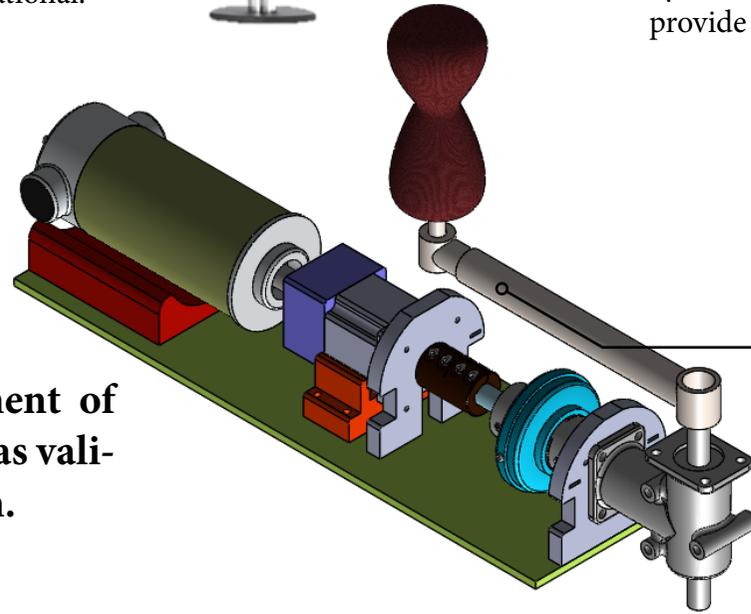
\*Provisional Patent filed



**Gamification** is an important concept to engage the user when performing the task and making the session fun, engaging and motivational.

**Tele rehabilitation** optimizes the supervision required by skilled doctors, keeps the user daily statistics and provide them the correct way of doing the exercise.

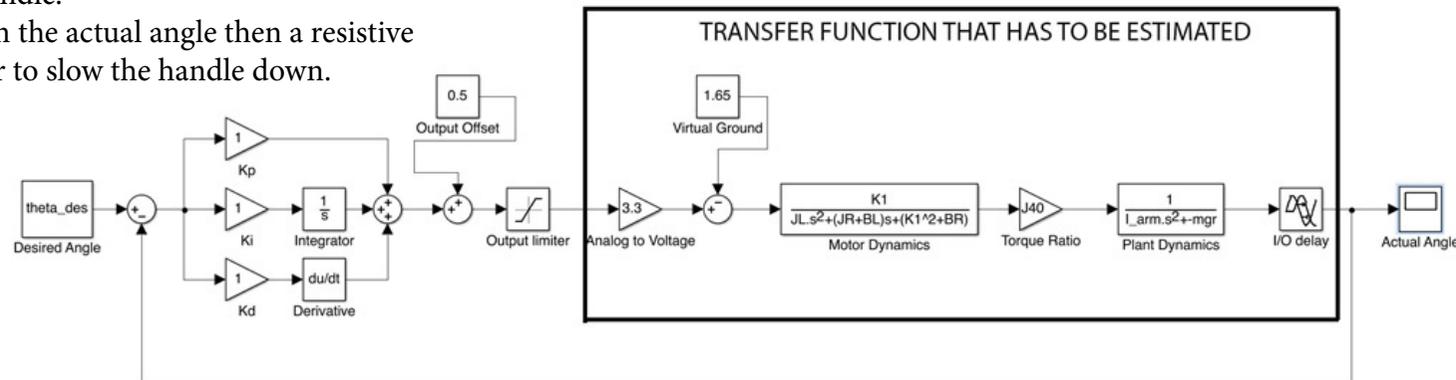
**I Lead design and development of “Rehabilitation Gym” as well as validating haptic feedback system.**



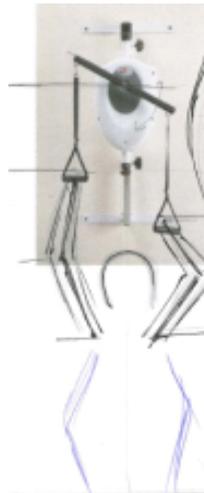
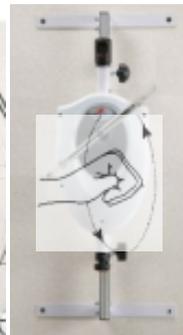
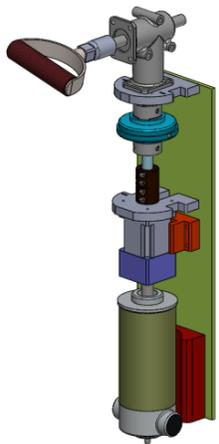
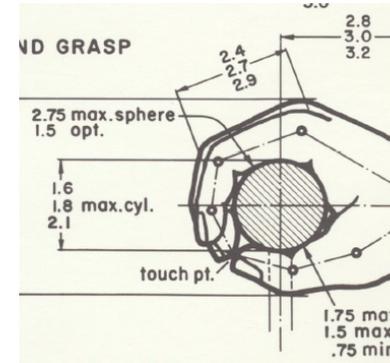
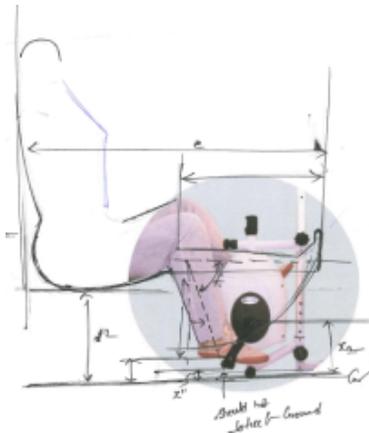
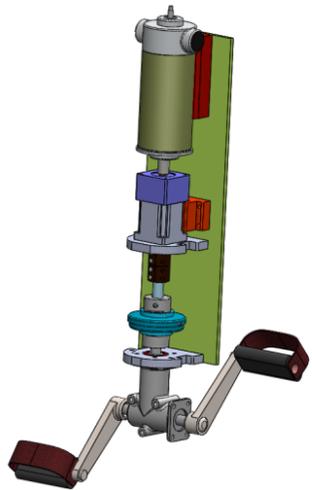
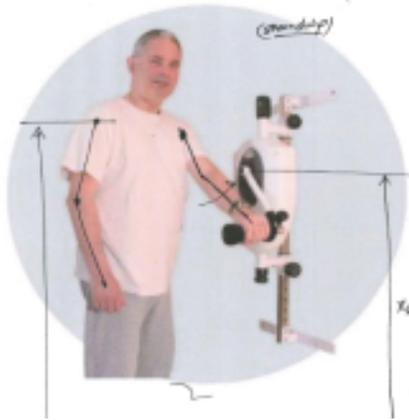
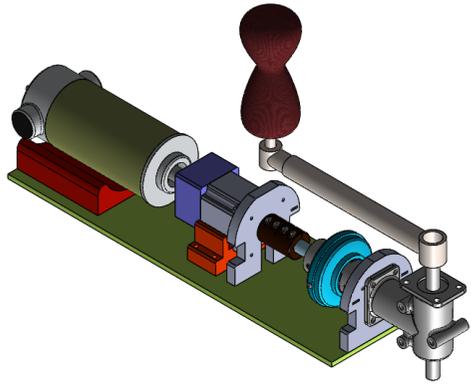
**Adaptive feedback (assistive or resistive)** helps the user to perform the task by providing assistive or resisting system torque based on user performance

**Block Dia of the TheraDrive Contoller Design**

- If the desired angle is less than the actual angle then torque is provided by the motor to move the handle.
- If the desired angle is more than the actual angle then a resistive torque is provided by the motor to slow the handle down.



# Anthropometric Design:



Designed for 95 Percentile population (5% & 95%)

Source: Henry Dreyfuss source book

# Mobile Service Robot for Elderly people

<http://www.med.upenn.edu/rehabilitation-robotics-lab/>

Research Assistant



I am leading human centered design, need finding, survey analysis, and design validation activities for NSF Grant entitled “Affordable and Mobile Assistive Robots for Elderly Care”.

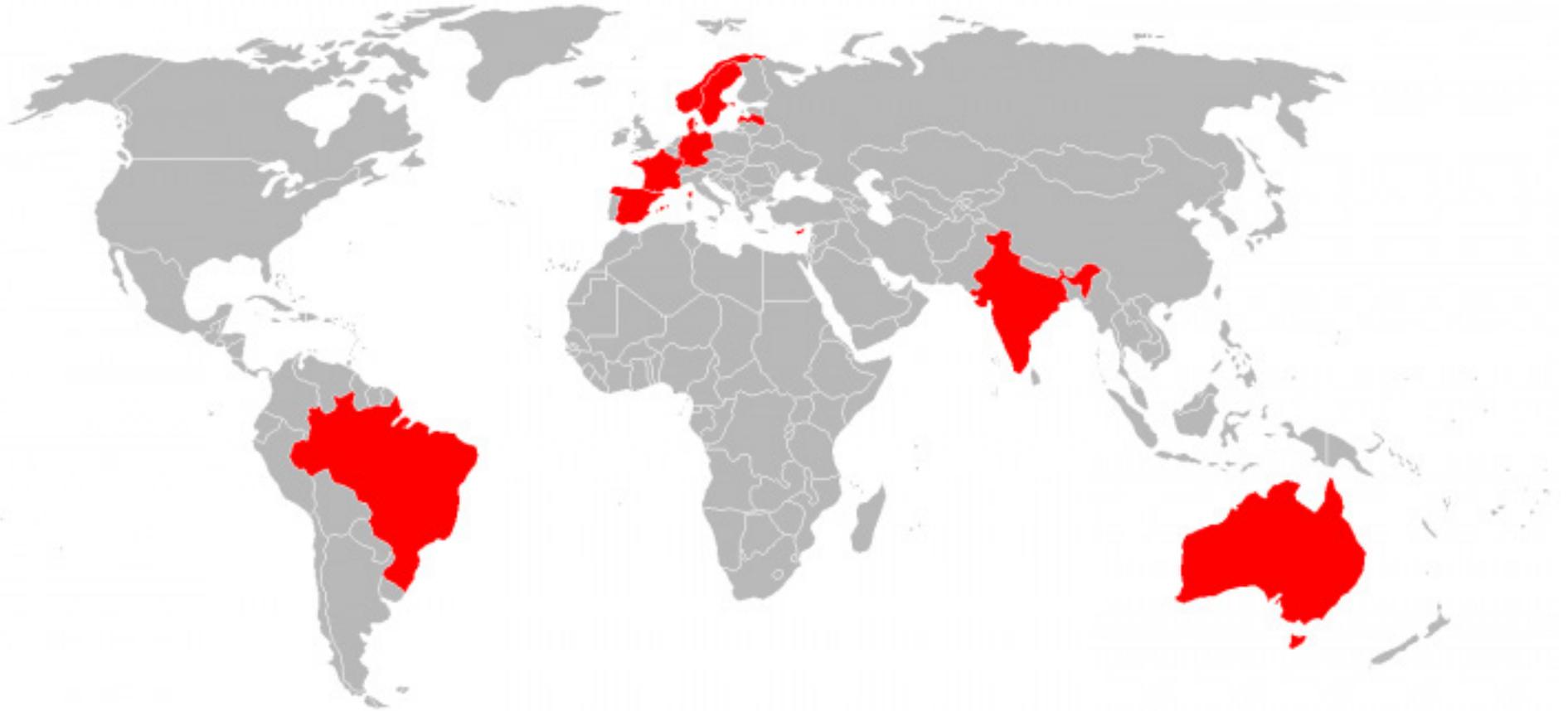


**Partners**

\*Currently phase 1 deployment is running.



Aug 2006 - July 2014



**Technical Lead (offer development) of various global projects for Asia pacific, Nordic, European, and Latin American market focused on wiring devices, cable management system, control and network connectivity domain.**

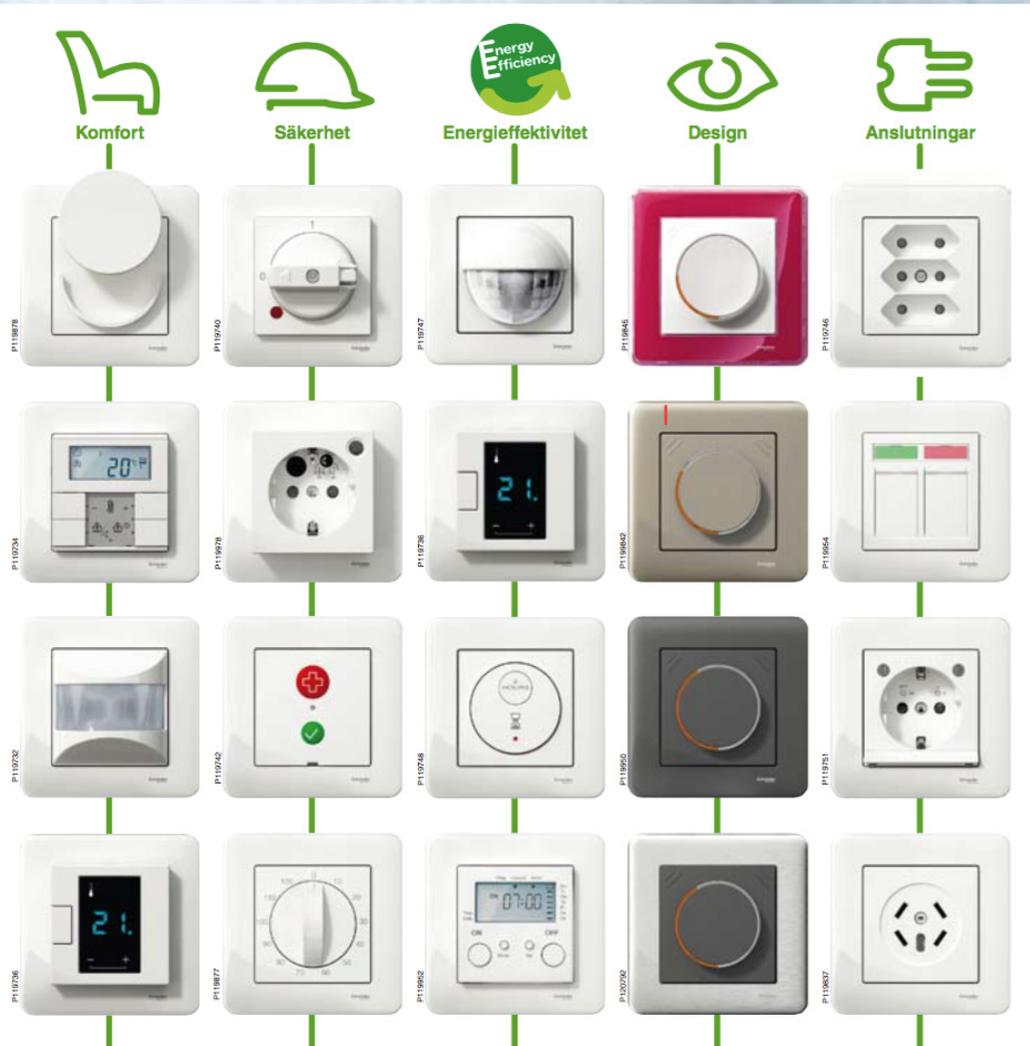


Led design and development of Exxact (Nordic), Opale (India), IP44 Elso Joy (Germany), UNA (Latin America), and Bluelink (Nordic) ranges which got successfully deployed in the market.

- Control
- Wiring Devices
- Home Automation
- Network Connectivity
- Cable Management System

Engineered end-to-end development of more than 250 distinct products

Exxact™

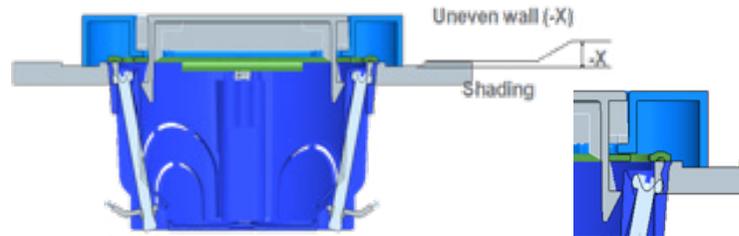


# Patented Work

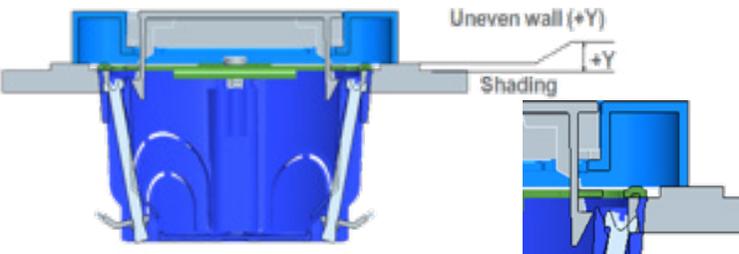
## Uneven wall Snap design

Patent number - EP2602888A2

Solution provides flexibility to assemble product in uneven wall scenario. Fig1 & Fig2 shows the problem with Existing Snap design.



Flexibility with Negative unevenness wall

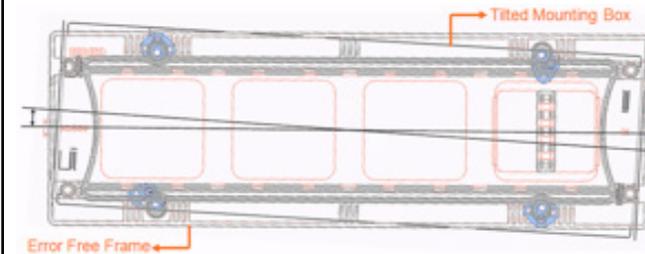


Flexibility with Positive unevenness wall

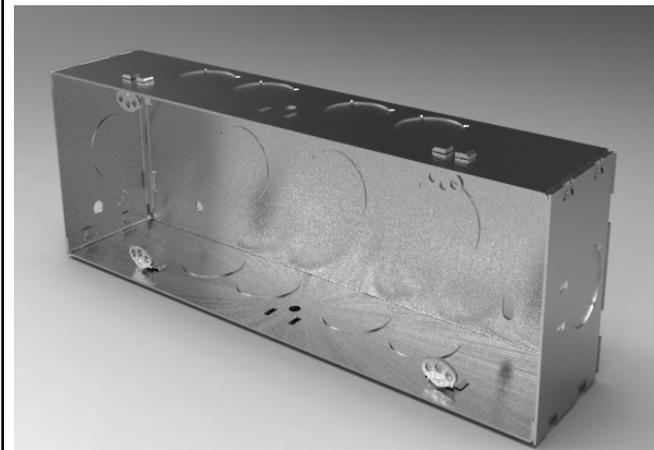
## Angular Adjustable Lugs

Patent filing number - 777/KOL/2013

Solution gives flexibility to install the technical frame correctly even though mounting box has been installed incorrectly. Patent already filled in India but yet to be granted.



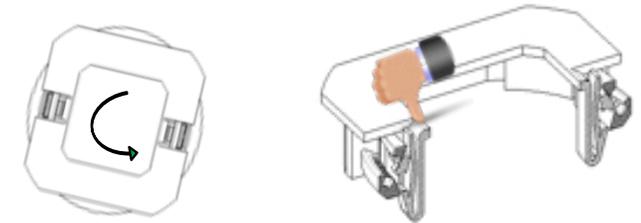
Lugs are adjusted to make the Fixing frame straight even though box is oblique



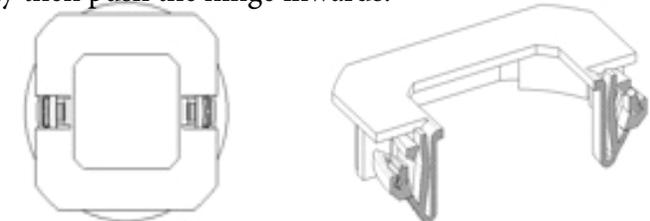
## Releasable locking with angular adjustability

Patent number - EP2270941A2

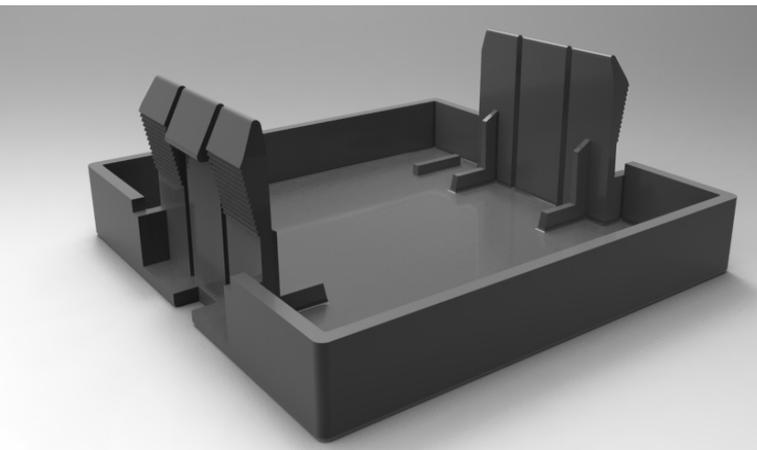
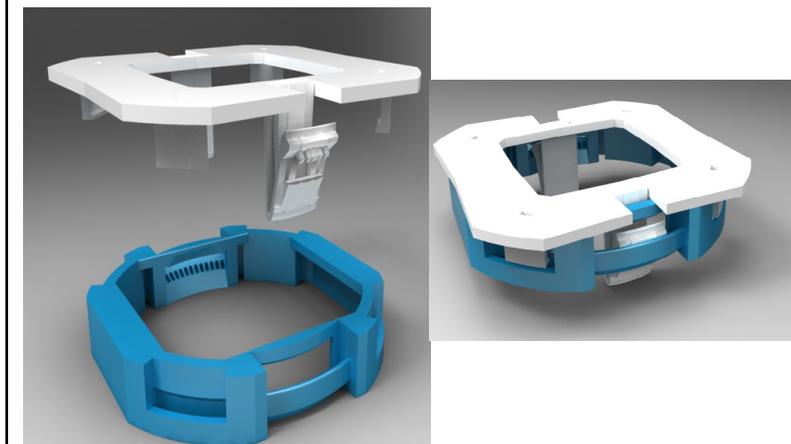
Solution provides flexibility to adjust product angularly in the wall hence eliminates the need to have screw fixation in the assembly.



Step 1: After coming to step 1, we align the frame correctly then push the hinge inwards.

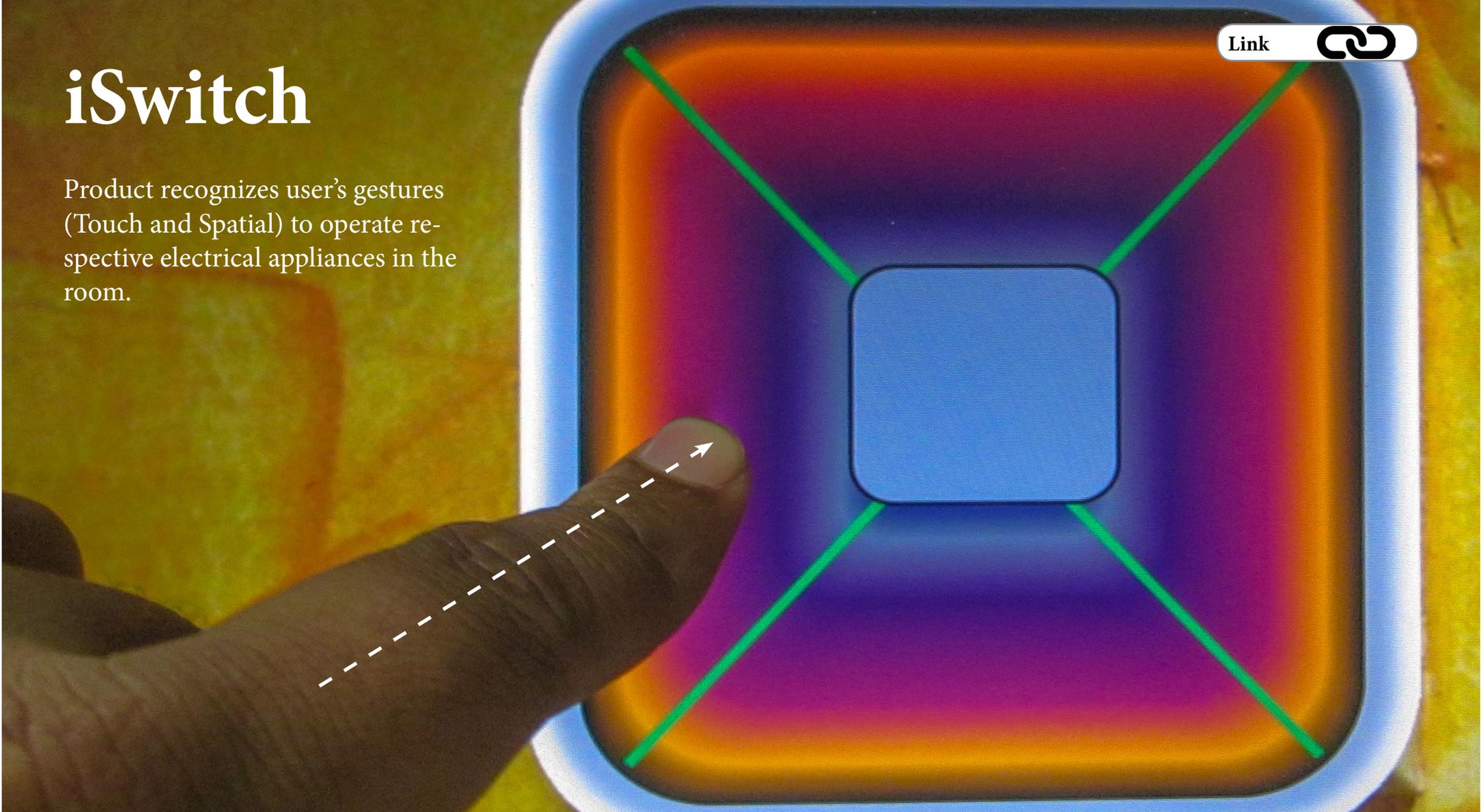


Step 2: Snaps locks in its' position

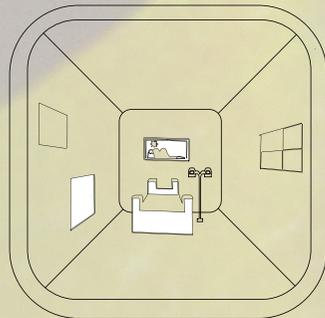


# iSwitch

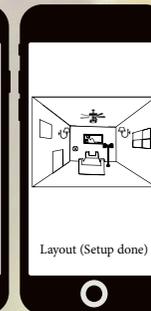
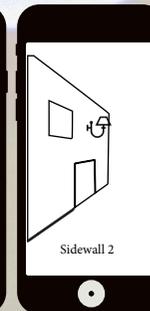
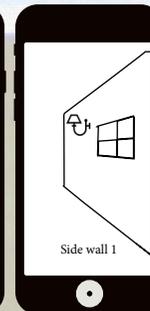
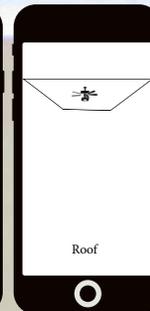
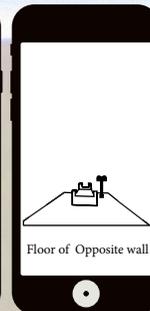
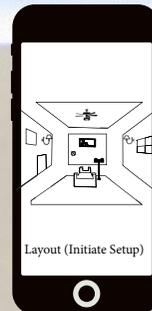
Product recognizes user's gestures (Touch and Spatial) to operate respective electrical appliances in the room.



## Setup:



iSwitch could be setup over bluetooth using phone or laptop to create room layout / Scenario.



# iSwitch

## Problem:

It is always confusing to know which switch belongs to which appliance in the scenario when we have multiple devices attached to the same switch board.



Present



Proposed

## Concept:

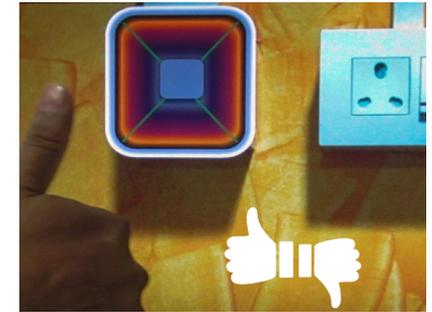
- Single Device, controls all the appliances of a room, making it really convenient and make home clutter free.
- It Works on intuitive user defined gestures for various appliances i.e. fan, lights, shutter blinds, mood lighting, HVAC

## Hardware:

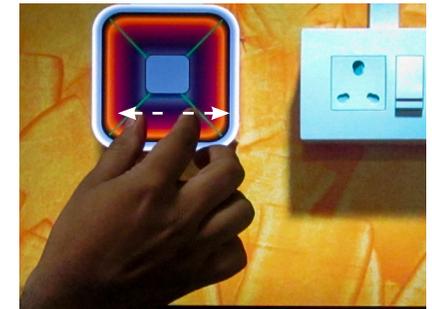
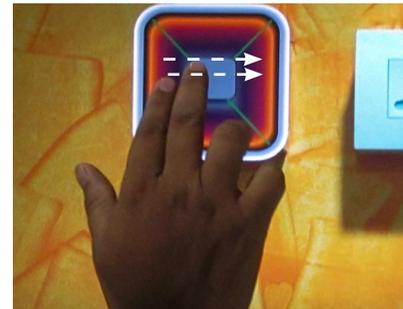
- Adafruit 2.8" PiTFT - Capacitive Touch.
- Raspberry Pi
- Bluetooth
- 3D Printed Case
- fasteners



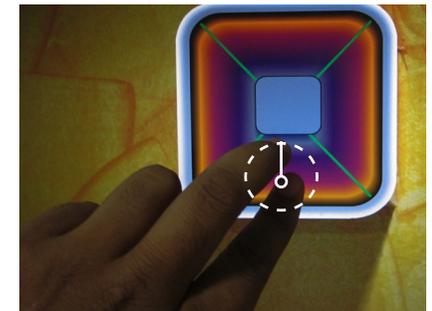
## User Interaction:



Hi & Bye gesture (Along with sound) to switch On / Off the mains.



Pattern of finger tapping to switch on/off the concerned devices.



Making a pivot from the thumb/finger and rotating the other finger in CW direction to increase speed (Feels like rotating the knob)

# Switched Socket

This solution eliminates the need to have a switch to operate a Socket Outlet as Socket works as a switch too.



Detailed Design

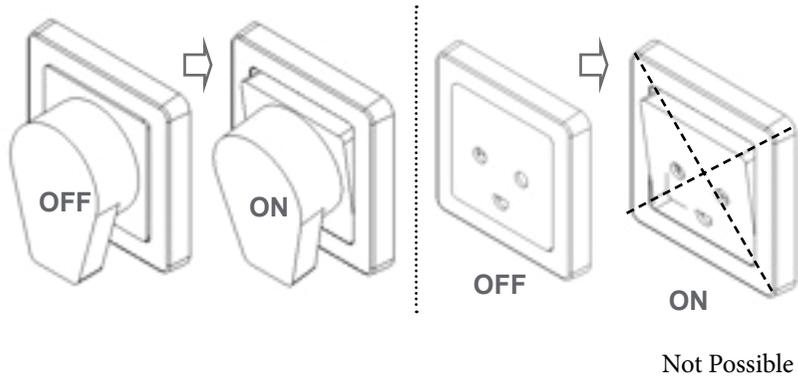


It is quite common to see Socket, then a switch to control Socket. Other wise having a “Well” in the Socket which quite spoils the Socket look however that is indispensable as a safety concern; which is well addressed in this solution.

# Switched Socket

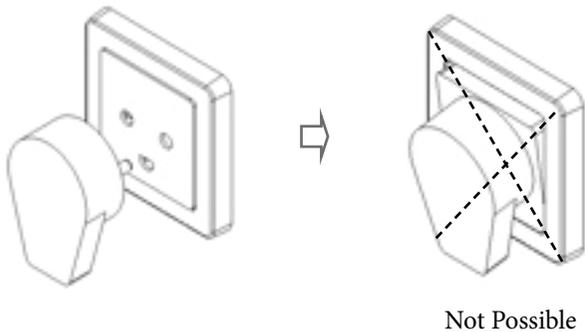
## Features details:

1- Device could be toggled ON/OFF only when plug remains inserted into the device.

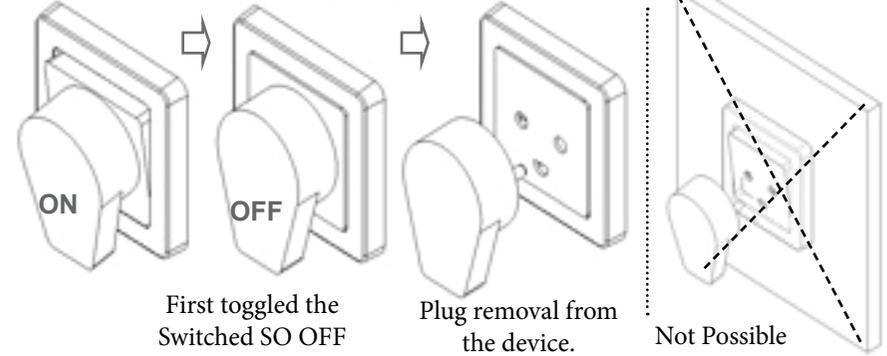


2 - By Design switched SO is parallel to the wall when there is no plug inserted.

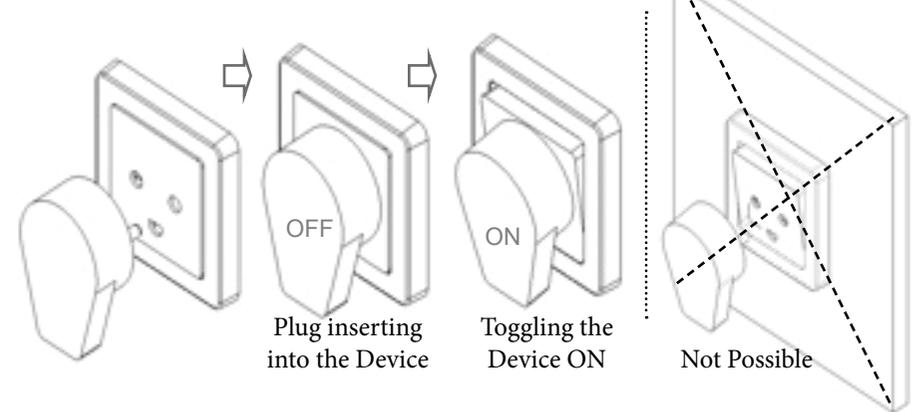
3 - Force of inserting plug will never toggle the SO



4- Plug can be removed only when device is OFF. It eliminates the risk of getting shock while removing plug as device is "OFF".



5- Plug can be inserted only when device is OFF

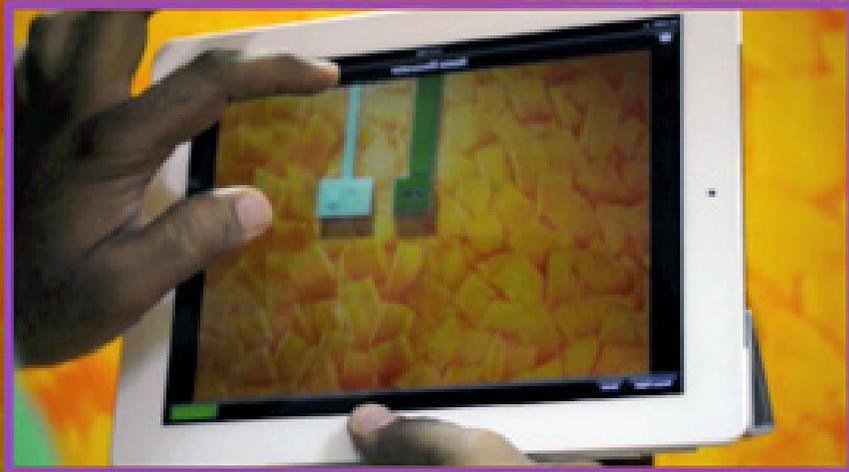


6 - Switched SO doesn't operate by jerking of the plug wire. (Vacuum cleaner test doesn't operate the switch)



# Augmented Reality System

**Augmented Product visualization:**  
Ability to create and analyze different scenarios; What colored products to buy as per the wall color or you can even change the wall color to find the adequate color of the product before deciding.



Video: <https://youtu.be/Ikg5nunWkZk>

# Augmented Reality System

## Augmented Product catalog:

It helps to create final scenario, what products and where they will be installed which leads to no confusion to the installers what end users wants.



Video: <https://youtu.be/Ikg5nunWkZk>



# Dimmer and Light Guide Design

Utmost care has been taken to achieve the uniform glow around the edge of dimmer knob that too by one single LED source.



# Dimmer and Light Guide

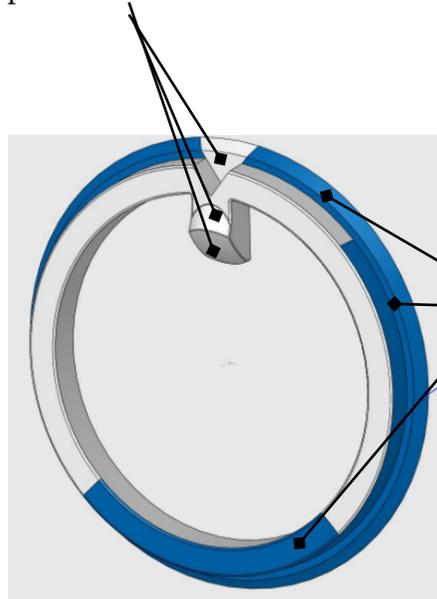
## Ray Tracing:

Optimized the light guide shape with the help of ray tracing.



Software used: Opticad for-Ray Tracing

These 4 surfaces are acting as a mirror, need to make them high polish as high as possible.

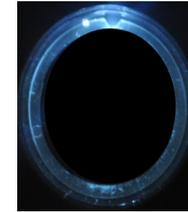


Optimizing number of matt surfaces (Blue highlight) as well design of the light pipe to control the uniformity of the light across.

## Solution:



Initial Design



With Light Glow



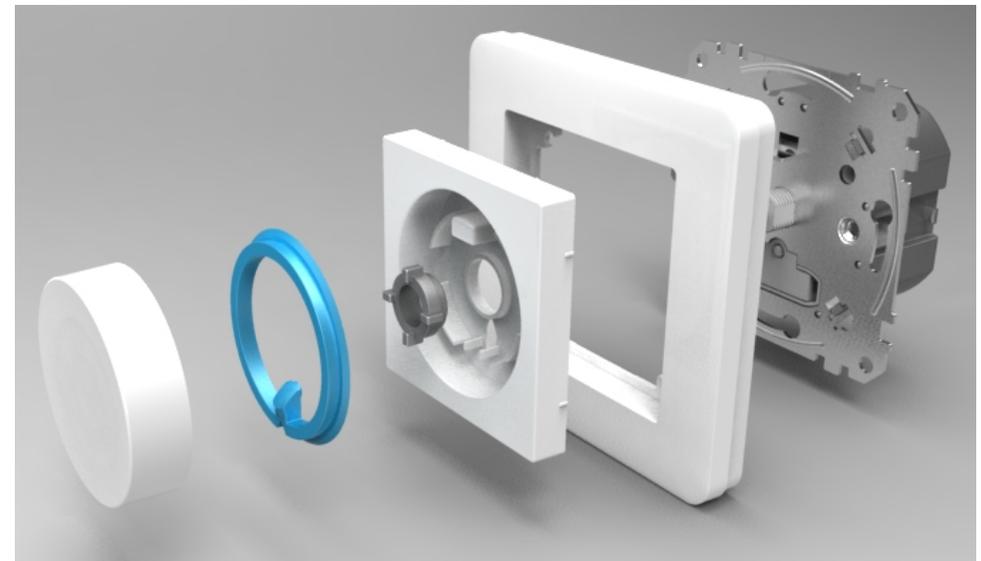
Final Design



With Light Glow



## Exploded View (Assembly):



# Wavelet



Link

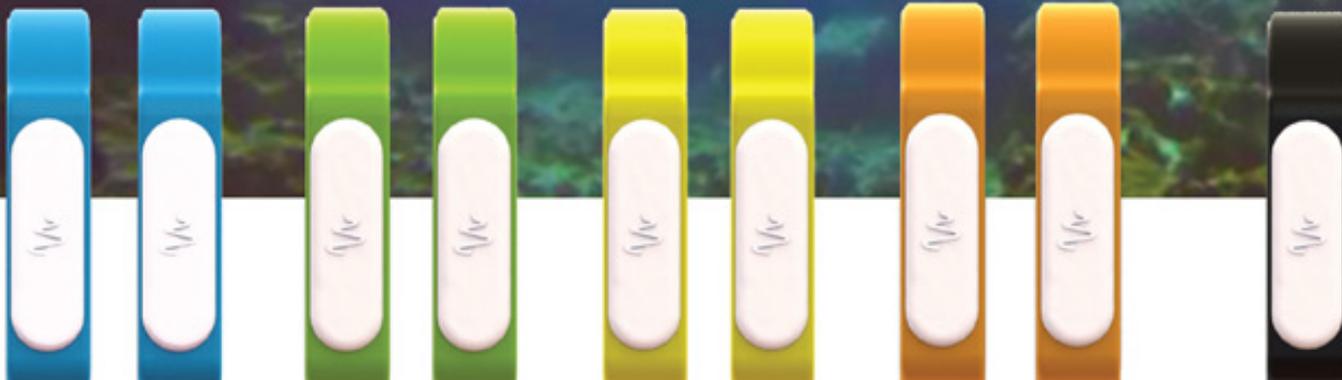


Academic Work  
Team of 3

---

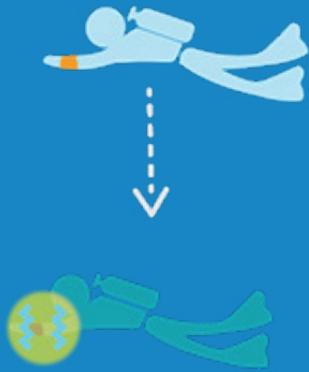
The **wavelet** system is a set of wristbands that facilitate underwater communication between divers, their buddies and instructor from a distance without having to be looking at each other.

---



# Interaction:

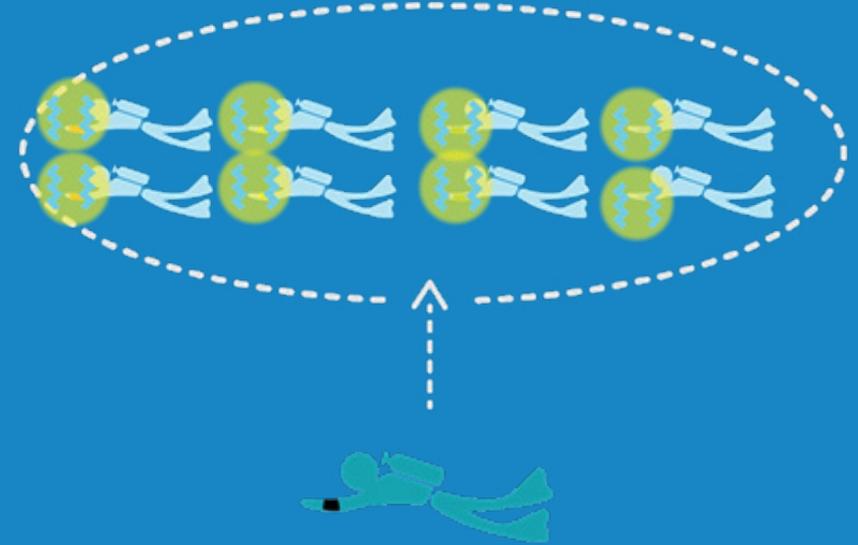
## DIVER TO INSTRUCTOR



## DIVER TO BUDDY



## INSTRUCTOR TO GROUP



### INSTRUCTOR BAND



### SENDER BAND

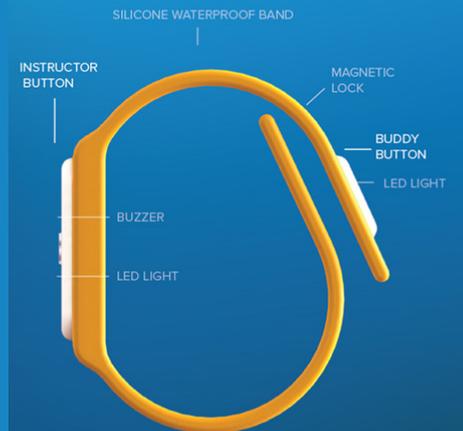


ALERT IS SENT

### RECEIVER BAND



### DIVER BAND



Your safety and excitement is just a push away.

# Scenarios

**Under Water one can easily be panicked!**

Wavelet helps Diver to notify his buddy or instructor when in Need.

**Because of the limitations of the environment a diver's safety is:**

dependent on the proper use of established safety measures/procedures.

What if the visibility is very low?

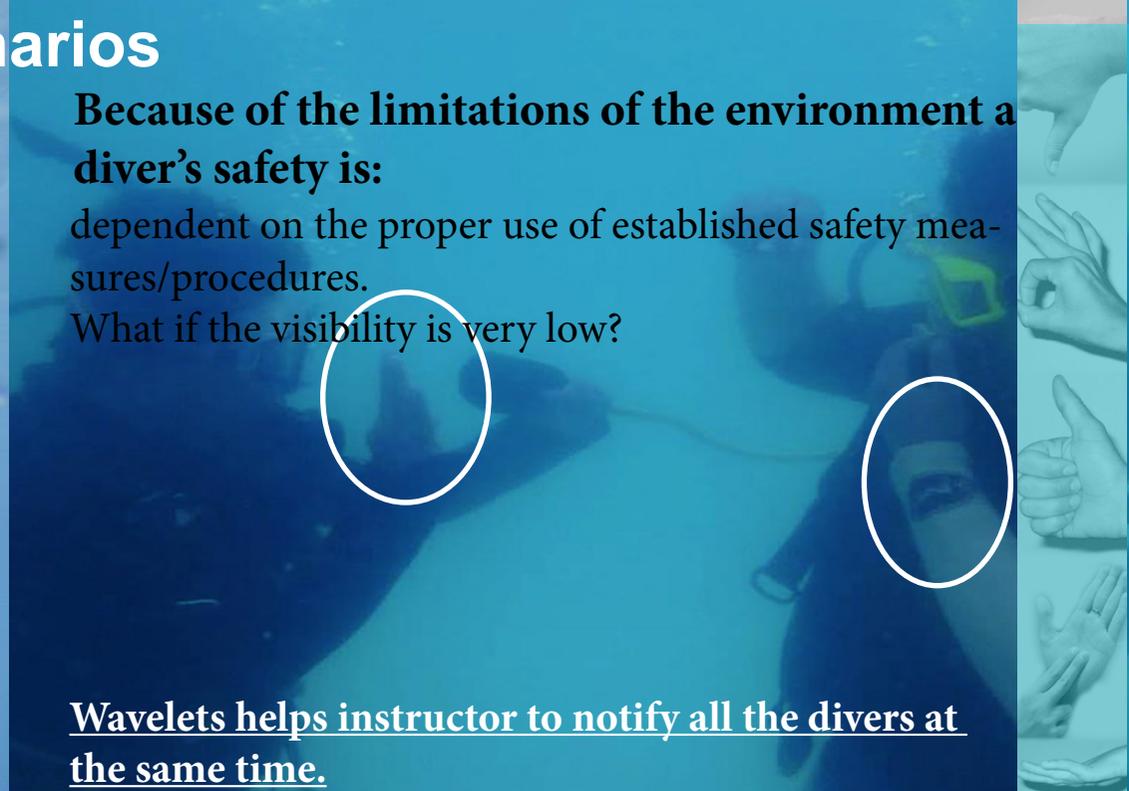
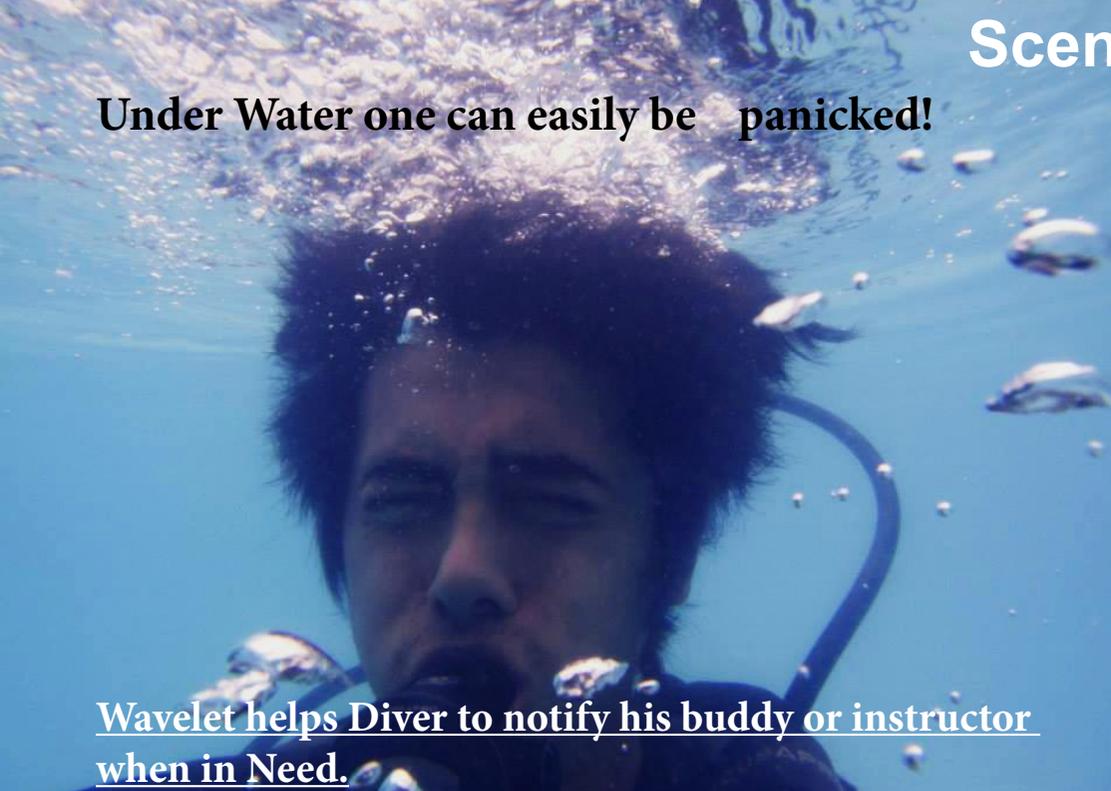
Wavelets helps instructor to notify all the divers at the same time.

**Sharing the Excitement with Buddy!**

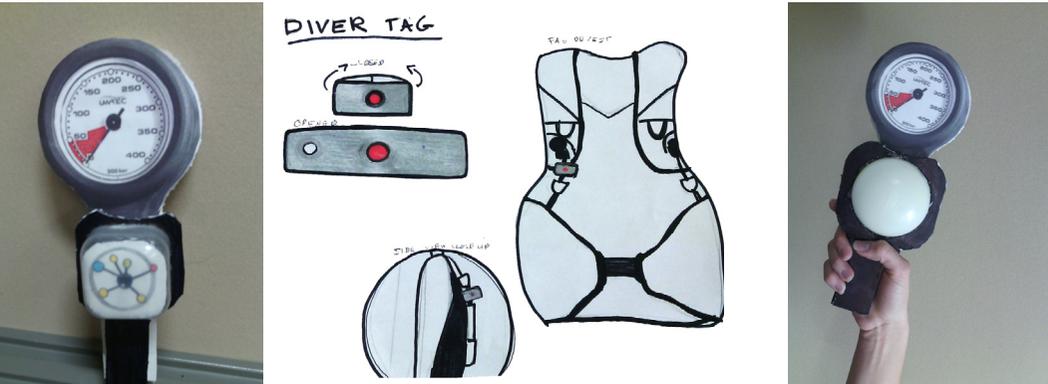
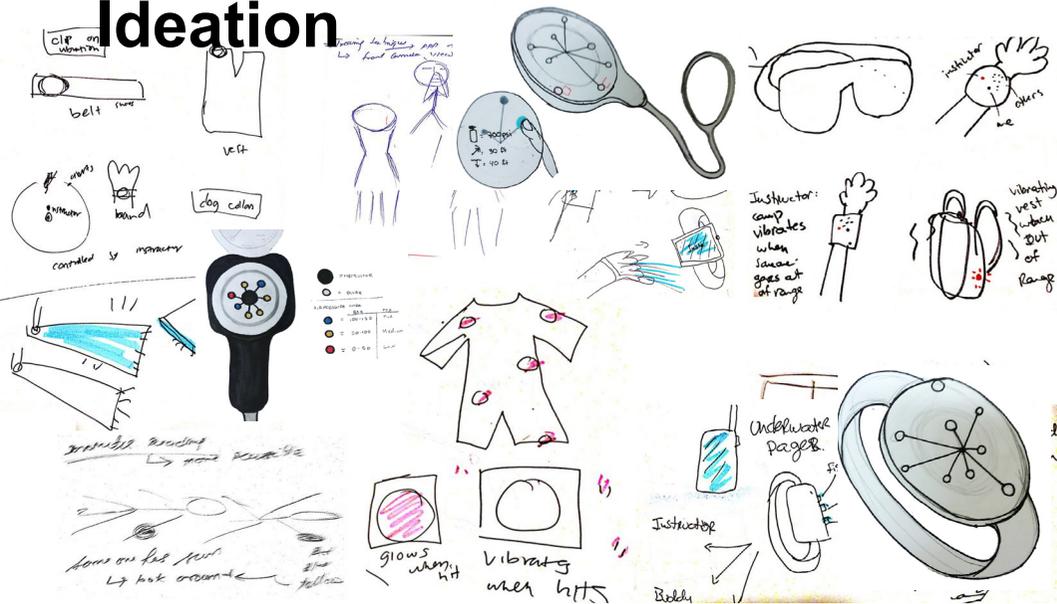
Wavelet helps Diver to notify his buddy to share excitement.

**Instructor: Keeping the group together.**

Wavelet helps Instructor to keep the group together by alerting at the same time.



# Ideation

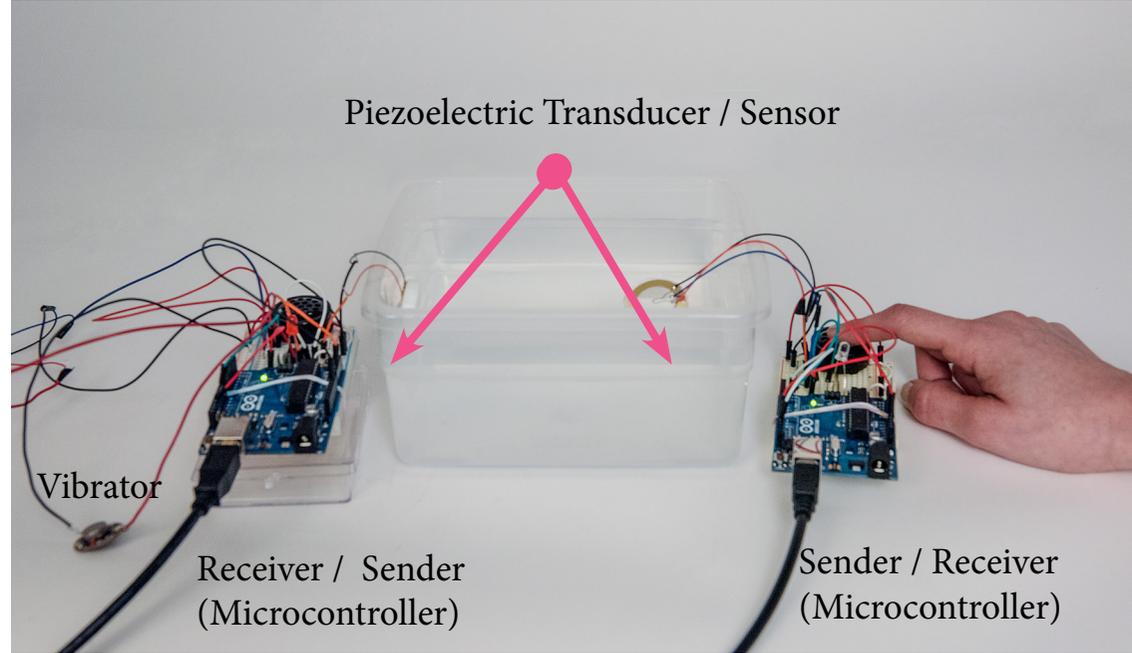


# Feedback:

It collects and helps with the most basic communication needs of any diver. This band is a must have accessory for divers. Great job!!”  
~ Harry

The simplicity of the device is it's beauty. I can definitely see people wanting this for multiple reasons.  
~Lee

# Hardware prototype



Link to Video >> <https://youtu.be/98YYBhfygVI>

Piezo electric sensors converts pressure into sound waves which is received at the receiving end by another Piezo sensors calibrated to emit and receive certain sound frequency.

# Physical prototype



# Mechatronics Project:

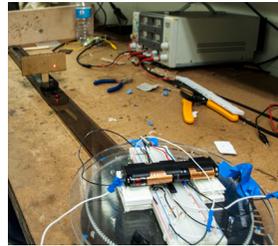
Design and developed various Mechatronics systems like Golfer, Self Balancing Robot, WiFi Speaker, Robokey Robot (Participated in Ice hockey tournament) just to name the few.



## Stalker: Follow Infrared Light

### Individual project

Designed and built to track an infrared beacon over a 180-degree arc at a distance between 50 and 90 centimeters.



## Labyrinth: Remote Controlled Robot

### Individual project

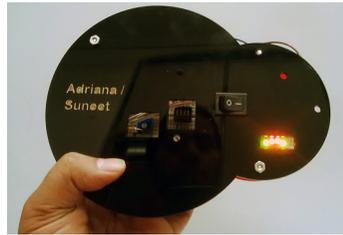
Designed and built the mobile robot which can be remotely navigated through a labyrinth



## Stroboscope: LED strobe light

### Individual project

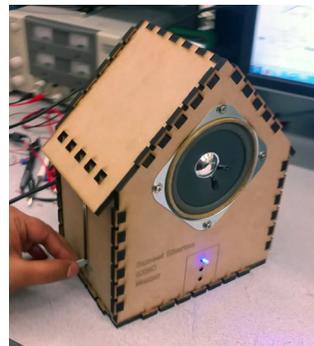
Microcontroller (M2), C Programming  
Combined general-purpose I/O with the timer subsystem on the M2 Microcontroller to create a battery-powered, user-adjustable LED strobe light.



## Orchestra: Wirelessly Controlled Speaker

### Individual project

Microcontroller (M2), C Programming  
designed and constructed a battery-powered, GF1004-based instrument capable of playing a tone for a specified duration when requested via an mRF wireless command.



## Golfer:

### Team of 2

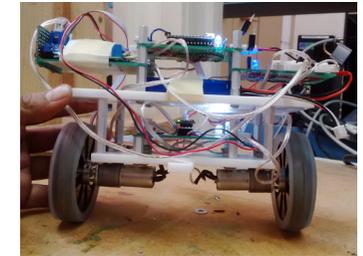
Microcontroller (M2), C Programming  
designed and developed Battery powered golfer which point and shoots towards the IR beacon.



## Acrobat: Self Balancing robot

### Team of 4

Microcontroller (M2), C Programming  
Designed and developed fully self contained Acrobat, which touch the ground only through two coaxially-mounted wheels, and have a center of gravity more than one-half wheel radius above the wheel axis.



## Robot to play Hockey

### Team of 4

Microcontroller (M2), C Programming  
Robot Participated in Annual Robockey tournament at University of Pennsylvania.



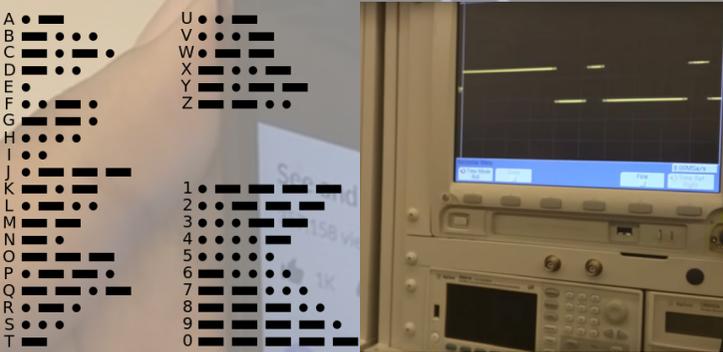
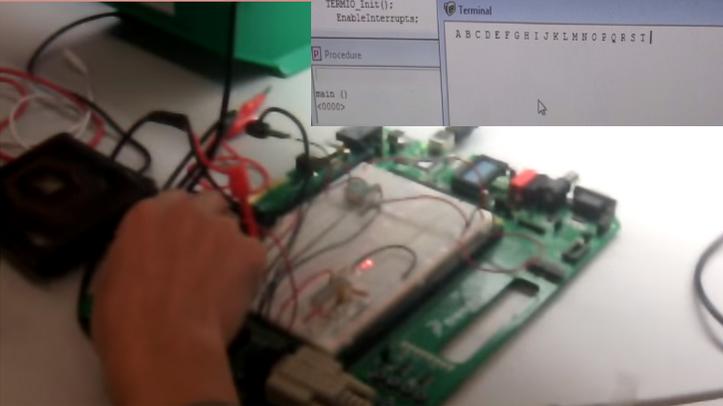
Video: [http://www.youtube.com/playlist?list=PL3bkrh9dozcsX-g1TkkWmCZ-\\_GmRoWrrTi](http://www.youtube.com/playlist?list=PL3bkrh9dozcsX-g1TkkWmCZ-_GmRoWrrTi)

## Morse-Code Decoder:

```
int itr=0;
short space_flag = 0;

TERMINO_Init();
EnableInterrupts;

Procedure
main ()
<0000>
```



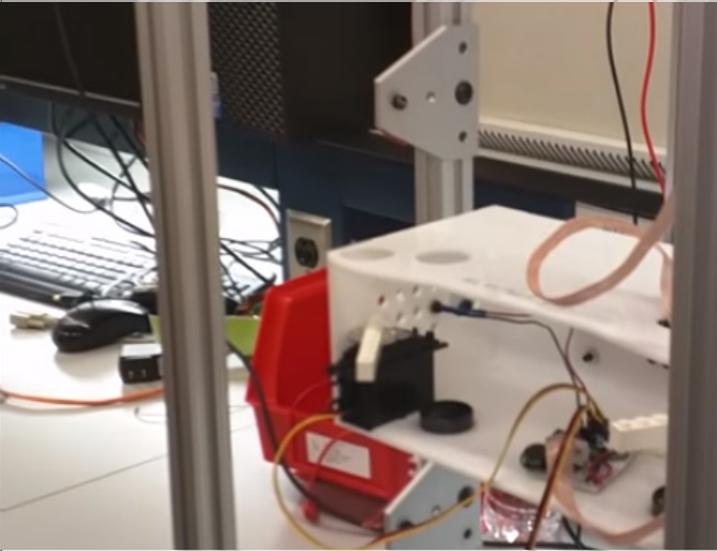
Built the Morse Code decoder using polling and interrupts on an input switch. We used HSC12 micro-controller to responds to input transitions, in the form of key press and duration of key press determines whether the input is a dot (.), dash (-), or space ( ).

Microcontroller: HSC 12 Motorola

## Programming Elevator:

We used Pulse-Width Modulation (PWM) to control the elevator. By using the PWM signals we controlled the elevator's vertical position as well as open the door at each floor.

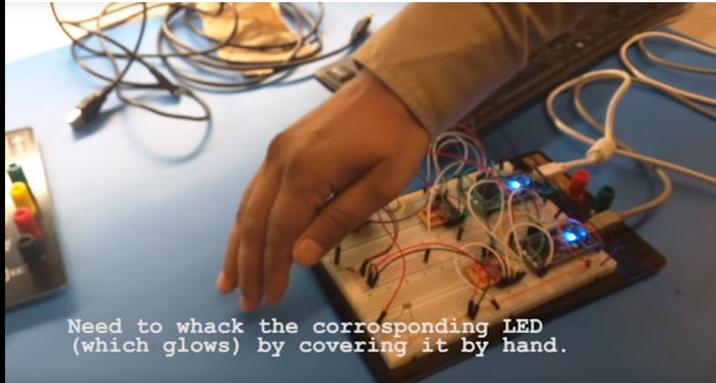
Simultaneously we used the GPIO module to detect which floor the elevator is at.



Elevator was designed to service the requests in an order that reduces travel distance by taking into account the current direction of travel.

Microcontroller: MBED ARM Cortex-M3 LPC176

## Wireless Nodes: Whack a mole game



Need to whack the corresponding LED (which glows) by covering it by hand.

We built our own Whack-a-Mole game by creating wireless sensors network. We used total 3 micro-controller, 1 master node and 2 mole nodes. The master node is randomly assigning the moles when to pop up (turn on LED), and you have to whack them (cover their light sensors) as fast as possible.



Changing light condition

Microcontroller: MBED ARM Cortex-M3 LPC176

# ShoeHack\_Obstacle

Link>> <http://youtu.be/vnMdrPj8RbY>

Shoe makes a buzzing if user is going to hit an obstacle or very close to obstacle to warn the user. We have used Arduino Lilypad, coupled with Buzzer, LED and proximity sensor.

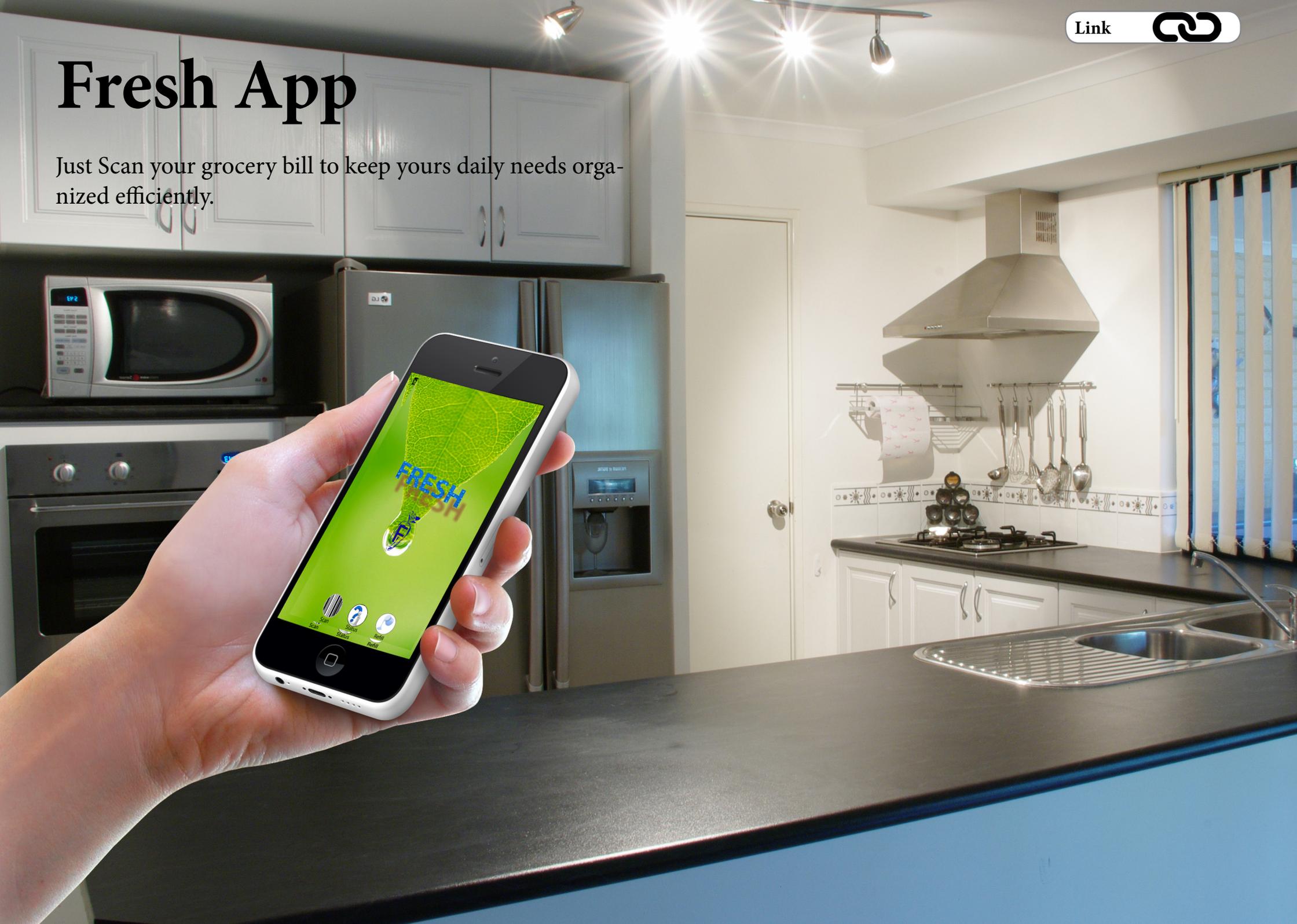


## Ideation:

<p>Where are my shoes shoes theft</p>	<p>Safe to step in</p>	<p>stomping foot distances signal Help needed! Air-motively (L.R.L.R.L.R)</p>	<p>Cyclists -&gt; safety</p>	<p>subject warn about obstacles proximity sensor (Gator)</p>	<p>Sports Training Technique could be perfected -&gt; Running / long jump / soccer -&gt; skating</p>	<p>Shoe Laser tag</p>	<p>Sports Training Technique could be perfected -&gt; Running / long jump / soccer -&gt; skating</p>
<p>Shoe theft - Locate your shoe</p>	<p>Safe environment</p>	<p>Stomping pattern to activate SOS</p>	<p>Cyclist's indication</p>	<p>Proximity - Warns obstacle Ahead</p>	<p>vv Athlete to learn the right way</p>	<p>Shoe Laser tag - Play on the move</p>	<p>helps Athlete to learn the right way</p>

# Fresh App

Just Scan your grocery bill to keep yours daily needs organized efficiently.



## Ethnographic Research Interview : Insights

We conducted our ethnographic research interviews with 5 families to understand the most basic problem in regards to the home organization.

People who store perishables at home need to easily identify what has expired because expired food takes up space and is not safe for consumption and if they know in advance what is going to be expired they would rather consume instead of throwing it away.

People who launder clothes that get wrinkled need to store their clothes separately from the clothes that are ready to be worn because they take up more space than ironed clothes and look messy.

Families with small kitchens need to manage their long term and short term pantry efficiently because they don't have much space in the kitchen to keep both inventory.

We built prototypes for the above selected insights and went back to the group to get the feedback and then expanded our solution on first insight to make an App to organize the grocery.

### User Interaction: Wire frame



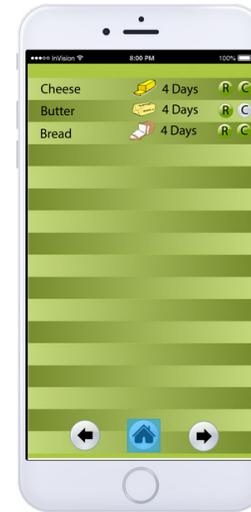
Home Page



Scan



Updating status



Refill Status



Overall Status

Just Scan the grocery bill, App extracts perishable items and organizes on basis of expiry date in different category i.e. dairy, vegetables, meat etc.

App alerts user when the perishables are near to be expired and prompts to update the status (Consumed / Refill). With time, App understands user's consumption pattern and provide suggestion on how much quantity to buy as well keep track of nutritions on basis of user's consumption pattern and give suggestion for healthy diet.

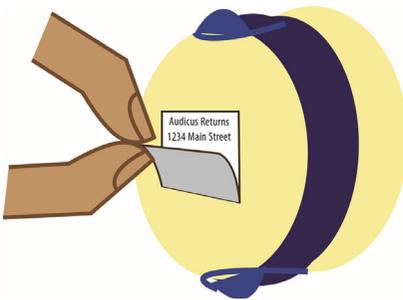
# Capsule At home hearing test

## Problem statement

\* 2 weeks design sprint done for "Audicus private limited" to make hearing test easy and accessible for consumers before they decide to buy hearing aid.



Capsule at home hearing test



## Three simple steps

TEST  
(Rough Online test)

Have a doubt on my hearing ability  
(Quick rough check)

TEST  
(At-home hearing test)

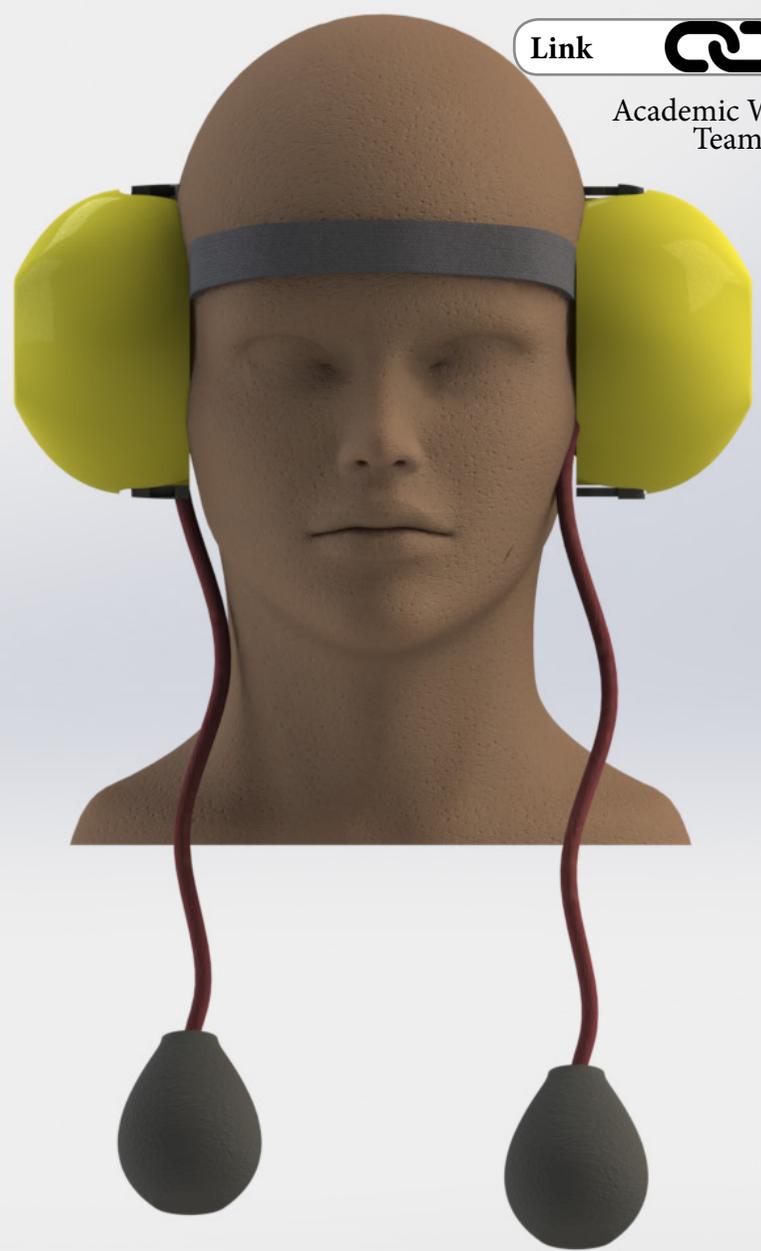
Confirming the doubt by Calibrated device  
(sent free to home address)

SELECT BUY

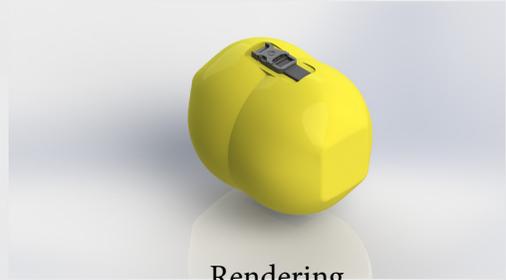
Selecting hearing aids and order

## Details

- The packaging converts into sound-proof earmuffs
- All in one hearing test with no need for a computer
- Physical grip buttons designed to help users with limited motor skills
- Built in return shipment label to make return shipment seamless



Prototype



Rendering

# Audicus: 3 Steps Process

Take Advantage of Our Labor Day Sale: \$100 Off Two Canto Hearing Aids! Discount Code: LABORDAY

**Audicus** Have Questions? 888-979-6918 Search

Home About Audicus Get Started Shop Hearing Aids Hearing Loss Customer Reviews

Hello Robert, Thanks for taking our Online hearing test, your test results are below.

September 9th, 2015

**Audicus Score**

**Below Average**

We recommend you take our **free at home hearing test** to get more accurate results that we can use to calibrate a hearing aid specifically for you.

**An affordable hearing aid for everyone**

Try it Risk Free for 45 Days. Payment Plans Available.

**Uno**  
\$499/EAR

Hearing Loss Range  
Mild — Profound

**Dia**  
\$599/EAR

Hearing Loss Range  
Mild — Profound

**Canto**  
\$699/EAR

Hearing Loss Range  
Mild — Profound

**Need help?** 888-979-6918 help@audicus.com Chat with Us!

A few days later, Robert receives this package in the mail...



- 1 START**

Pull the head set pieces apart and unwind the grip buttons that are stored inside each of the headsets.
- 2**

Place the forehead strap above your eyebrows and pull the neck strap over your head. The headsets should be covering both of your ears.
- 3**

When you are ready to start the hearing test, squeeze both of the grip buttons at the same time until they turn green.
- 4**

The test has now begun. Squeeze the grip button that corresponds to the ear you hear the sound coming from. The test will last 15 minutes.
- 5**

When the test is finished the grip buttons will flash red for 30 seconds. Feel free to take the headset off your head.
- 6**

Roll the grip buttons up in their covers and place them back inside the headsets.
- 7**

Fold the straps inside the headsets and place the edges of the headsets together. Use the buckles to snap them together.
- 8 FINISH**

Peel off address label and a prepaid return label will be under it. Please place in a US mailbox and we will contact you with your results and next steps shortly.

# Nurse's Hurting Back

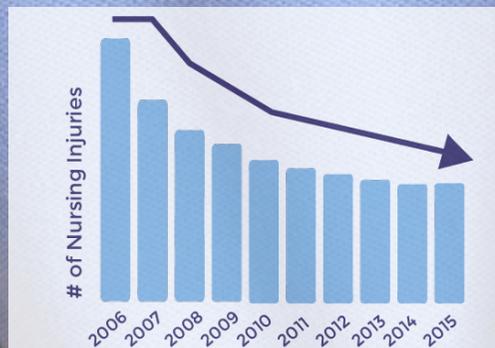
## Objective:

A research project done at University of Pennsylvania Hospital system (UPHS) to find cause of Nurse's back injury and to find ways to reduce the the same.

## Injries at UPHS

Nursing injuries from patient handling and expenses for these injuries have been trending downward since the ceiling lifts have been installed in 2006.

**But Why there are still injuries?**



## Stake holders:

NURSE MANAGERS



ADMINISTRATION



NURSING SCHOOL



SAFETY SPECIALIST



UNIVERSITY OF  
PENNSYLVANIA  
HEALTH SYSTEM

"In the course of an eight-hour day,  
**a nurse will typically lift 1.8  
tons, which is pretty astronomical"**

Amy Williamson

a workplace safety coordinator for [Baptist Hospital](#).

"Hospital's Heavy Lifting Lightens load on Nurses" 7/19/2012 The Tennessean



UPHS is one of few hospitals that have invested in installing ceiling mounted lifts in every room to alleviate heavy lifting for nurses. But after the initial drop a certain level of injuries has still persisted and we investigate further what is still causing that.

# Observation

We visited a range of units with a range of patient needs. The less mobile the patients were the higher rates of injuries among nurses. We also noticed that the nurse's satisfaction with the lift went down the less mobile the patients were.

	SURGICAL PROGRESSIVE CARE UNIT	MEDICAL TELEMETRY	MEDICAL INTENSIVE CARE UNIT
Mobility of Patients	Limited Mobility, mostly conscious	Low Mobility, some unconscious patients	Mostly not mobile and often unconscious
Injury Rates	Low	Medium	High
Current equipment success	Lift to transfer patients between beds Toileting patients Adjusting patients in bed	Lift to transfer patients between beds	Lift to transfer patients between beds
Current equipment gaps	Ambulating patients	Ambulating patients Toileting patients Adjusting patients in the bed Boosting	Ambulating patients Toileting patients Adjusting patients in the bed Boosting

# Perspectives

**NURSING ADMINISTRATION**

The lift can be used to address all patient handling needs and the greatest challenge is encouraging use.

**NURSES**

Lift is well used in certain circumstances but **not seen as the right tool for every patient handling need.**

# Insights



LIFT EDUCATION

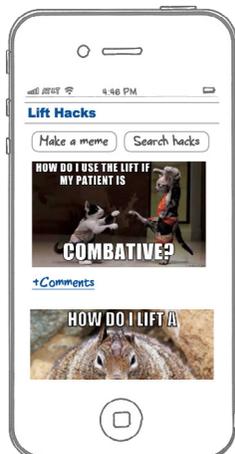


NEW TOOLS

We think that they are both right. We believe that more lift education as well as investing in new tools are needed to serve all nurses.

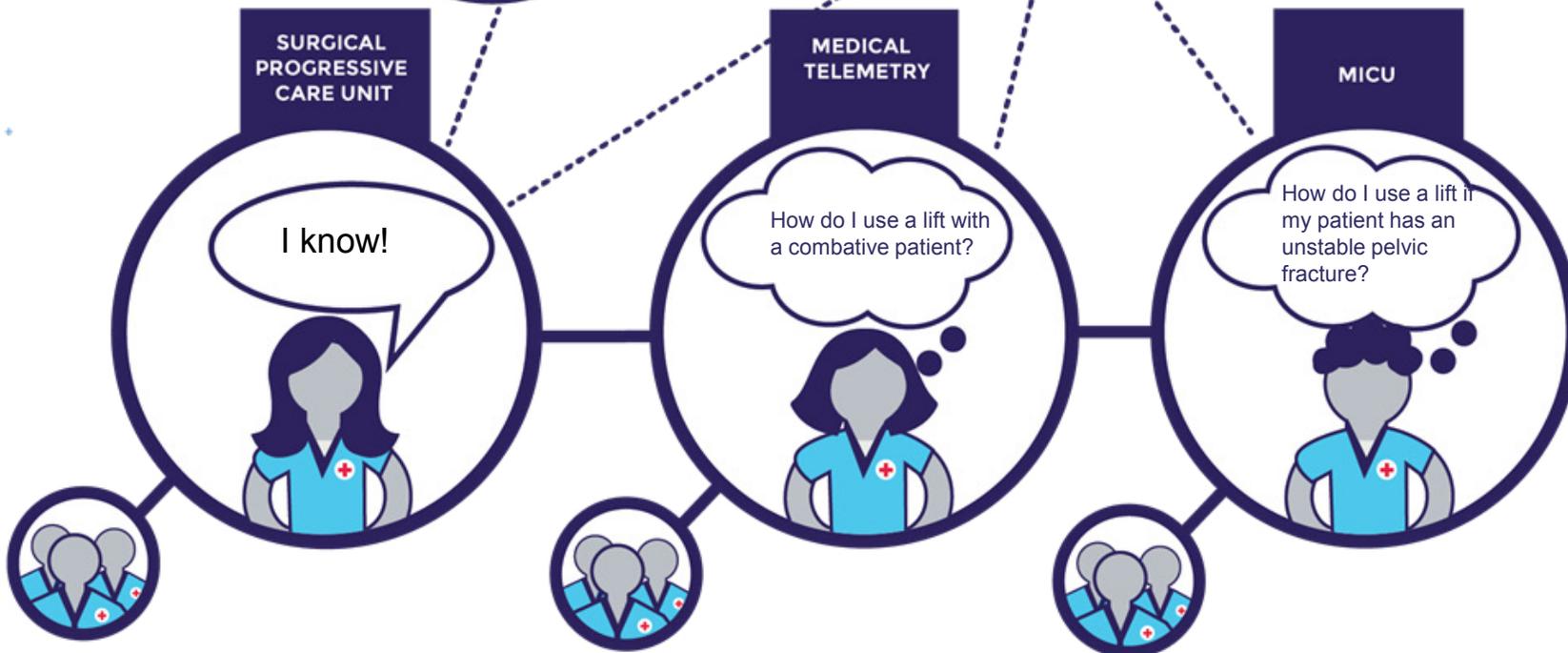


LIFT EDUCATION



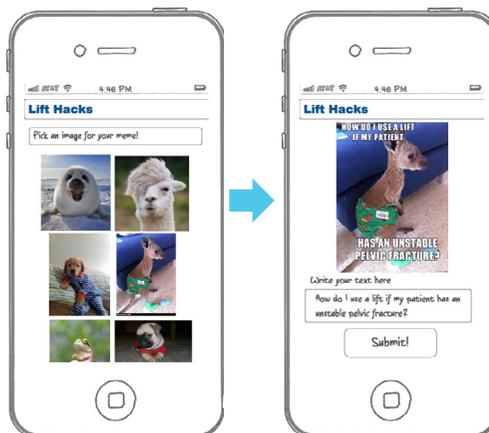
ADVANCED SPH CLASS  
8 HOURS

SPH AT ORIENTATION  
45 MINUTES



**Our first approach is a tool that helps those who have the answer to communicate with those looking for knowledge but in a lighthearted all inclusive way.**

A mobile meme based question asking forum specifically designed for nurses. It offers peer to peer knowledge share which nurses will trust because it is from their fellow coworkers who have done these tasks themselves.



John has a question about using a lift with a patient with an unstable pelvic fracture. He could use the lift hacks app to pick a meme then ask his question with text on top of the meme. When he submits it it will go into a main feed where other nurses can comment on the post and give their advice.



Mobile MEME based App

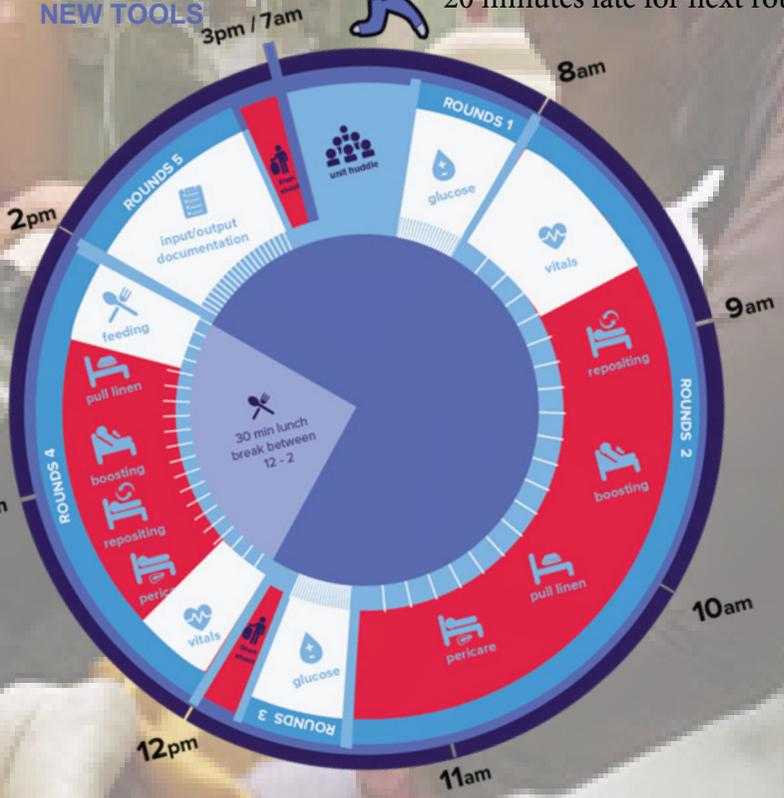


Ryan (CNA) must accomplish a lot of tasks in small windows of time for 20 patients. He has to do 5 rounds and some of his tasks such as glucose checks need to be done at a certain time of the day.

NEW TOOLS



1 extra min x 20 patients = 20 minutes late for next round



Because of this time crunch Ryan often opts to do manual SPH over using the lift. These highlighted task are where Ryan could use the lift but he doesn't.



Pericare



Sheets



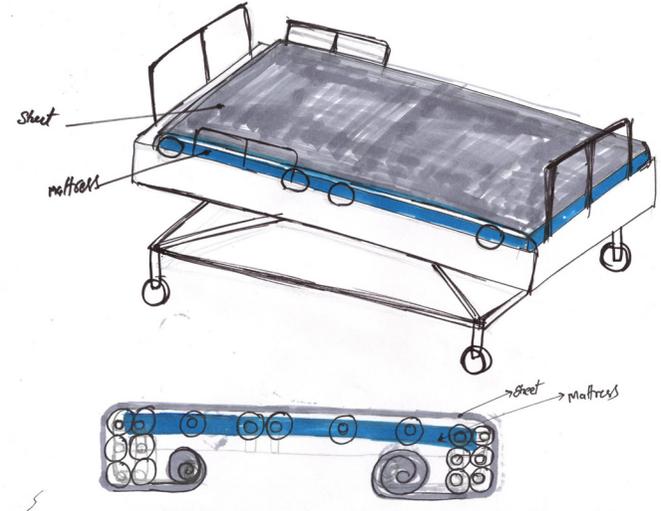
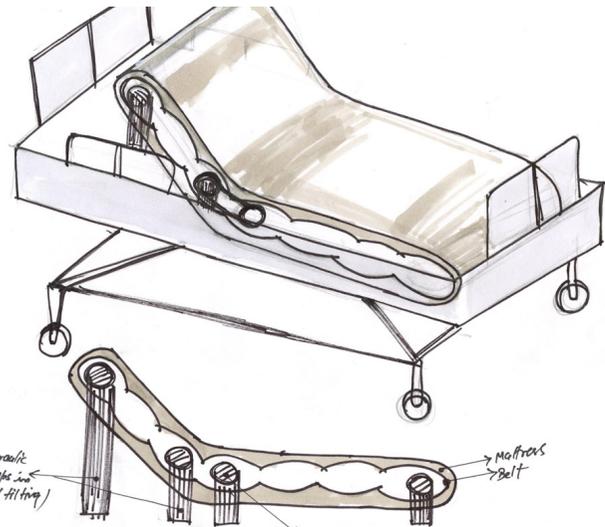
Turning



Boosting

“Boosting is done most frequently of all those things, so it would be a good place to start.”

## Concept



We thought what if we could eliminate boosting all together, so we ideated on ways of how to make a patient automatically slide up using the mattress or the sheets, and got really good feedback

## Conclusion



1

Every nurse should be able to attend Advanced SPH Techniques class within their first year in the UPHS



2

Create a Peer to Peer crowdsourced knowledge sharing platform

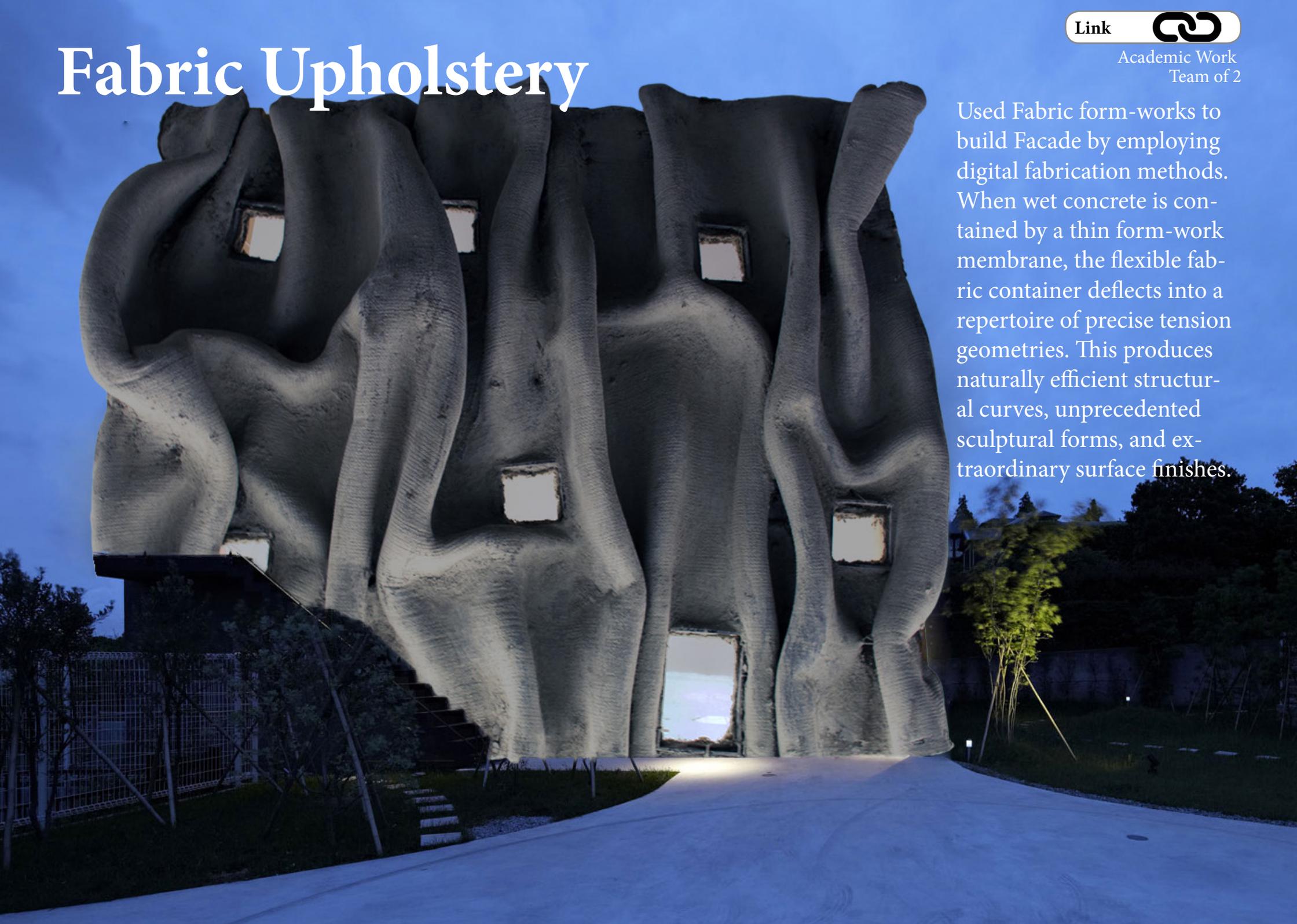


3

Evaluate where the lift is not meeting the nursing staffs needs and then focus on creating a diverse system of tools to address SPH that adds to the lifts usefulness.

# Fabric Upholstery

Used Fabric form-works to build Facade by employing digital fabrication methods. When wet concrete is contained by a thin form-work membrane, the flexible fabric container deflects into a repertoire of precise tension geometries. This produces naturally efficient structural curves, unprecedented sculptural forms, and extraordinary surface finishes.



# Fabric Upholstery - Inspiration

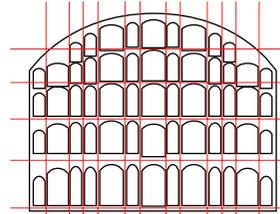
## Inspiration

Hawa Mahal  
Jaipur, India  
Built in 1799

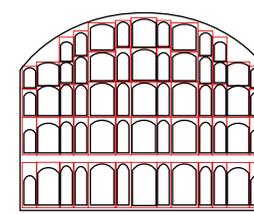
Palace made of porous facade with elaborate carvings casting self-shadow.



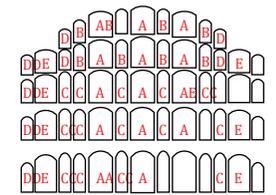
## Analysis: Correlation with Fabric Manipulation



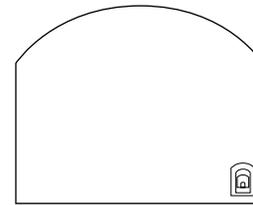
Vertical / Horizontal



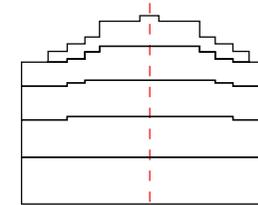
Pixel



Arrangement



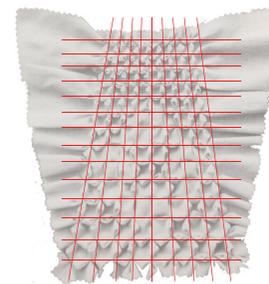
Part to Whole



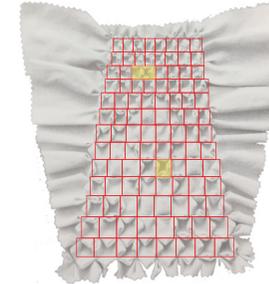
Symmetry



Plan View: Systemic arrangement



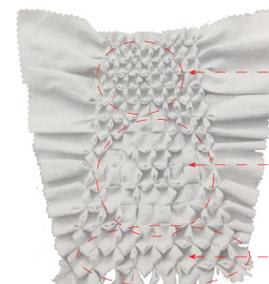
Vertical / Horizontal  
Strokes



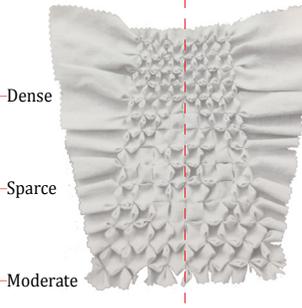
Pixel



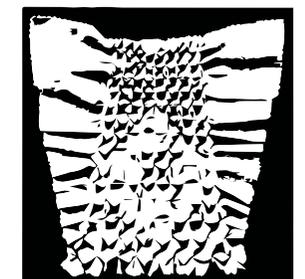
Composition



Play of Scales



Symmetry



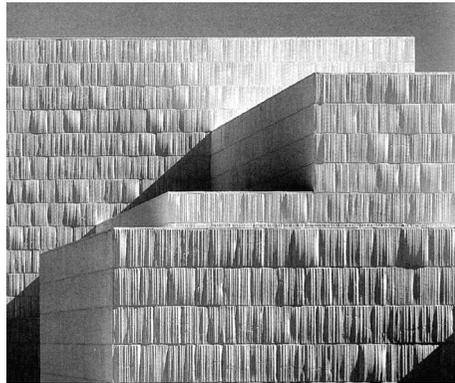
Light Study

# Fabric Upholstery - Precedence Study

## Precedence Analysis: Fabric Inspired Architecture



Facade in Sevilla



House in The moral of Madrid



Kenzo Unna



University of Manitoba



P\_Wall, 2013

Fabric form-works can be used to form columns, walls, beams, trusses, slabs, panels, and thin-shell structures in both precast and in-situ construction. Due to the great efficiency of tension membrane form-works, the form-work itself is extraordinarily light.

## Fenestration Study



Dr Chau Chak Wing Building  
(Australia)



Beekman Tower  
(New York)



Lou Ruvo Center for Brain Health  
(Las Vegas)



The Dancing House  
(Berlin)



University of Manitoba

We want Fenestration to create some sort of tension with Fabric Form-work such as fabric is trying to push in, hence creating naturally occurring curls and patterns.

# Fabric Upholstery - Experiments

## Building Pattern and Casting:

We created numerous patterns to understand fabric's behavior and casted the same to understand how different patterns deforms when concrete is contained by fabric.



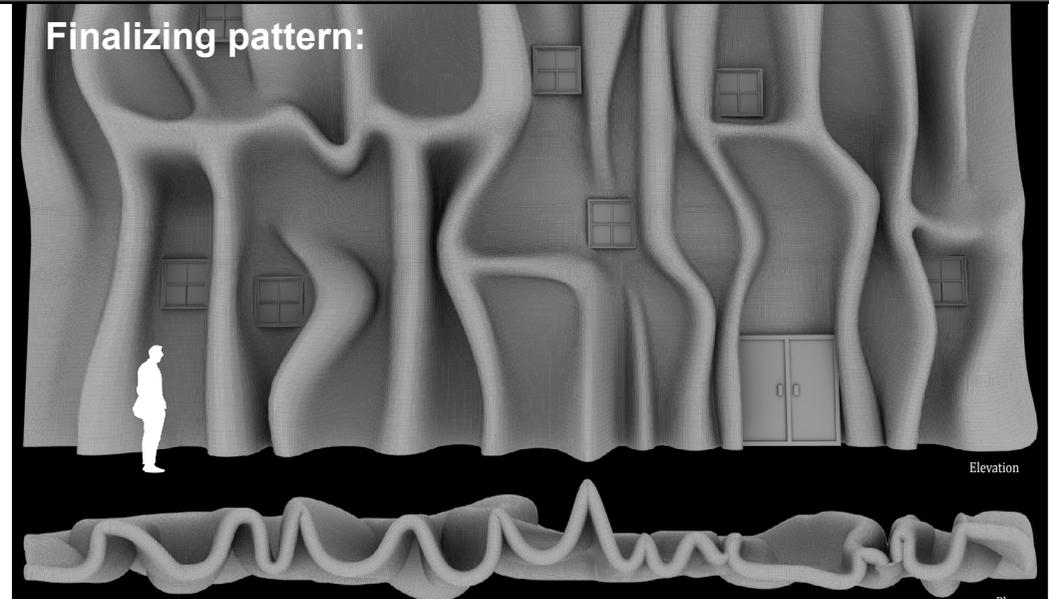
## Alternate material:

We want to go away from the block or tile kind of structure instead we want to build the facade having continuity of form just like fabric.

Casting doesn't seem the appropriate solution as it requires a very big cast which will be impractical at higher scale so we used Concrete Canvas™.



## Finalizing pattern:



We as well used the digital fabrication techniques to get the desired look and make room for facade's various components windows, door.

## Prototype:



Working with real material was challenging as it has the actual thickness but the pattern is scaled down to 30:1. We made lot of adjustments in the design to make up for that.

# Mechanical Toy

It is Fun to watch - how planetary gear system creates fascinating opposing movements, smooth and flawless.

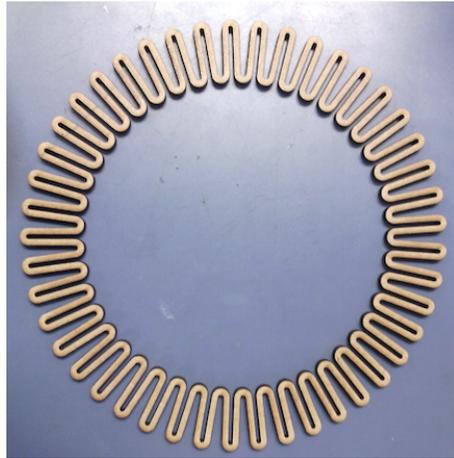
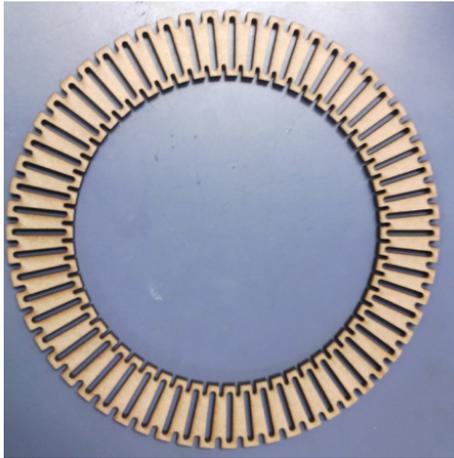
Ball makes it easy for the child to grab the crank and rotate with less effort with utmost safety.

Link



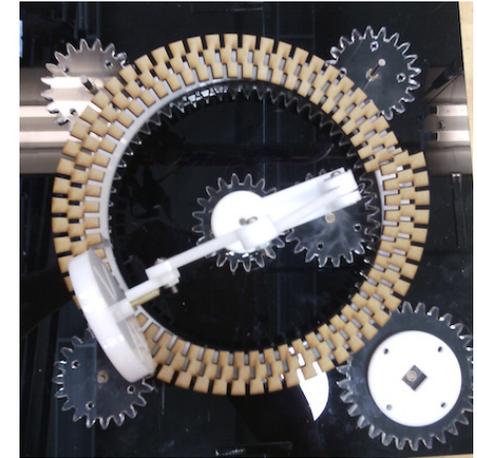
# Mechanical Toy

## Living Hinge for Ramp:



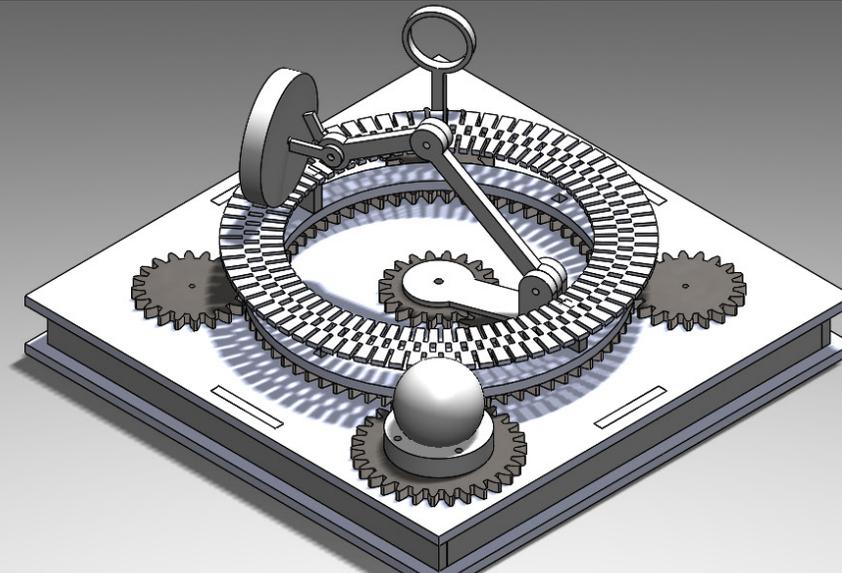
Various Laser cutting pattern on MDF - having varied degree of flexibility as required for the Ramp.

## Optimizing Mechanism



Mechanism Testing - Mechanism works smoothly and flawlessly while rotating the crank (Ball).

## 3D Design and Simulation:



Designed and simulated the mechanism in Solid-works. Whole design is physically achieved by means of Laser cutting and mechanical assembly.

# Watering Can

Contemporary and Elegant design makes watering can a piece of Art sitting gracefully inside the room.

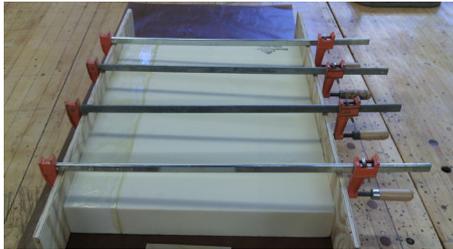


Large Opening makes it easy to fill the Water and hollow handle and deeper neck uniformly distributes the Water which intern balances the weight and keeps it centered.



## Manufacturing: Thermoforming

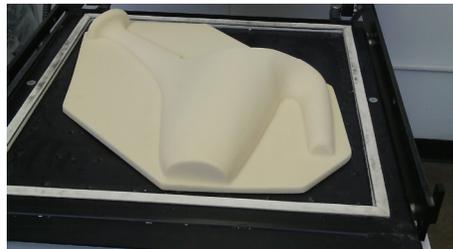
- Design is split in 2 halves and each half is milled on the 3 Axis milling machine.
- Thermoformed parts themselves have very high surface finish hence doesn't require much post processing apart from smoothing the joints.
- Finished design had production like quality and glossy surface Finish.



Glued polyurethane foam to make the piece big enough for milling both halves.



Sanded the pattern using fine sand paper to get smooth surface finish.



Placed the part on the bed.



Cut the extra portion so it could be fitted in thermo forming bed.



Thermo Forming Process



Final Finished Half. Similarly 2nd is built and joined together.

## Manufacturing: 3D Printing

- Due to large size, I split the design in 3 parts and 3D printed them separately and joined together by super glue.
- Surface finish is always an issue with 3D printers and require lot of post processing.
- Finished design has a production like quality and glossy surface Finish.



Added layer of bondo at uneven places and sanded it to make the coating uniform.



Multiple round of sanding and adding layer of bondo until desired smoothness achieved.



Another round of sending and adding thin layer of bondo.



Initial coat of primer to cover the unevenness.



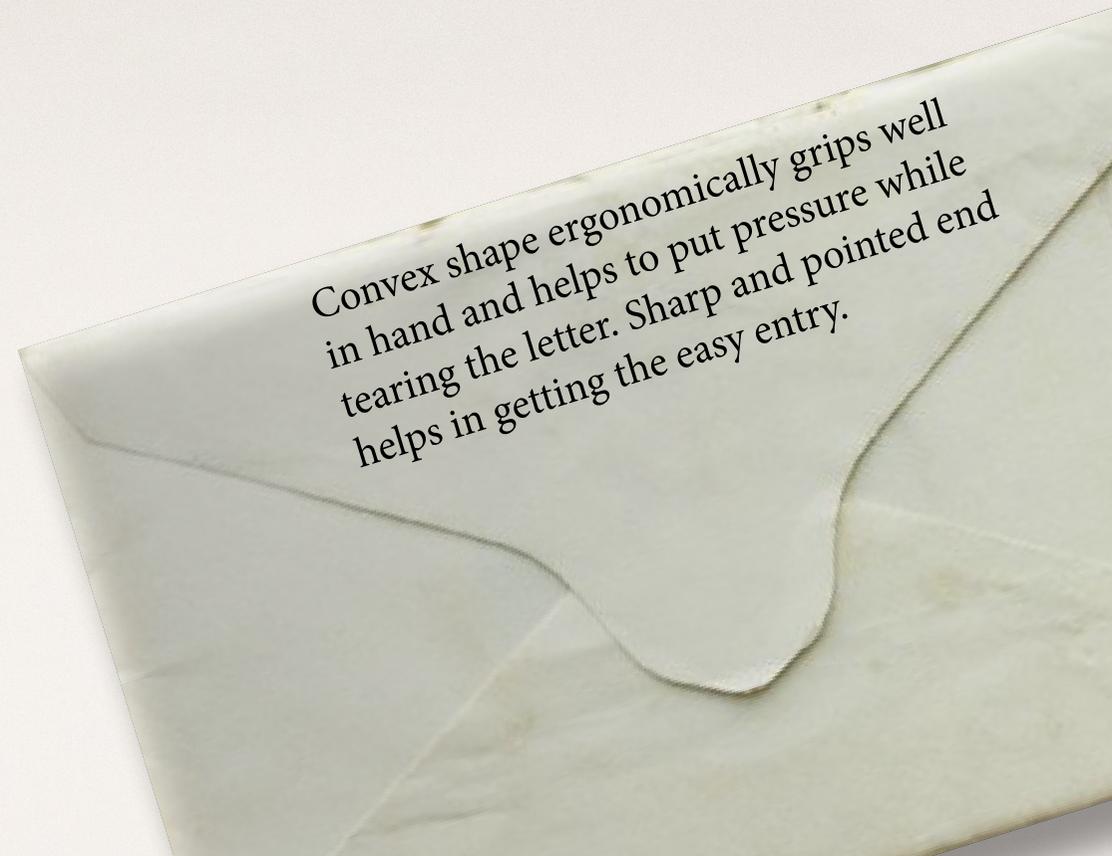
Once desired smoothness achieved, Put the first coat of Paint.



Final coat of Paint after drying.

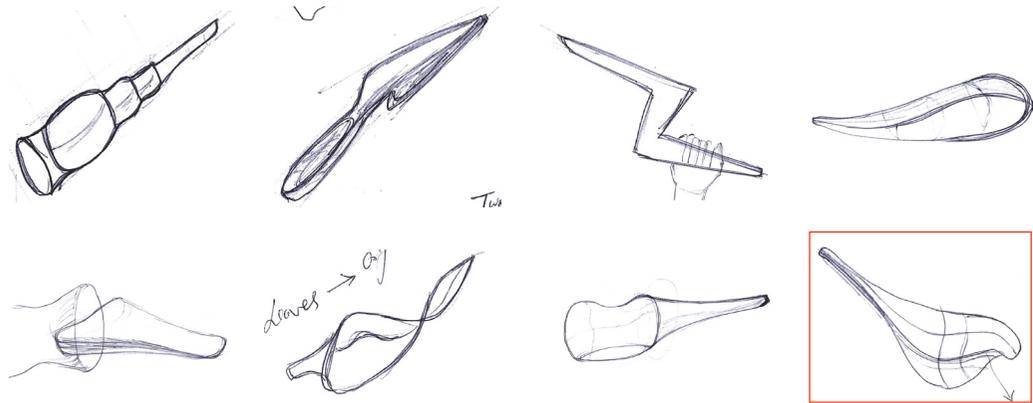
# Letter Opener

Letter opener is crafted from the wooden blank by using power and hand tools. Form is comfortable to hold, effective in opening a sealed envelope, and sculpturally communicates its purpose.

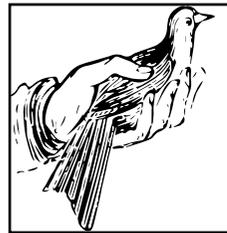


Convex shape ergonomically grips well in hand and helps to put pressure while tearing the letter. Sharp and pointed end helps in getting the easy entry.

## Ideation and design inspiration:



Gently touching the bird in the hand



## Process:

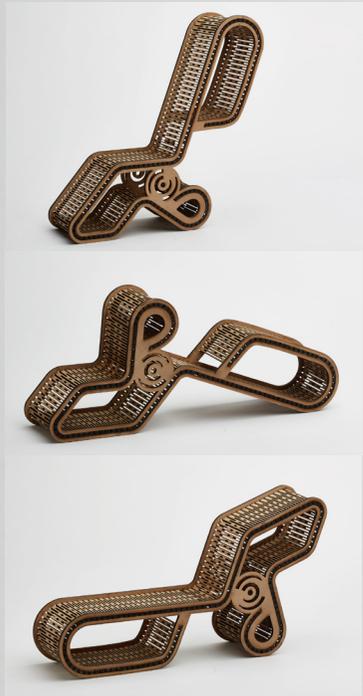
- Printed the drawing at 1:1 to scale.
- Cut the front / top / side view.
- Pasted the front / top / side view on the wooden block respectively and marked the outer boundary.
- Cut the front view on the band saw.
- Glued the cut piece back to the wooden block.
- Now cut the Top view on the band saw.
- Removed the Cut pieces. Cleaned the wooden piece.
- Using the Drumel tool, achieved roughly the desired 3D profile.
- Sanding! Sanding! Sanding! until get the desired finish.
- Cleaning and Polishing.

## Working with Wood



# Protheus

The Proteus consciously steers clear of requiring moving parts or adjustments to be able to achieve the multiple transformations that it is capable of – the simplicity of the tumble is an inherent characteristic that makes this design unique.



# Protheus

## Inspiration:

Various Yoga postures gave the idea of having a chair which can change shape and each transformation has a meaning.



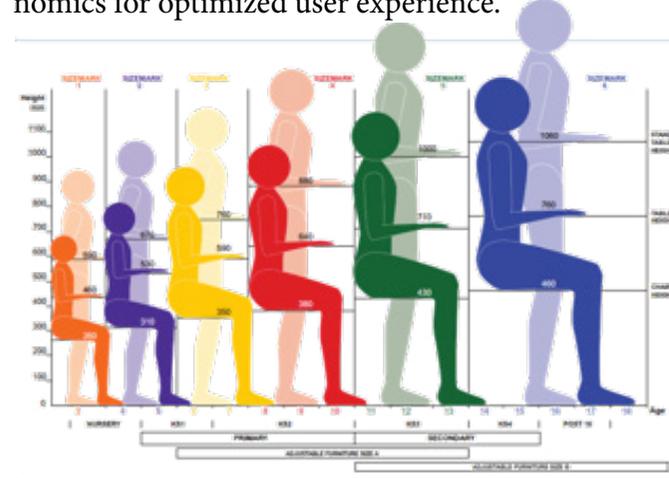
## Ideation - Sketch Models:

Built various models with different material, shape, and size; all having flexibility to accommodate different users when we place them in various designed positions.



## Scenarios:

The design is in line with standard anthropometry measurements and ergonomics for optimized user experience.



## Process Selection:

Material	Process	Complexity (10-Highest)
Wood	veneer Lamination	8
Wood	Steam Bending	9
Plastic	Injection Bending	9
MDF	Milling the profile	8
MDF	Laser cut bent profile	6
Bamboo	Bending outer structure	8
Canes	Profile Bending	8

## Experiment with Laser Cutting:

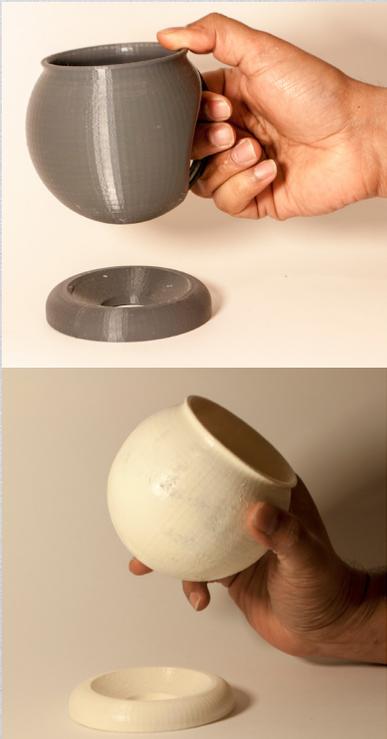
To get the desired Bend.



Wood is a tricky medium to get the desired bend and I was looking for ways to achieve the wood to flow on a complex contour which was quite impossible by steam bending and veneer lamination. Optimized laser cut pattern not only helped the wood (MDF /Plywood) to roll over the contour smoothly, but also gave the required strength

# Kulhad

This cup and saucer has the most natural shape existed – Sphere, Quite the reason droplet or hail storm tends to become spherical, though not the perfect ones and here too I have some intended imperfection to give room to new expression.



# Kulhad

## Inspiration



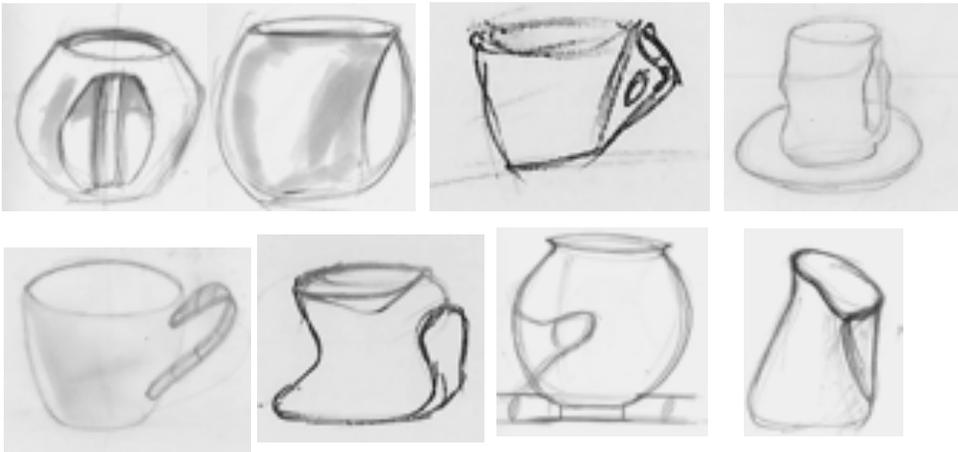
Kulhad” – Made of Clay, is used to serve tea



Matka” – Made of Clay, is Used as Water Storage

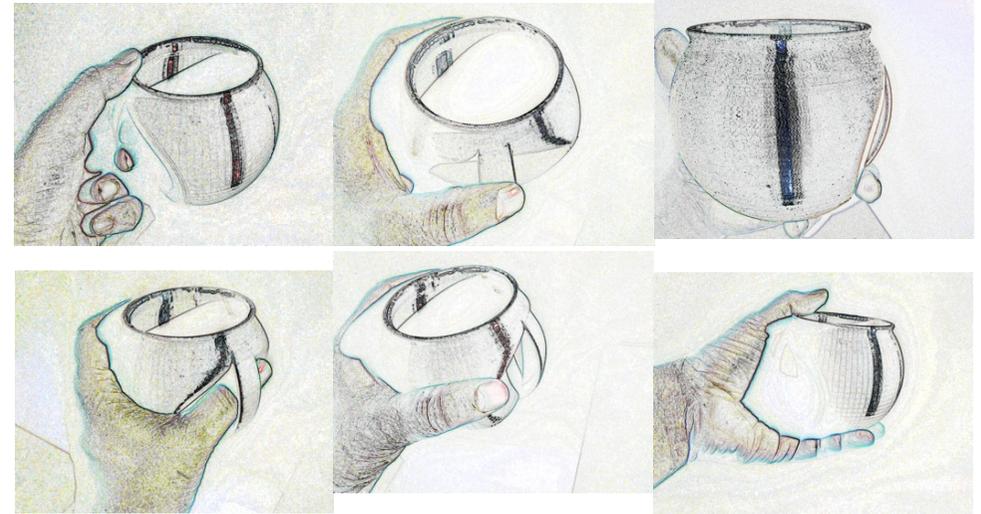
Cup is inspired from traditional Indian pot called “Matka” made of clay and saucer from “Erundi” made of clothes, Predominantly used in Rural India.

## Ideation:



## User Interaction / Scenario:

Handle has been carved from within the sphere hence makes it an integral part of the cup and spherical geometry gives the feeling of completeness when one moves ones hand over it.



## Details

Shuttle bend at the top provides room for the lip to rest for gentle shipping. Spherical bulge at the saucer further complements the cup's geometry and smaller size of it doesn't take away attention from the cup and keep it prominent as intended.



# ASHWA (FSAE'05 - Australia)

## Project Brief

Project "Ashwa", a project to construct and fabricate a formula-styled race car. The car was fabricated for competing with cars made by universities around the world at Formula SAE, Australasia, 2005. (We were the first Indian team to participate in FSAE-A)

## Role and Responsibility:

I was Involved in following activities under project "ASHWA".

- Chassis design
- Design of fuel tank, fuel line and crush zone.
- In charge of project costing (Highlight - Winner of the costing event).

## Achievement

- First Indian team to participate in FSAE-Australia.
- Won "Best cost report Award" event, which was led by me with one of my colleague.
- Won "Best Endeavour" award.



"Ashwa" Launch in College

## Things Designed and developed by Me



Chassis Fabrication



Suspension Testing



Fuel Tank



Fuel Tank (With Insulation)

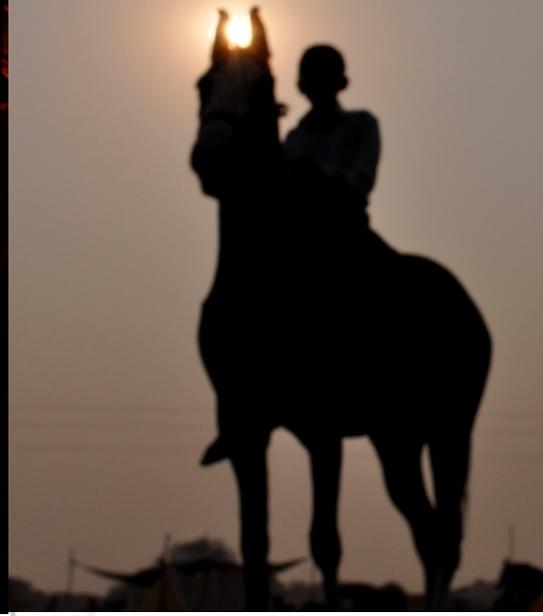


Crush Zone / Crush Zone with Aesthetics



Best Cost Award

# Photography



Link



# Sketches

Link

