DESIGN PORTFOLIO

TANYA GUPTA

ABOUT ME

Hello! I am Tanya Gupta, a final year student of Mechanical Engineering Department at the Indian Institute of Technology Bombay, India. I am concurrently pursuing a minor degree in Computer Science and Engineering.

Being a very curiosity driven person, I have explored various fields, which include algorithm design, robotics, investment banking and public policy. These interests of mine have in common the requirement of logical thinking ability for analyzing and deriving out of the box solutions by thinking differently.

Managing academic commitments along with my lines of interest and extracurricular activities in basketball, dance and mentorship, has helped me grow into a diligent person, with an acute sense of time management and the ability to work efficiently individually or in a team.

Creative thinking and innovation have driven me since childhood. I am eager to learn and contribute to the cross-disciplinary applications of design and engineering.

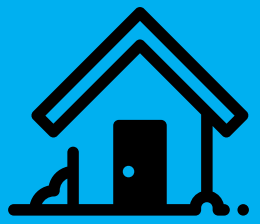
CONTENTS

FOLDABLE HELMET

INTERIOR DESIGN Business Model

SEGURA – The Safety Watch

SCHOOLAGE – Elder Home



MUSIC SYNCED STAGE LIGHTS

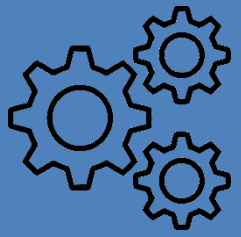
POSTER DESIGN

ACTUATOR Simulations

CANVAS PAINTING

POLCY DESIGN

MECHANISM DESIGN



FOLDABLE HELMET

ACADEMIC
AUG 2018 - NOV 2018

Problem statement

Helmets available in the market today ensure safety but tend to take up too much of space and make carrying them around and their storage a hassle. With circumferences as large as 60-65 cm at the base they tend to occupy almost all the space in a vehicle's boot space or the rider's bag. This prevents people from having the motivation of carrying the helmet with them.

In India, two wheelers accidents constitute roughly 24% of all road accidents, a figure that has been steadily increasing year on year. 90% can be prevented or the damage caused can be reduced by use of helmets.

[1] ACCIDENT STATISTICS INVOLVING VEHICLES IN INDIA

My Role

As team leader of a group of 5, I divided the tasks of CAD Modelling, interaction with vendors for manufacturing, assembly, poster and report preparation between the team members. All of us were involved in the ideation, conceptualization and feasible design decision.

Additionally, I ensured once a fortnight meetings to stay updated on work done and finish our prototype with enough time to compensate for external disturbances and required changes.

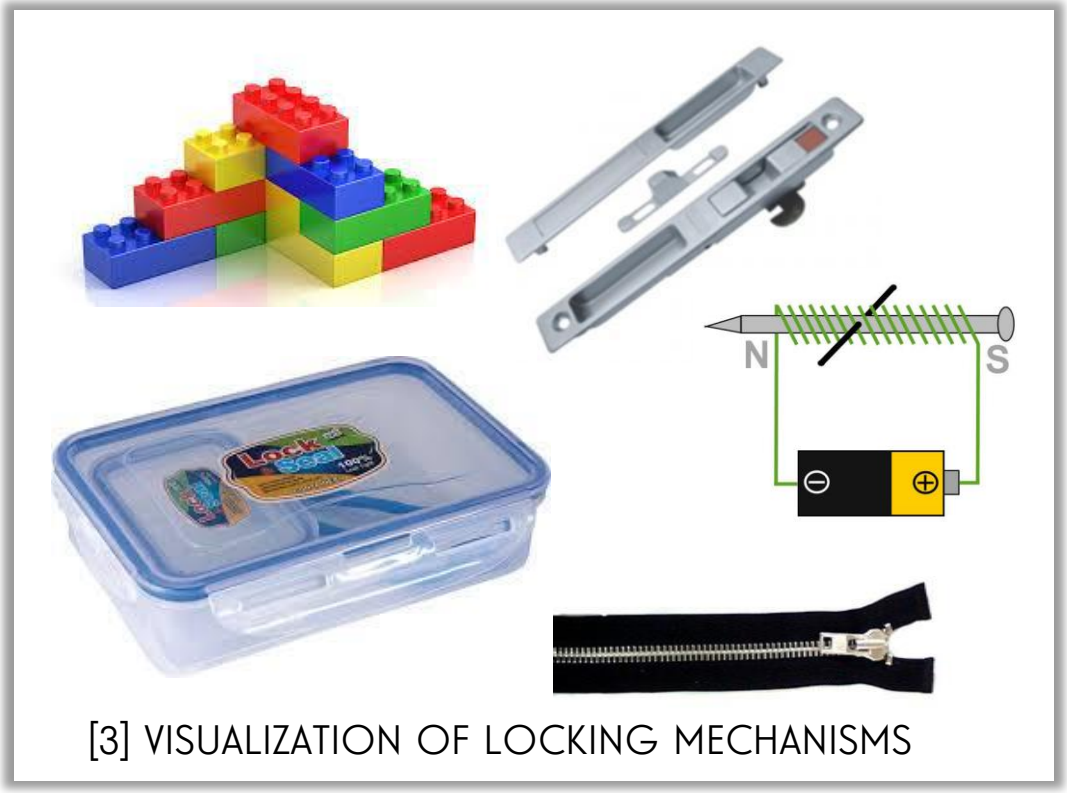
[2] EXISTING CYCLING HELMET DESIGNS IN THE MARKET

Existing Folding Mechanisms

Existing foldable helmets in the market are geared towards cyclists not bikers. Additionally, they are too expensive to be affordable to the common man. Our aim was thus to design an affordable helmet with capabilities of volume and weight reduction.

Design Requirements

- Must Provide Safety
- Should not impair vision
- Lightweight
- Comfortable
- Modular
- Portable
- Storage should be easy
- Should cushion impact



[3] VISUALIZATION OF LOCKING MECHANISMS

Discussed Locking Mechanisms

After various sessions, we ideated the following locking mechanisms.

1. The lock and lock tiffin mechanism
2. Lego blocks imitating mechanism
3. Window shutting lock technique
4. Use of electromagnets
5. **Zipping mechanism**

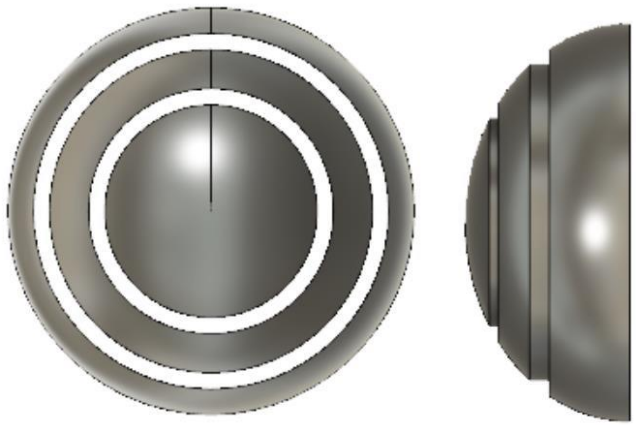
Though the zipping mechanism could be unsafe at certain impacts, it was chosen as a feasible design for ease of use and prototyping

Solution

The first prototype has been 3D Printed. To address the issue of reducing weight whilst not compromising on strength is what influenced the choice of ABS as a starting material for the first iteration of the model. Zips were bought independently and glued to the three parts. Thus, there are 3 detachable parts which can be stacked one inside the other when not in use.

Dismantle after use → Collapse and store → Re-assemble for use

[4] PROTOTYPE, Size: 18" diameter with 0.5" thickness



[5] CAD MODEL IN FUSION 360

Future Scope

The next iterations of this prototype would require many changes to be usable and effective. Some of these include

1. Shape the helmet Elliptical like actual helmets
2. Cushion material like foamed polymers to absorb impact on collision
3. Material optimization using Optistruct Software

BUSINESS MODEL CANVAS

PROFESSIONAL
NOV 2017

The submission of a business model for an Interior Designing firm for my selection to Women Emerging in Finance Workshop held by Goldman Sachs.

Designed for: XYZ Firm Date: 27/11/2017

Designed by: Tanya Gupta Version: 4

KEY PARTNERS
- Real estate agents
- Architects
- Builders
- Painters
- Electricians
- Networking
- Designers

KEY ACTIVITIES
- Home improvements events
- Open houses(staged)
- Furniture/Fixed line
- Building company networks

KEY RESOURCES
- Software
- Professional references
- Portfolios
- Samples

VALUE PROPOSITIONS
- Space planning
- Window treatments
- Furniture/fixtures
- Lighting
- Artwork
- Specially priced packages
- Affordable contracts

CUSTOMER RELATIONSHIPS
- Provide the highest quality interior design consulting experience possible.
- Sell specially selected products to these clients to further meet needs.
- Retain clients to generate repeat purchases and initiate referrals.
- Communicate with our client base through the website and personalized communication techniques

CHANNELS
- Website
- Outlets
- Mobile app

CUSTOMER SEGMENTS
- Residence owners who are getting new homes or want to do their own interior designing
- Start-ups who are setting up their first offices.
- Ambitious, showing and maintaining their home and office is important in their working life.
- Behavioral purchase characteristics:

1) Design which satisfies their living style and ambition and office workspace atmosphere
2) Wishes to have higher stature from among their peers/competitors

COST STRUCTURE
- Cost of labour
- Cost of furniture/fixtures, lighting, artwork and miscellaneous passed on to client
- Cost of marketing and advertisement

REVENUE STREAMS
- Clients
- Initial capital from investors, banks, lenders
- Designers and real estate agents tied up with would give us commission

SEGURA

PROFESSIONAL
DEC 2019

SEGURA - A WEARABLE SAFETY DEVICE FOR CHILDREN

STEAM School is a 10-day practical workshop organized by Maker's Asylum, As part of this program, we designed a prototype of a wearable watch which can track a child's location and notify parents in case of emergency. It also draws from user data and created a heat-map to identify safety zones. Link to Video Application that secured me a 75% scholarship for attending the program.

My Role

1. Since I was enthusiastic about learning as much as I can in a short period of time, my roles included making the App wireframe and designing the poster.

2. I read newspaper articles to derive child safety statistics to convey the emergency and need for our solution.

3. Additionally, as the only mechanical engineer on the team, I also made the CAD Model for 3D Printing

[6] PROTOTYPE

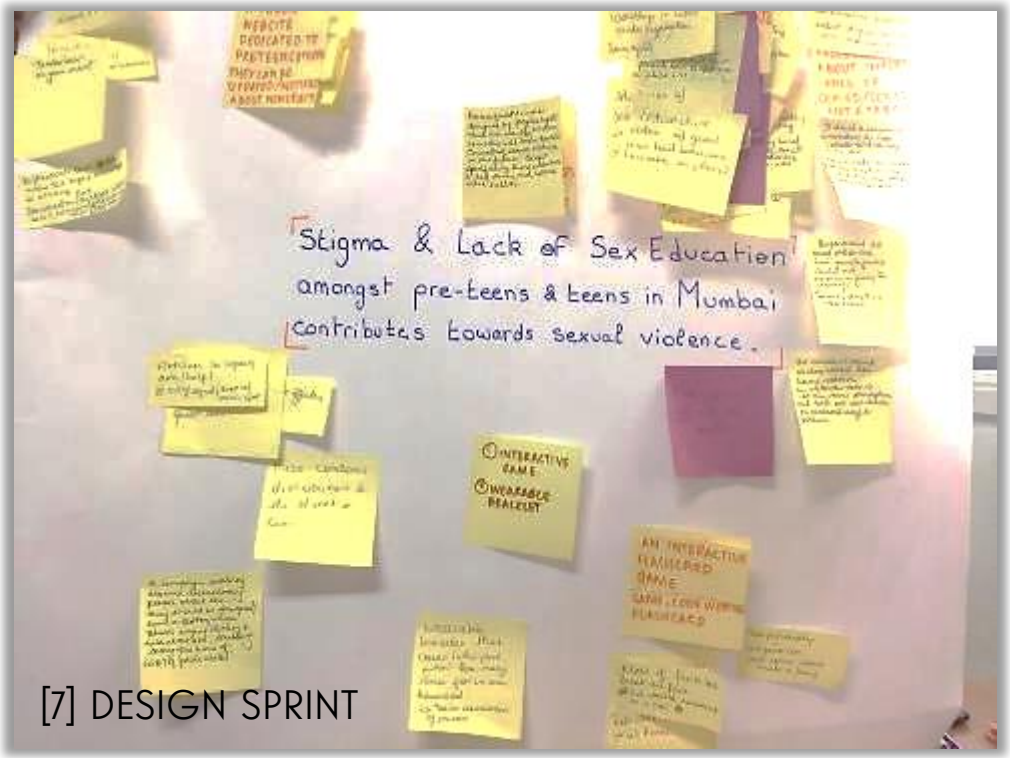
Defining Problem Statement

All team members were passionate about solving an issue pertaining to SDG 3, which is Good Health and Well-being.

We originally started with the problem statement of '**reducing sexual violence by removing stigma surrounding talking about sex in Mumbai**'. Our on-ground interactions with families revealed our assumptions to be false, and after several iterations we redefined our problem statement to revolve around children's safety.

Our final problem statement was –
"**IMPROVING SAFETY OF SCHOOL-GOING CHILDREN IN MUMBAI**."

The ideation, design sprints, stakeholder interactions, testing and pitch were done as a group.

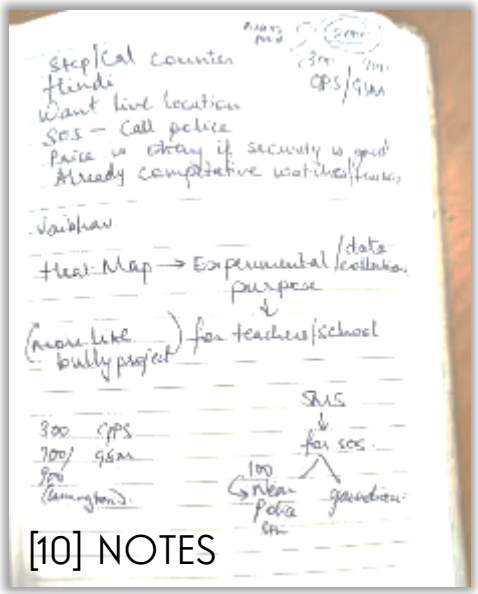


[7] DESIGN SPRINT

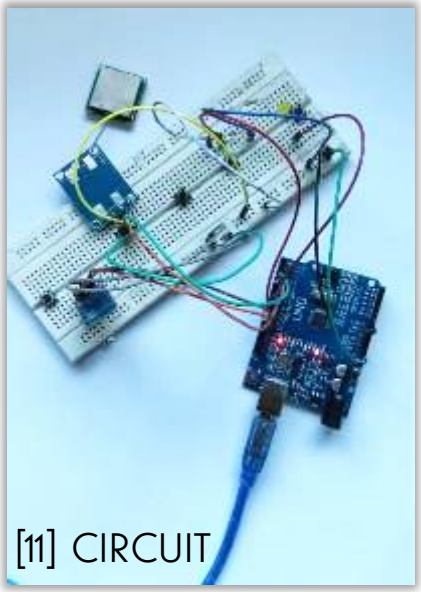

[8] STAKEHOLDER


[9] STAKEHOLDER

Identifying Product Features



[10] NOTES


[11] CIRCUIT


[12] STAKEHOLDER IDENTIFICATION

Existing smart-watches are expensive because they provide various functions. We decided to focus on a low-cost model by eliminating unnecessary features. We decided to provide 4 additional facilities-

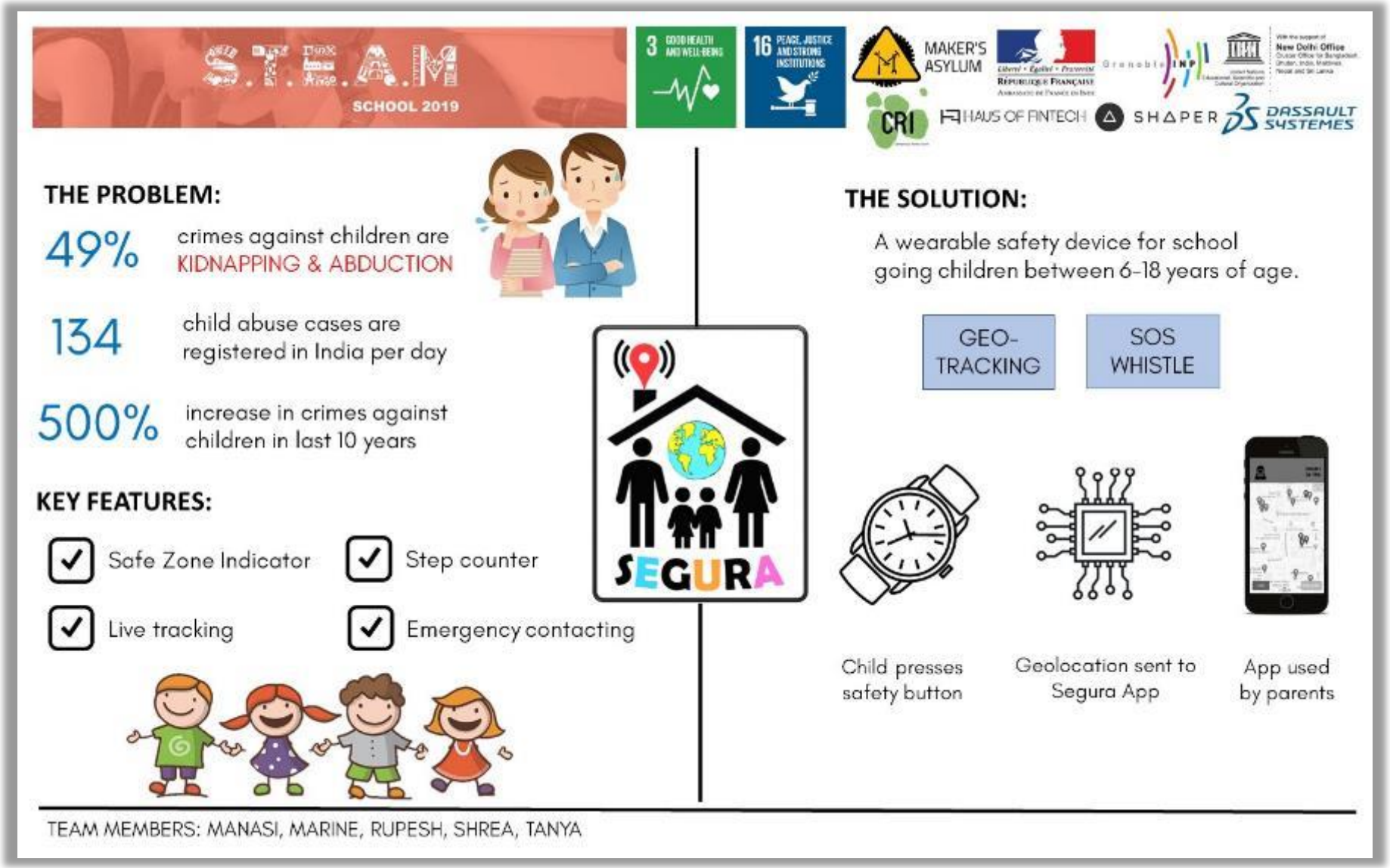
1. **Child tracking**, an optional choice since teenagers prefer having their privacy.

2. **Emergency calling** for a time when a child is being abused/kidnapped

3. **Heat-mapping** to identify safe zones and notifying parents when their child enters a red-zone

4. A cool **safety whistle** for children to be attracted to our product and notify people in immediate surrounding in case of crisis.

Segura Poster Design



[13] POSTER DESIGN, 10" x 16"

Segura App Wireframe

[14] WIREFRAME: Screens made on MS PowerPoint and click-through prototype made using the Marvel App. Link to Prototype

APPLICATION LOGIN

INTRODUCTION

EMERGENCY CALLING

HISTORICAL DATA

HEATMAP

LIVE-TRACKING

Final Product

A 3D printed watch and a separate geolocation tracker built using Arduino with the GPS and Bluetooth module. The App wireframe was utilized to explain the interface and working to parents.

[15] PRESENTATION SET-UP

[16] VIDEO

Link to Video

SCHOOLAGE

PROFESSIONAL
SEP 2018

A SCHOOL FOR THE ELDERLY

Thanks to the growing average age of the world population, the elderly face various forms of abuse, be it financial. emotional or physical, They lose the will to live and this leads to self-neglect.
I worked in a team of 4 with delegates from Indonesia, Taiwan and Africa during the Future Leaders Congress with the vision of empowering the elderly and helping them develop themselves and exploit their potential resource for economic growth of the country. Identified below are my contributions to the project.

Solution

Designed the curriculum for the school ensuring availability of adequate care, counsellors and provision of doctors in case of emergency

Skill development classes:

1. Cooking
2. Knitting
3. Painting
4. Farming
5. Carpentry

Recognition

Our campaign would involve student volunteers, fundraising and collaborating with existing organizations and using social media to generate awareness. Products made by senior citizens at the Schoolage can be sold to generate income and ensure progress.

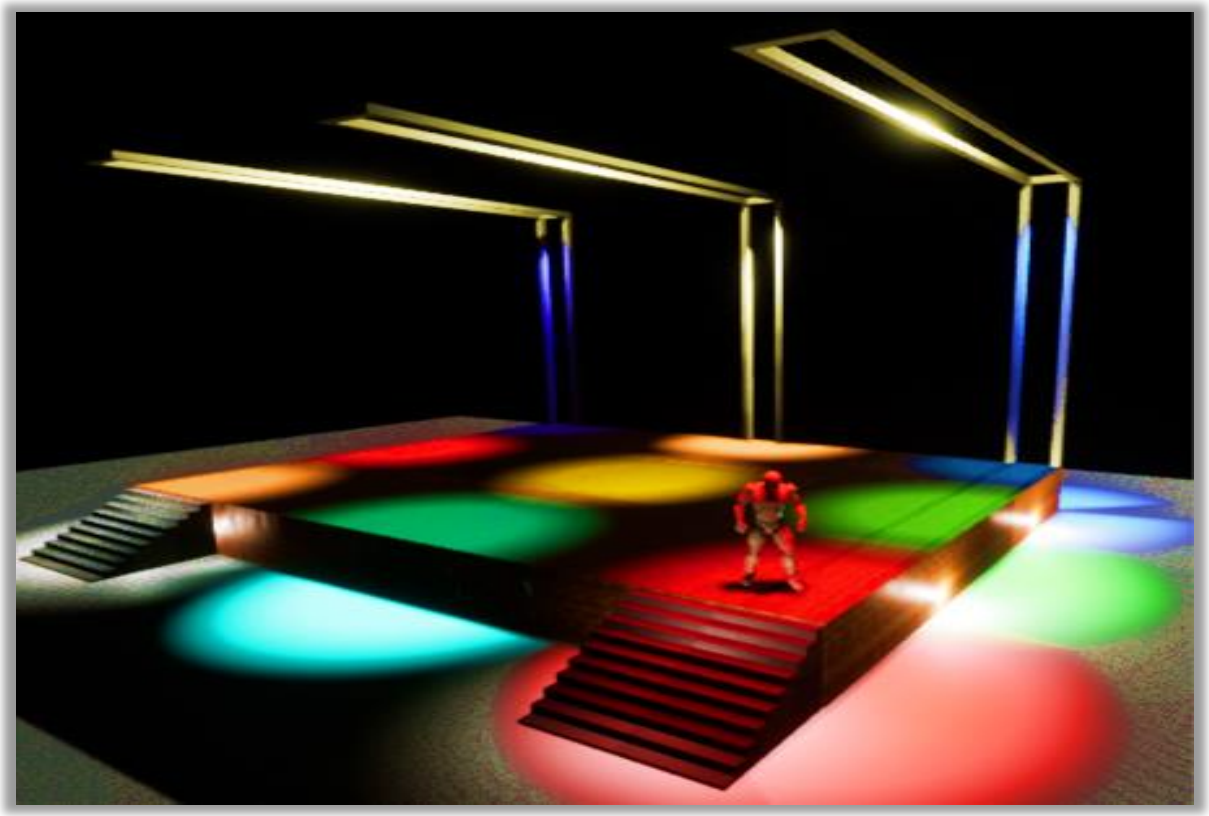
Expansion

1. For the first two years, we observe the conditions and growth rate

2. At the 3-5 years time limit, start looking for global expansion and working with government to set up “Ministry of Elderly”

MUSIC SYNCED STAGE LIGHTS

ACADEMIC
AUG 2019 – NOV 2019



[17] STAGE DESIGN IN UNREAL ENGINE

Problem statement

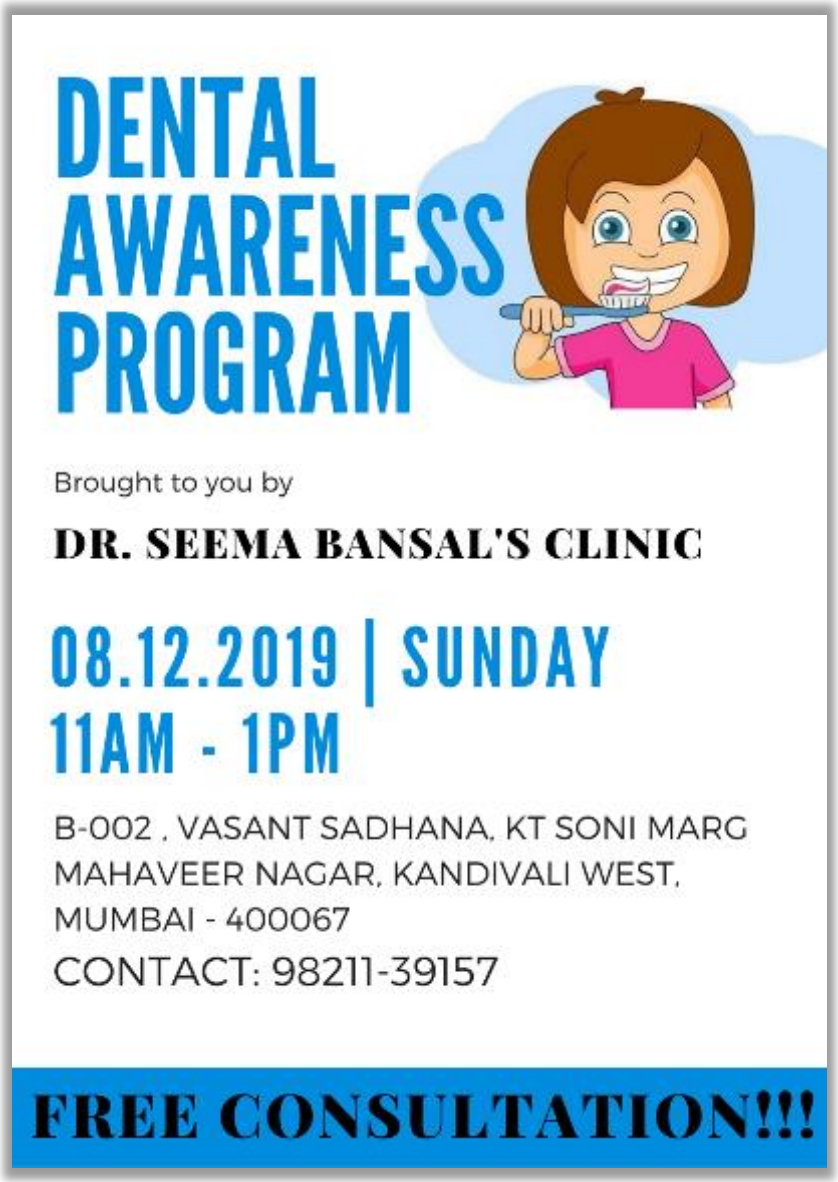
As my course project in Computer Graphics and Product Modelling course, I worked in a team of 4 on a project to sync stage lights to music beats.

My Role

I used the Unreal Engine software to simulate a stage and control the lights to the beats of music chosen by the user. This would eliminate the need for a middleman to control the stage lights and reduce hours of manual labor.

POSTER DESIGN

PROFESSIONAL
JUN 2019 – DEC 2019



[18] POSTER

Freelancing for Dr. Seema Bansal and making WhatsApp forwardable publicity posters for her clinic's Awareness program every Sunday for the past 5 months.

Requirements

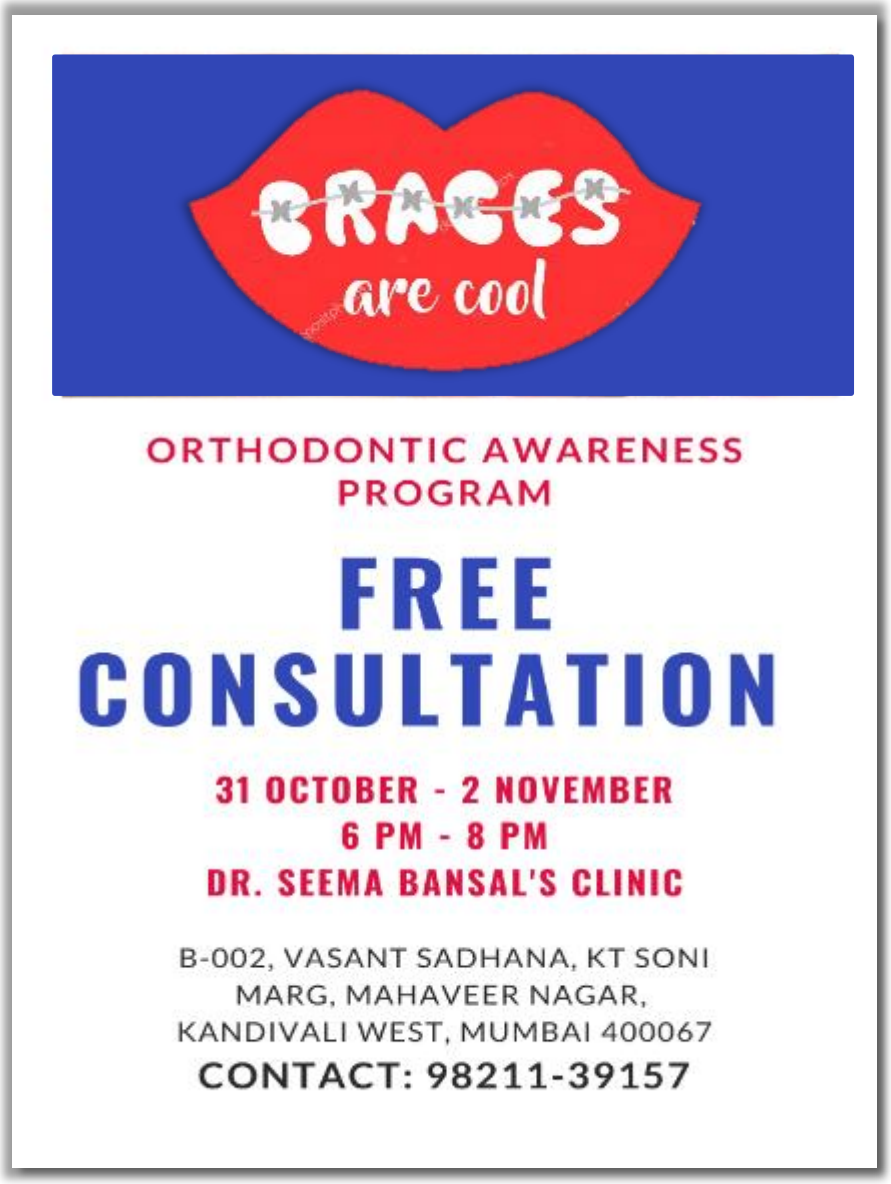
1) Mentions "Dental/Orthodontic Awareness Program"
2) Free consultation should be highlighted
3) Includes details like date, time, address and contact number
4) An image showing braces/teeth/toothbrush

Deliverable

Based on these instructions, I made several posters using Canva, and each of them was used for a period of one month. It boosted customer footfall by 200% and I am currently working on designs for her contact cards.

Poster Size: [18], [19], [20] – 42cm x 59.4cm

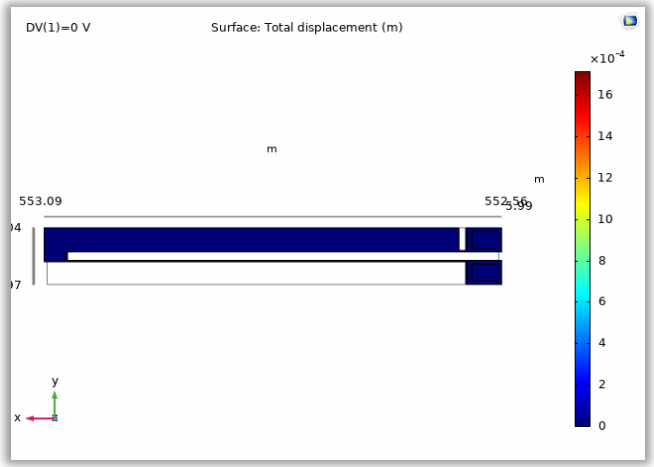
[19] POSTER 2



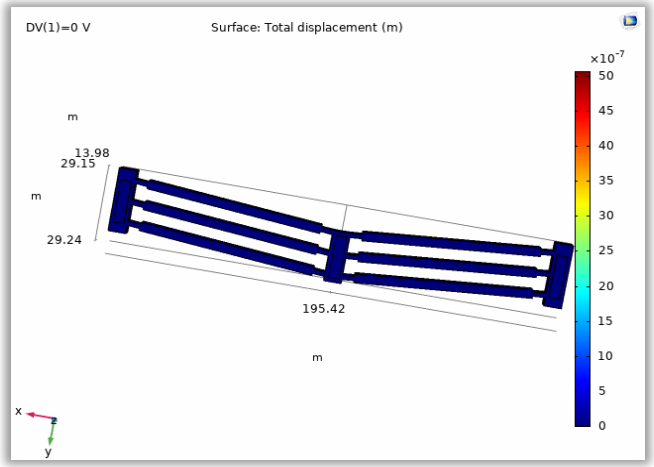
[20] POSTER 3

ACTUATOR SIMULATION

ACADEMIC
AUG 2019 – NOV 2019



[21] ONE HOT-ARM ACTUATOR



[22] CHEVRON TYPE ACTUATOR

Problem statement

A course project in Micro Electrical Mechanical Devices involved designing and simulating MEMS thermal actuators for understanding how they work.

Deliverable

The design of the model was done in SolidWorks and then the thermal simulations were executed on COMSOL software.

Dimensions and readings were taken based on extensive literature review. Simulations were run for displacement variation with time and temperature variation with time and analyzed for one-arm, two-arm and chevron type actuators

CANVAS PAINTING

PERSONAL
JUN 2019 – NOV 2019

I have taken courses in arts during my schooldays, and after a brief sabbatical I have rediscovered my love for painting. It is a great form of therapy and stress-buster for me, and I am now experimenting with **acrylic paints on canvas**. I am still learning, and hence starting with basic tutorials on Youtube from channels like **theartsherpa**, **gingercook**, **angelaanderson** and **colorbyfeliks**.

Canvas size: [24] 12" x 12"
Canvas size: [23], [25], [26], [27] 12" x 16"

[23] ABSTRACT MUSIC

[24] SHADES OF A FLOWER

[25] PEACOCK

[26] THE HANDMAID'S TALE

As a huge fan of Margeret Atwood's award-winning novel **The Handmaid's Tale**, it was inevitable I paint the scene of June running to her freedom through the woods at night.

As someone who loves travelling, I can imagine myself backpacking across Europe and encountering quiet vintage houses in remote villages!

[27] VINTAGE VIBES

POLICY DESIGN

PROFESSIONAL
SEP 2019 – OCT 2019

ECOLOGICAL CONSERVATION OF WESTERN GHATS

UNDER RAJYA SABHA MEMBER MR. BINOY VISVAS

The Problem

The Western Ghats are a mountainous and dynamic biodiversity hotspot and declared a World Heritage site by UNESCO. Unsustainable use forest resources and agricultural land along with climate change have led to major environmental damage in the past 20 years

International Comparison

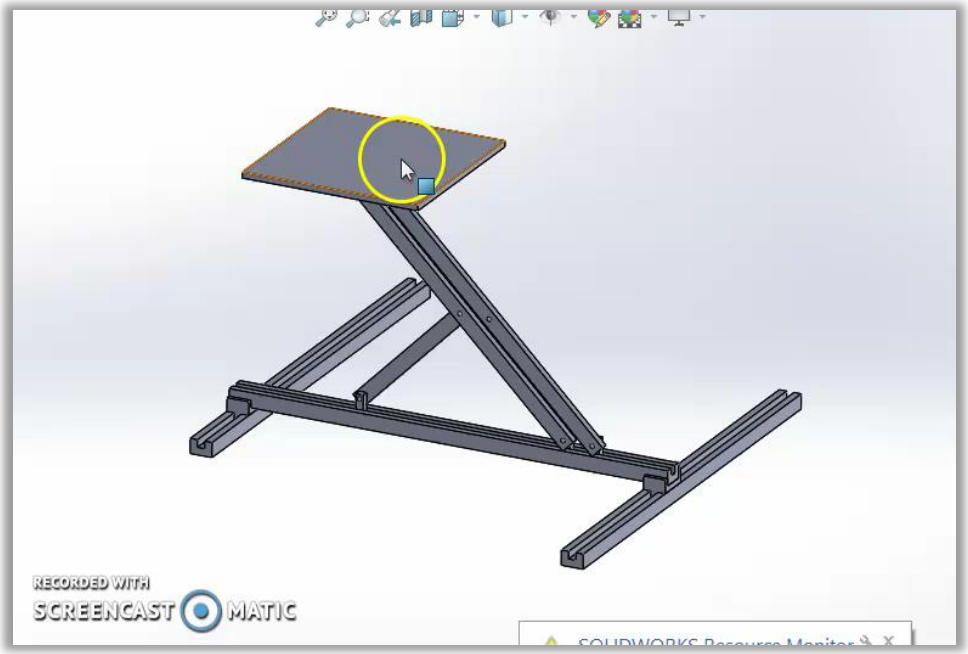
Kerala has the potential to become an eco-tourism hub and the state should conduct feasibility studies to identify regions compatible for ecotourism. just like Costa Rica has reversed its declining biodiversity by integrating the Payment for Ecosystem program

Technical Recommendation

Digitizing local ground level mapping and making them freely accessible to Local Government officials is important and National level Geographical Information Systems should be updated and integrated with national and global conservation efforts.

SCOTT RUSSELL MECHANISM

ACADEMIC
AUG 2019 – NOV 2019



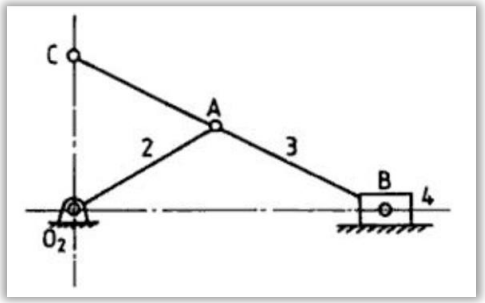
[29] SCOTT RUSSELL MECHANISM

Link to Video

As part of my Rapid Product Development course, I used SolidWorks to design the Scott Russell mechanism for 3D Printing in which two degrees of freedom are utilized to generate motion in 3 axis.

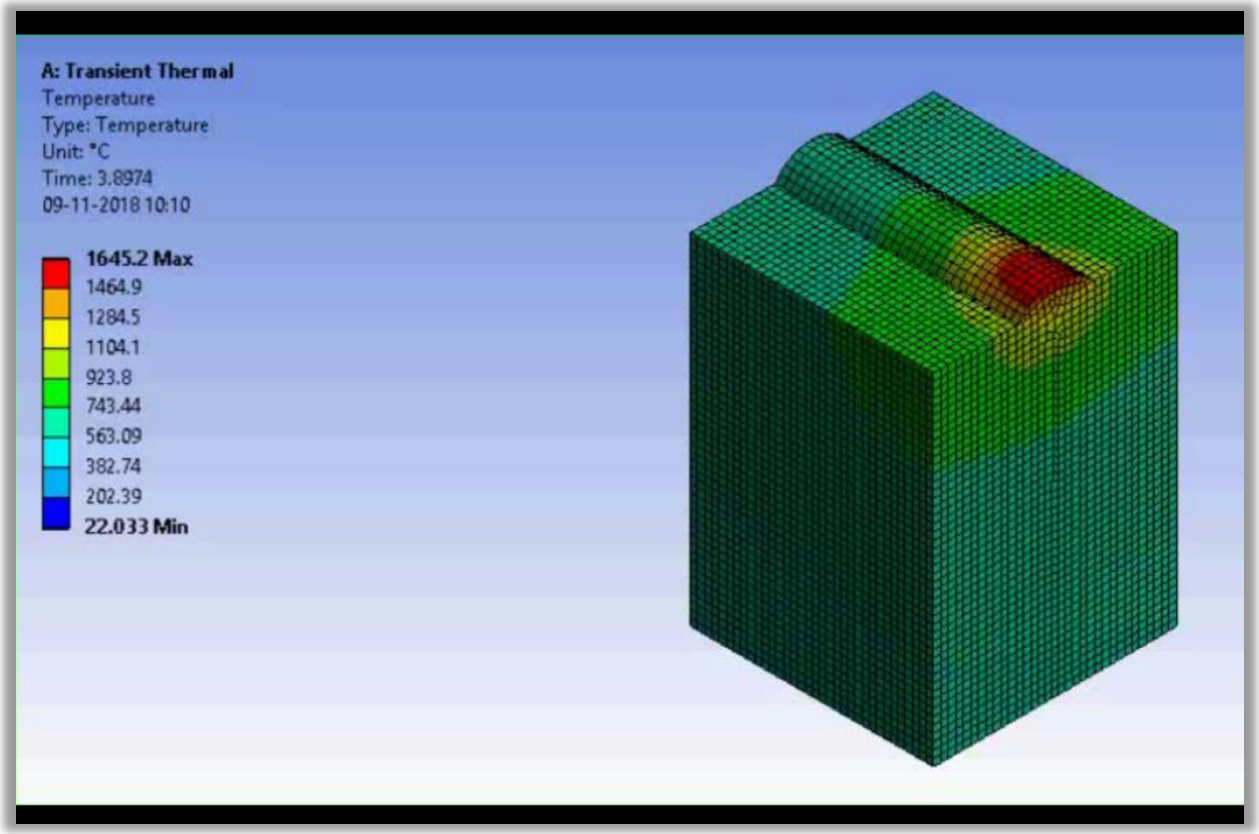
Based on the geometry of the linkage, the output motion is a simple sine function of the drive link or a simple harmonic motion. The movement of B is in one axis, while C moves in its perpendicular axis.

It opens up the possibility of incorporating multiple degrees of freedom without incurring additional costs of lead screws for different axis



LASER CLADDING MODELLING

ACADEMIC
AUG 2018 – NOV 2018



[30] LASER CLADDING MODELLING DONE IN ANSYS

Problem statement

As my course project in Manufacturing Processes 2 course, I worked in a team of 4 on a project to model the laser cladding process..

My Role

I used Fusion 360 to make the CAD Model and made the complete final report. Additionally, data collected after Heat Affected Zone experiments was reported in Latex and plotted in Excel by me for analysis purposes.

We have only two constraints: GRAVITY, and our IMAGINATION.