

# MindYourArrow

## UI-UX Design

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# COURSE DETAILS

NIRMA UNIVERSITY  
DEPARTMENT OF DESIGN

**Discipline:** Industrial Design

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**Course Code:** IDPR 313E

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**Course Faculty:** Gaurang Shah, Priyam Parikh

**Course Coordinator:** Sangita Shroff

# ACKNOWLEDGEMENTS

I would like to express my gratitude to the department headed by Prof. Sangita Shroff and all the people involved in the development of the entire product.

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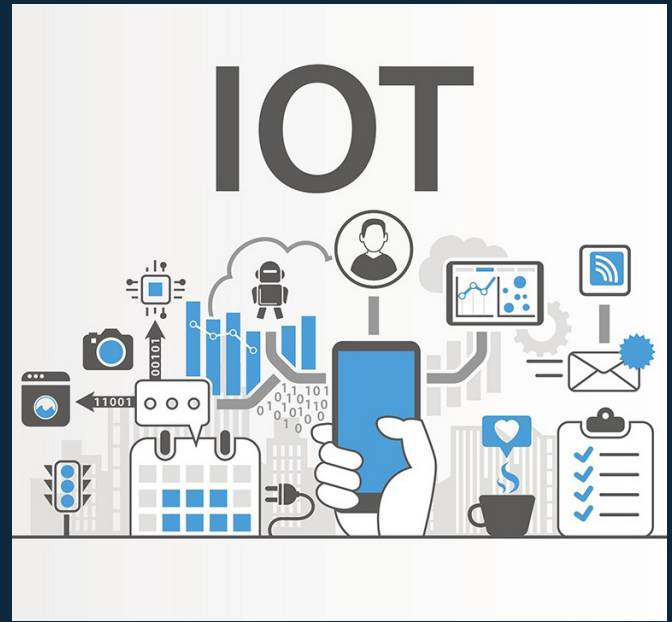
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# INTRODUCTION

The objective of this course was to create a product using basic understanding of Arduino, Internet Of Things and Basic programming.

Design a high a fidelity mock-up using Arduino and additive manufacturing tools/machines.

Gain technical skills and knowhow of electronic components and programming of sensors.



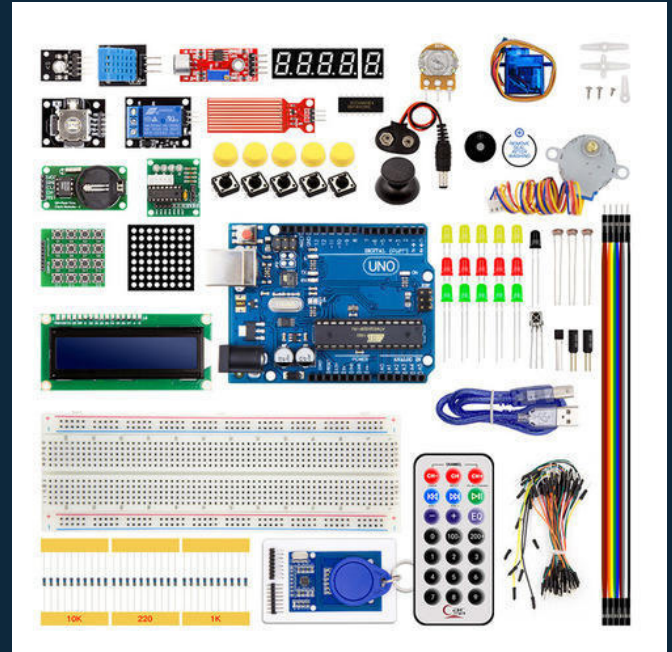
```
✓ ↕ 📄 ⬆ ⬇ ⬇
Blink

/*
 * Blink
 * Turns on an LED on for one second, then off for one second, repeatedly
 *
 * This example code is in the public domain.
 */

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop(){
  digitalWrite(led, HIGH); // turn the LED on (HIGH is the voltage level)
  delay(1000);             // wait for a second
  digitalWrite(led, LOW);  // turn the LED off by making the voltage LOW
  delay(1000);             // wait for a second
}
```



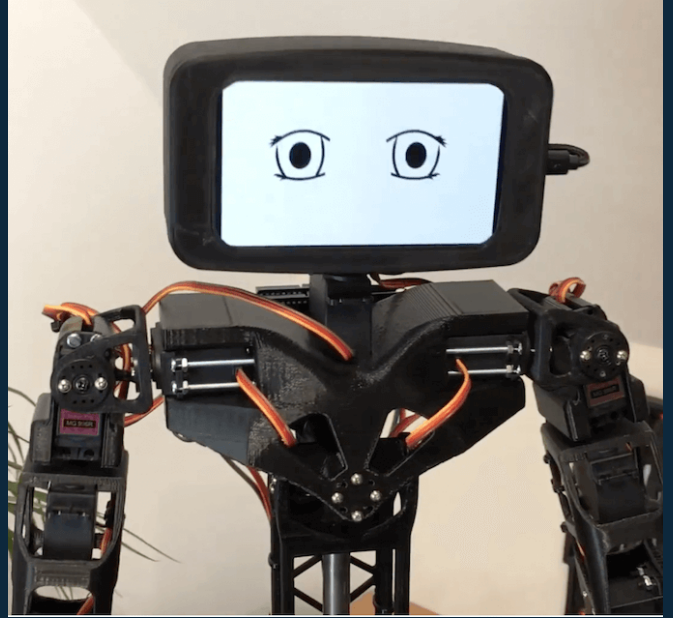
# WHAT IS UI/UX

“UX” stands for “user experience.” A user’s experience of the app is determined by how they interact with it. Is the experience smooth and intuitive or clunky and confusing? Does navigating the app feel logical or does it feel arbitrary? Does interacting with the app give people the sense that they’re efficiently accomplishing the tasks they set out to achieve or does it feel like a struggle? User experience is determined by how easy or difficult it is to interact with the user interface elements that the UI designers have created.

The “UI” in UI design stands for “user interface.” The user interface is the graphical layout of an application. It consists of the buttons users click on, the text they read, the images, sliders, text entry fields, and all the rest of the items the user interacts with. This includes screen layout, transitions, interface animations and every single micro-interaction. Any sort of visual element, interaction, or animation must all be designed.



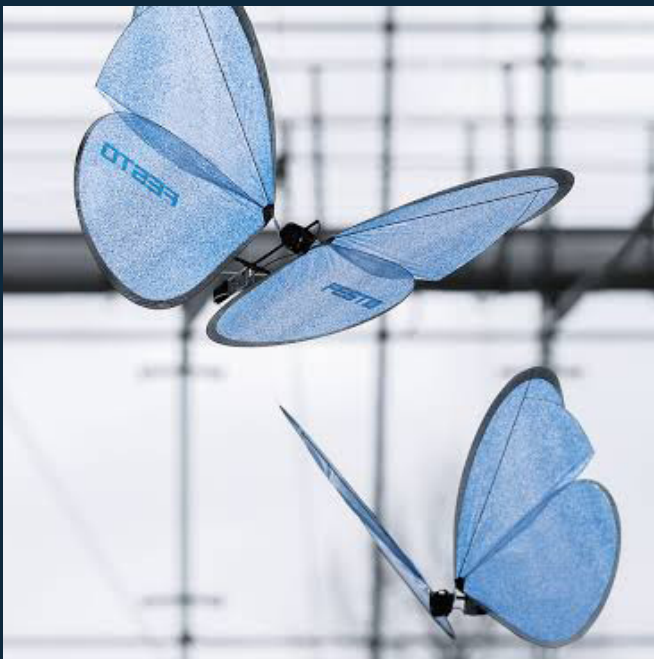
# APPLICATION OF ARDUINO







Arduino is extensively used in major and minor technical projects by students as well as experts. The application of arduino ranges from the smallest project of sensing heat in a classroom to featuring its role in a healthcare product, defense product, in agricultural department etc. The technology has opened up roads for various technical and smart innovations. The variety of boards that arduino has makes it usable for almost all the type of products and even in robotics.

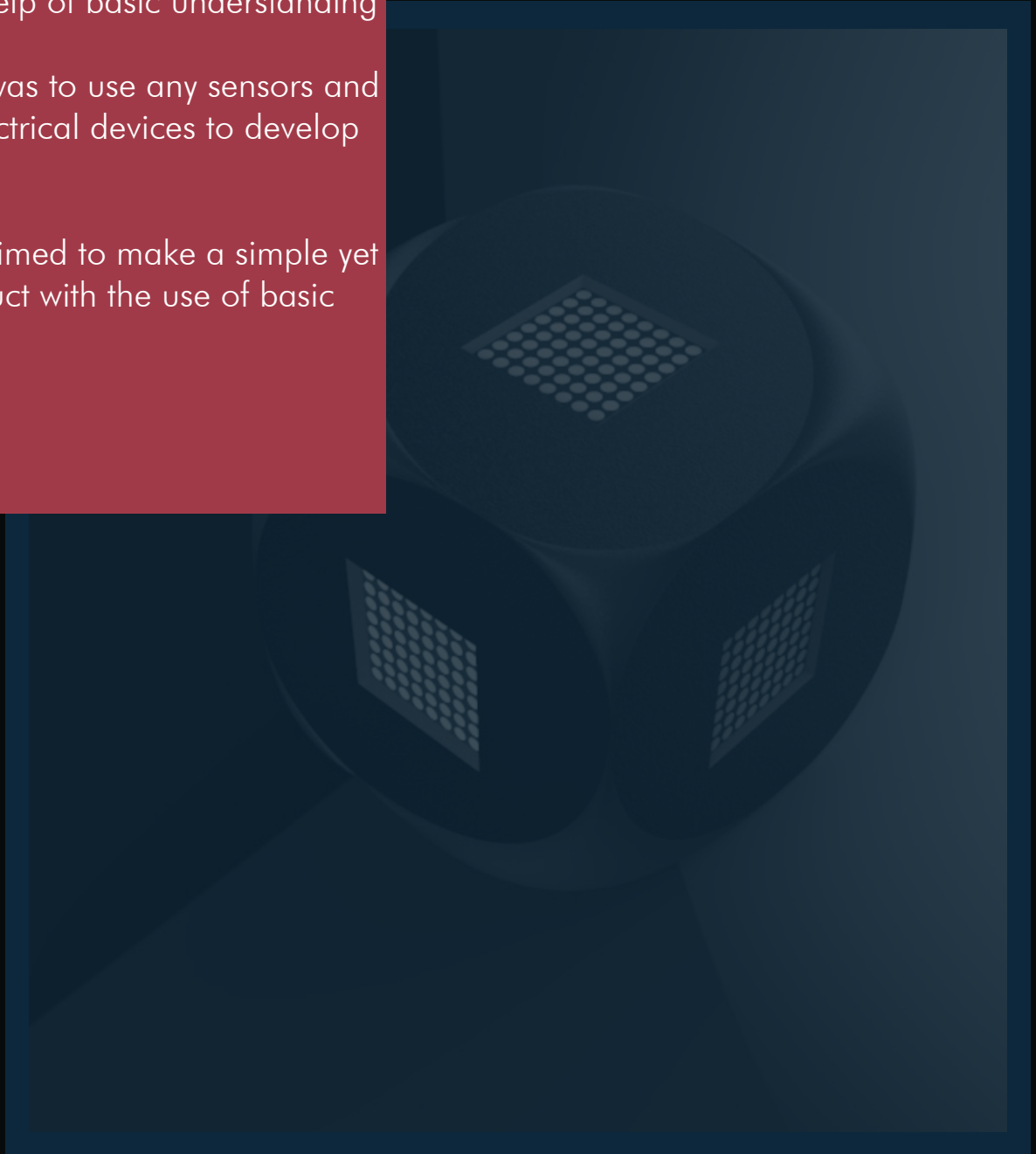


# PROJECT ONE - BRIEF

To design a smart object which connects user with the help of basic understanding of Arduino.

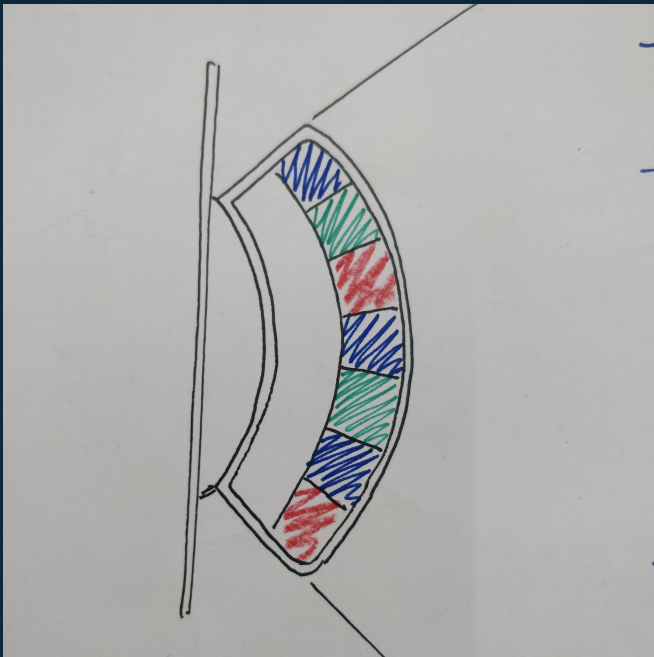
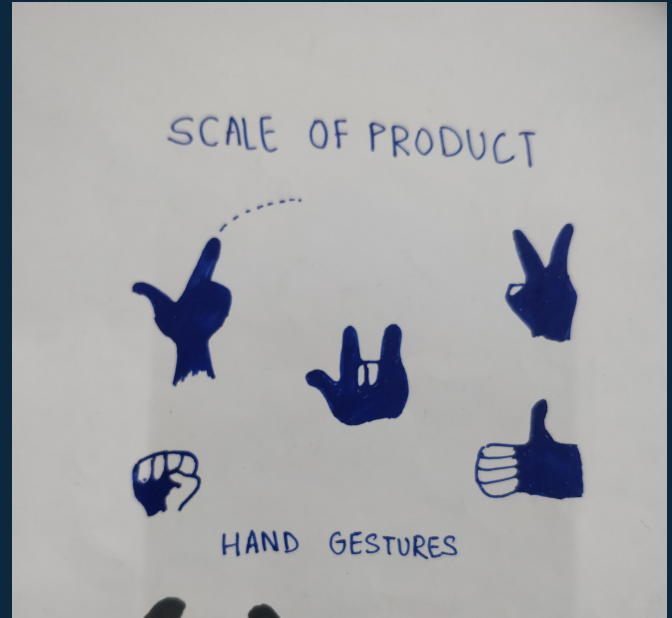
The objective was to use any sensors and elementary electrical devices to develop a product.

We as a pair aimed to make a simple yet sufficient product with the use of basic sensors.





# BRAINSTORMING



Initially we began ideating with simple ideas of playing with sound and light with a grid of 9 cubes of 8x8 cm. The arrangement increased the surface area. It also included an activity of painting the pixels using joystick. Association of sound and color for easy identification by a kid.

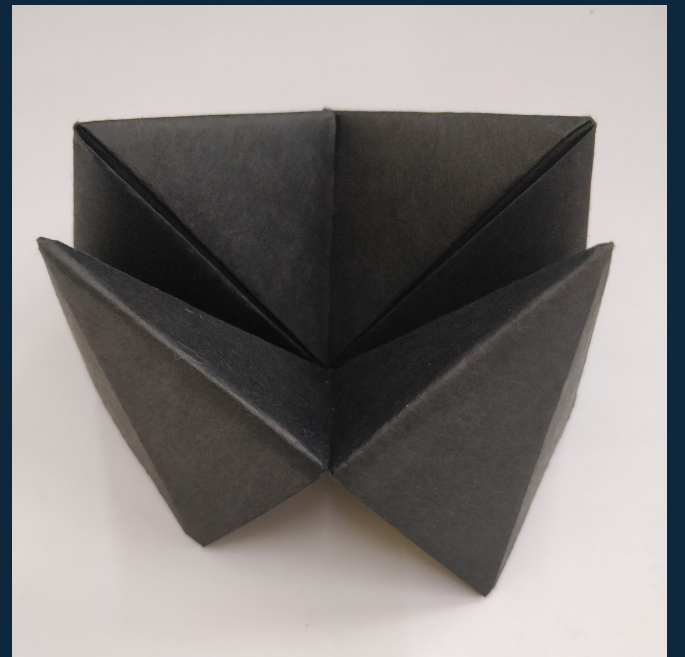
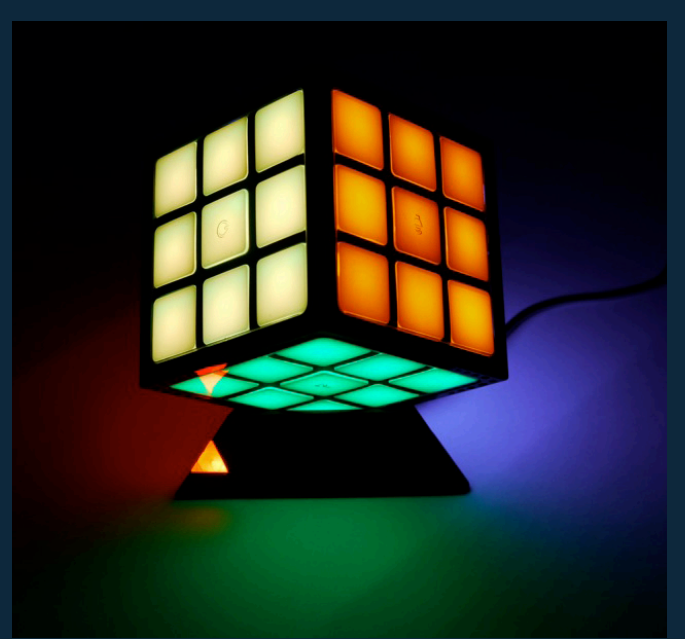
Using simple hand gestures to activate and control lights and sound effects. Playing with beats (can be scaled up as a wall). The convex curved wall installation would result into widespread of the output.

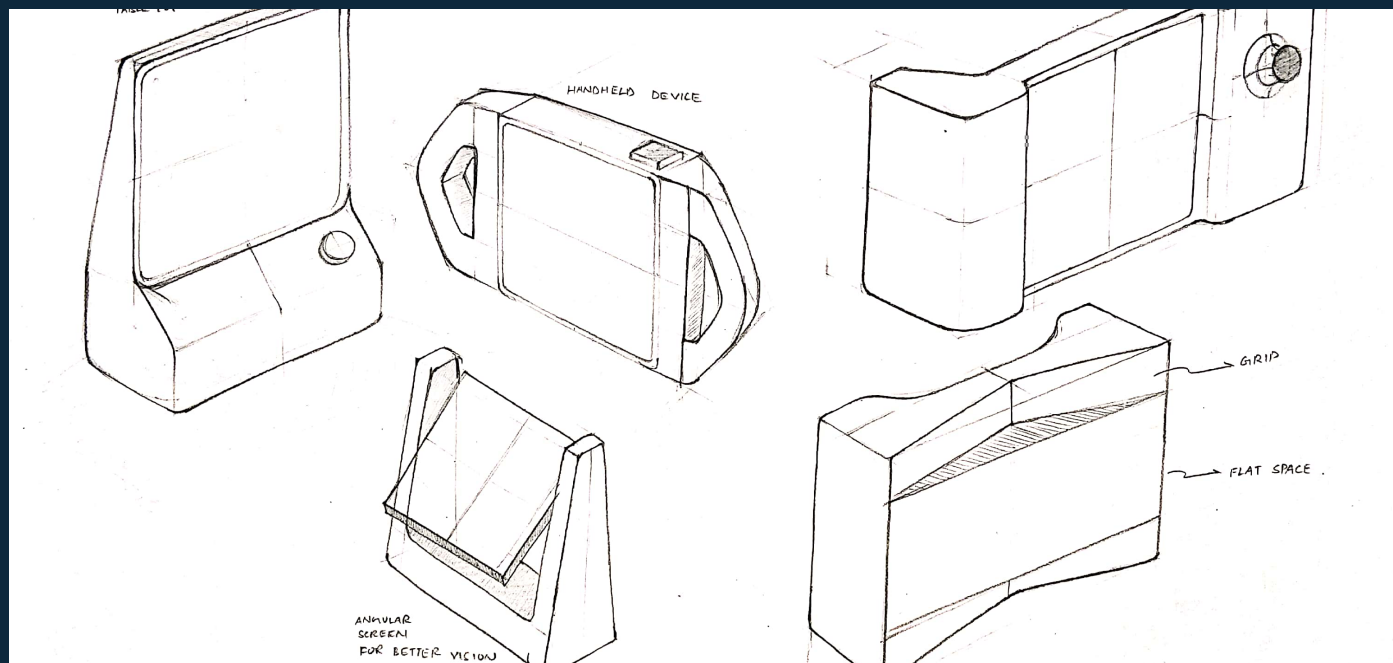
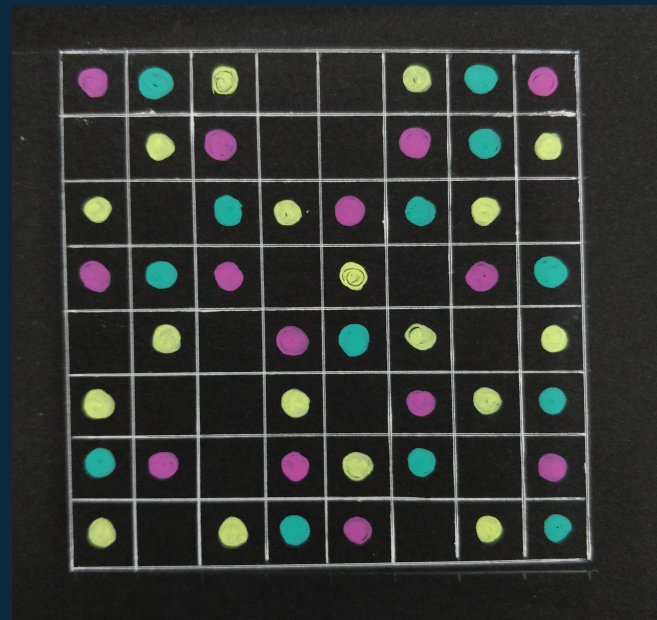
# IDEATIONS & INSPIRATION

To get inspiration for forms and games we tried to research and find out some toys and games/products.

For the final game derivation we got inspired from handheld games like rubix cube, fidget cube, puzzle ball, chip chop, dice, NotNot mobile game.

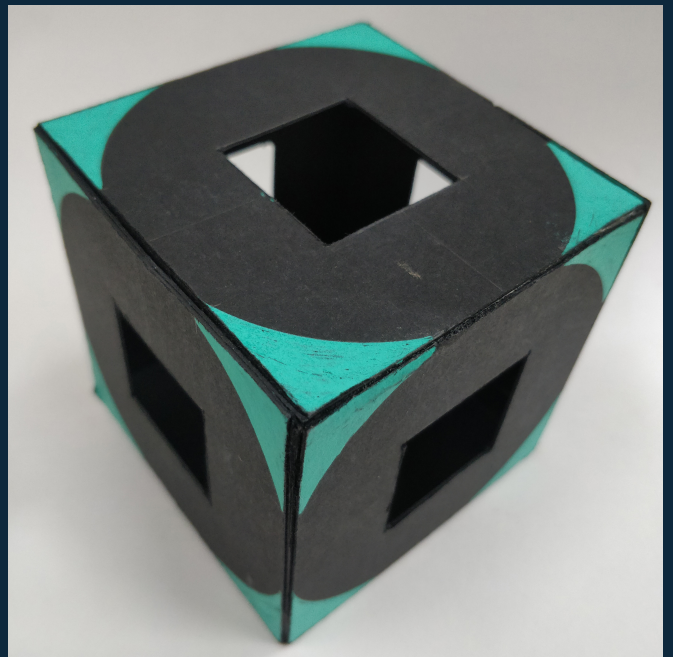
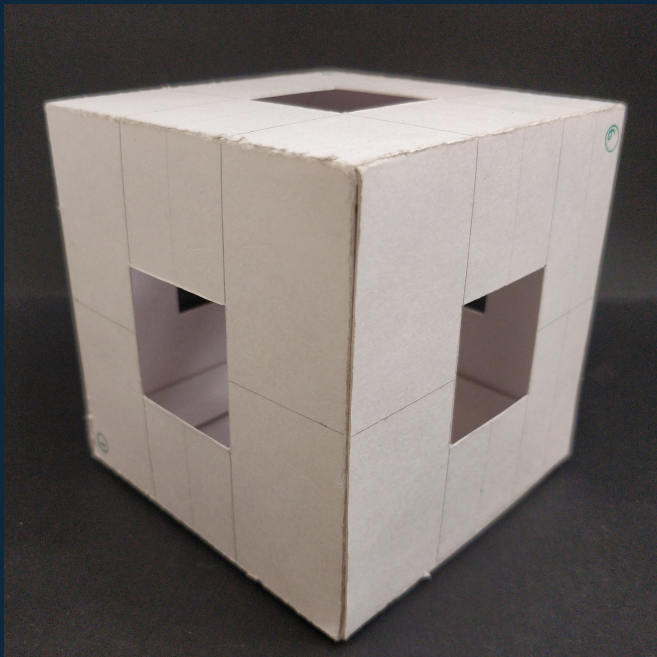
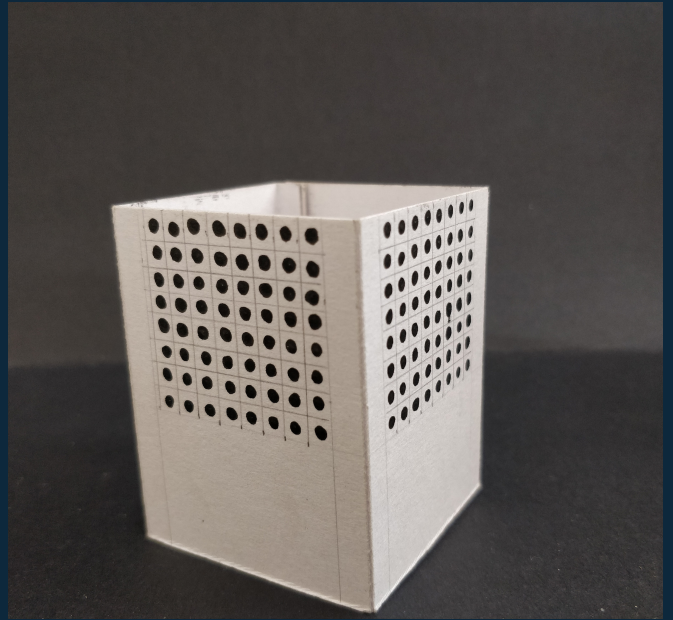
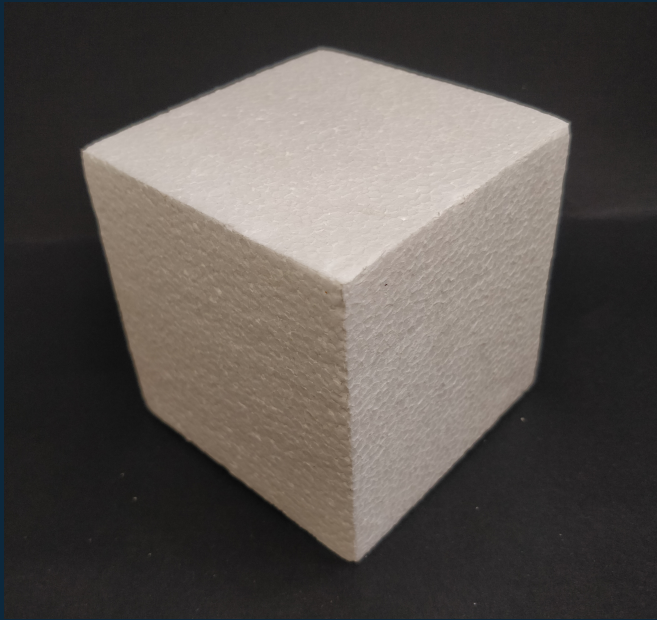
Initially we considered that it is necessary for us to have a flat plane surface as we were going to use LED Matrix for display; Hence we thought about a game which includes basic understanding of planes  $x,y,z$  and that is how we derived cube as our basic form.

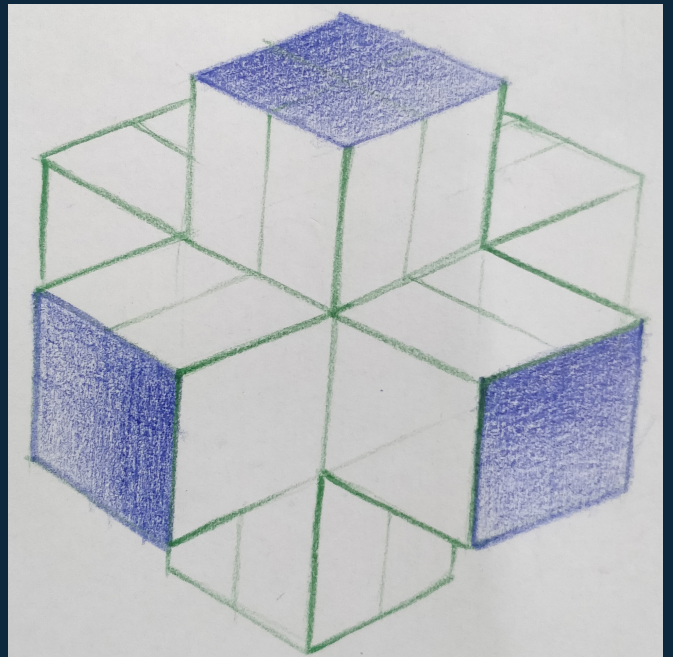
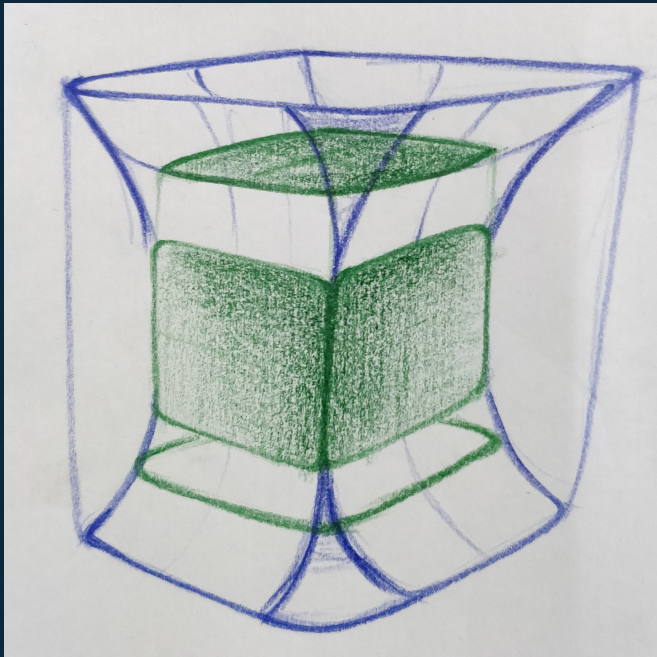
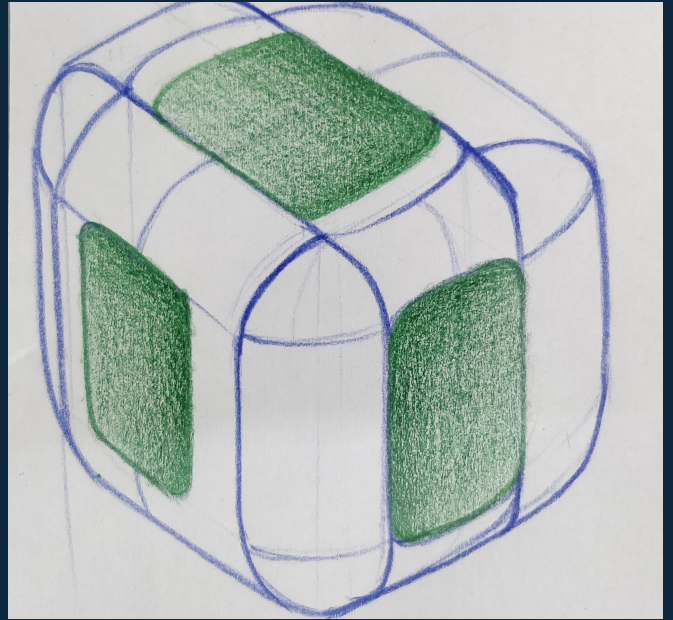
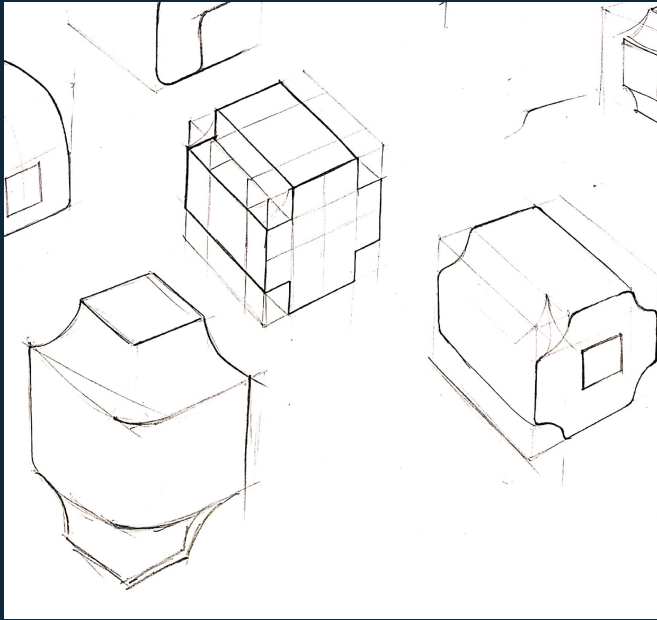






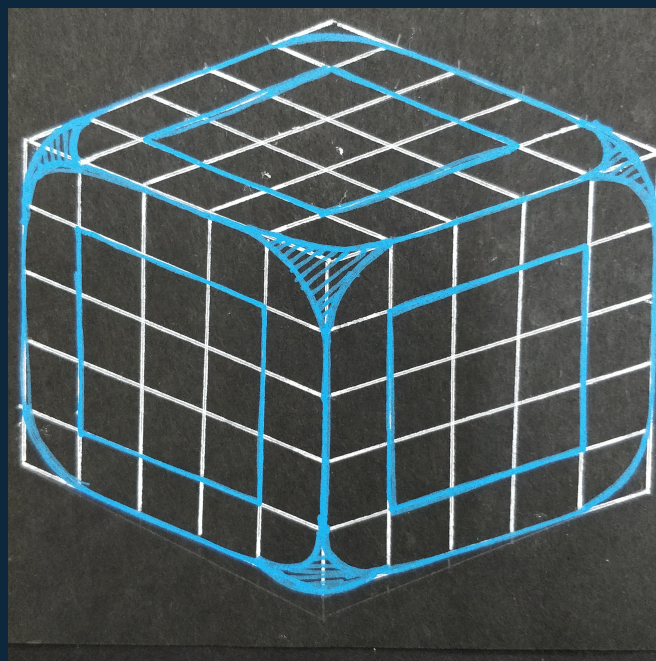
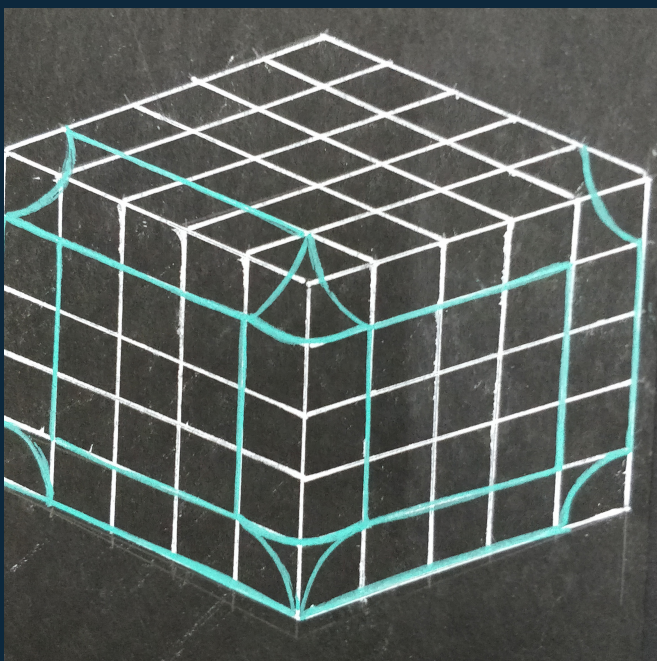
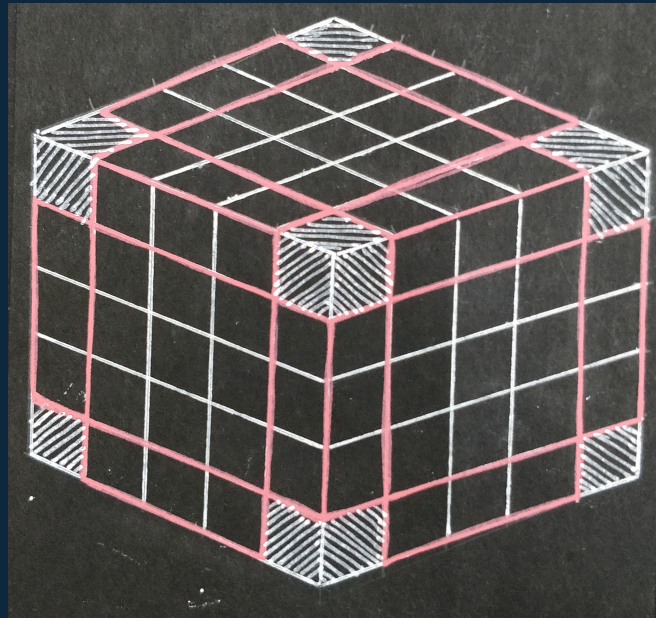
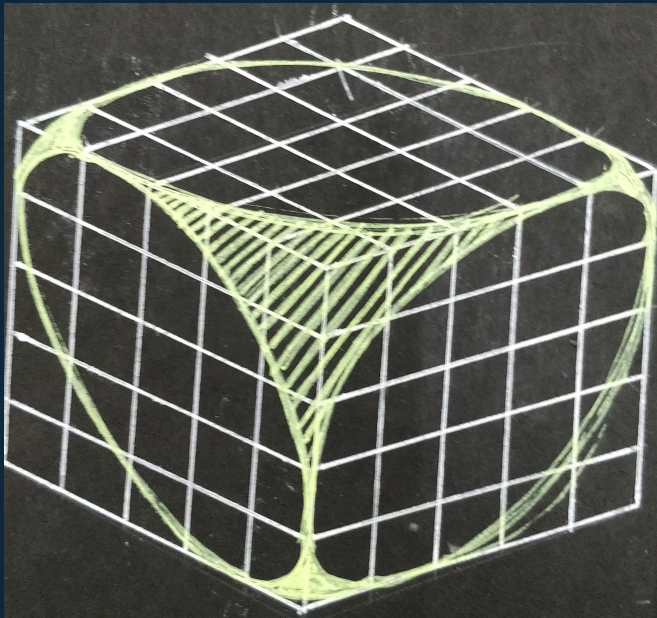
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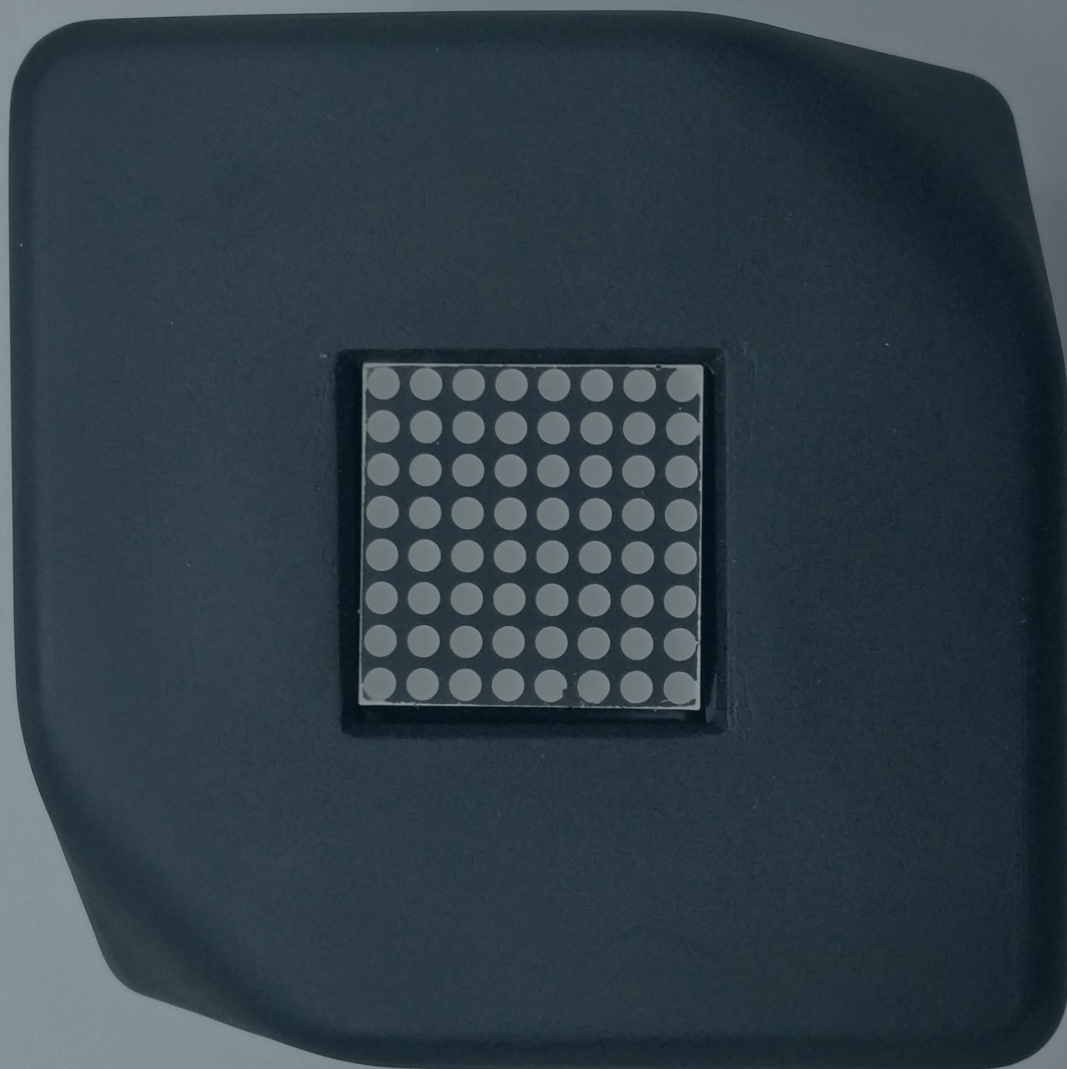


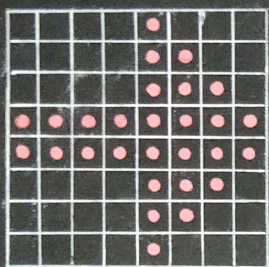


# FORMS









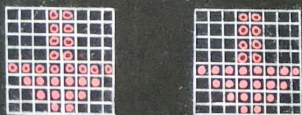
MIND YOUR ARROW ↓

## Cognitive Psychology

### Visual Attention

→ Principle of orienting of attention

- |                   |                                         |
|-------------------|-----------------------------------------|
| Symbolic          | Non-Symbolic                            |
| • Endogenous      | • Exogenous                             |
| • more controlled | • very minimal control                  |
|                   | • attention is automatically controlled |

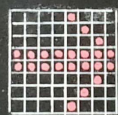


• Something that is flashing captures your attention more.

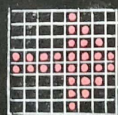
## “WHY TO ROTATE IN OPPOSITE DIRECTION?”

Sensitivity increases when something unusual or un-expected things occur.

### Chunking



Chunking in three parts

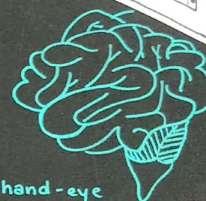
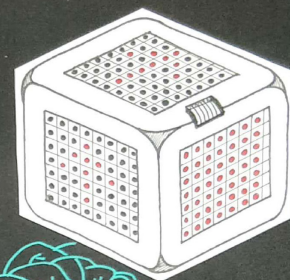


Chunking in two parts

### User Feedback

→ 5 → 11

• Solid headed arrow.



CHALLENGE  
Your reflexes

- Improves hand-eye coordination.
- Improves response/reaction time
- Improves the coordination of perception, processing and response

Rotate towards LEFT  
Rotate towards RIGHT

Rotate UPWARDS

Rotate DOWNWARDS

Scanned with  
CamScanner



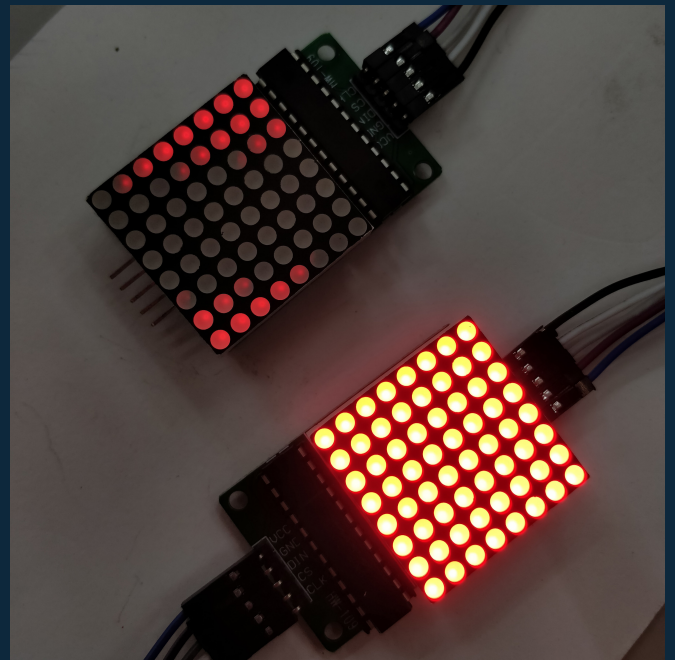
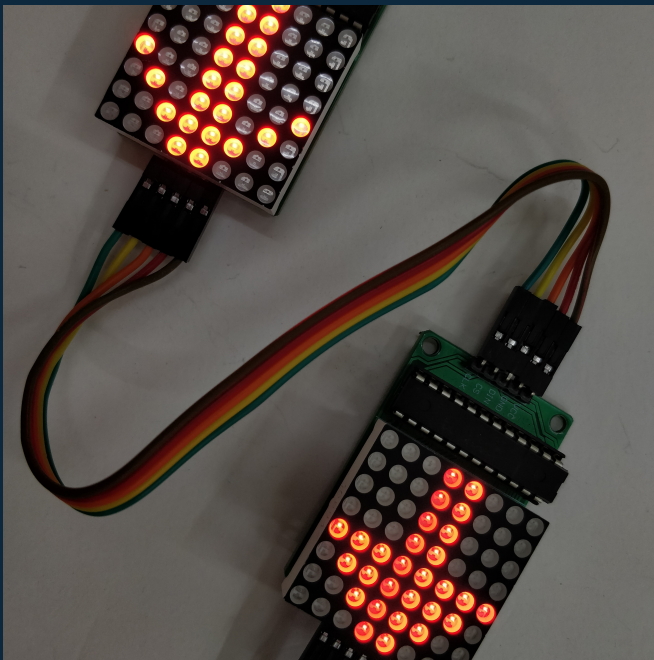
While selecting the arrow type that is a solid headed arrow or a 3-lined arrow we analysed that human brain has a tendency of chunking a whole into different elements. Lesser the chunks one can easily combine it to form the whole. So, in case of the arrows people chunked

the solid headed arrow into two chunks whereas the 3-lined arrow was chunked into three chunks. Hence, it was noticed that users preferred a solid headed arrow over lined arrow. As per the principle of visual attention there are two types of visuals, symbolic and non-symbolic.



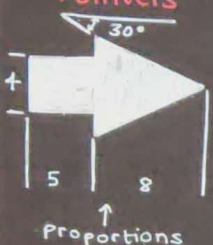
Symbolic is more endogenous and controlled; whereas non-symbolic is more exogenous and controls attention automatically hence a flashing arrow in a particular direction would guide the user. While we thought about whether we should design the game in which the human has to rotate the arrow in direction of the arrow or direction opposite to the arrow displayed. We considered that users sensitivity increased when they had to turn it in the opposite direction to that of an arrow displayed. As the sensitivity increases when

something unusual or un-expected happens. That is how to get an accurate measure of sensitivity something unusual or unexpected needs to happen.



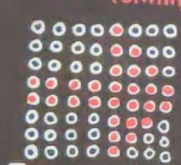
## → DISPLAY

### - Pointers



### - DOT MATRIX

● minimum dot size (5mm)



[limitation]  
5:5

Red - Colour

- excitement (instincts ↑)
- One of the color which is easiest to recognise.

Created with CamScanner

## → MANUAL CONTROLS

### - Economy of human motion

Five kind of motion follow, in order of increasing effort, exertion, and time of operation:

1. Finger
2. Finger and wrist
3. Finger, wrist and forearm
4. Finger, wrist, forearm and upper arm.
5. Finger, wrist, forearm, upper arm and body.

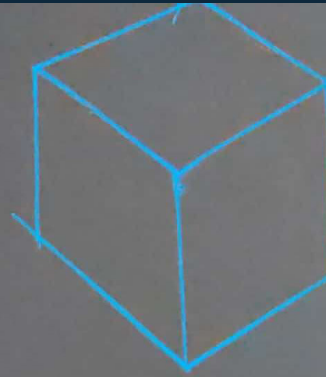
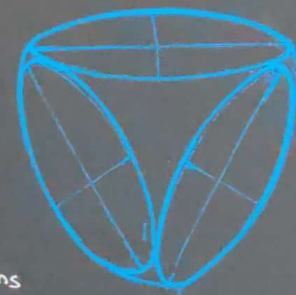
### - Grip Designs

Hand grips should conform to use and hand motion; use rounded shapes and cylindrical grips.

## → THE ENVIRONMENT

### HUMAN VS. MACHINE

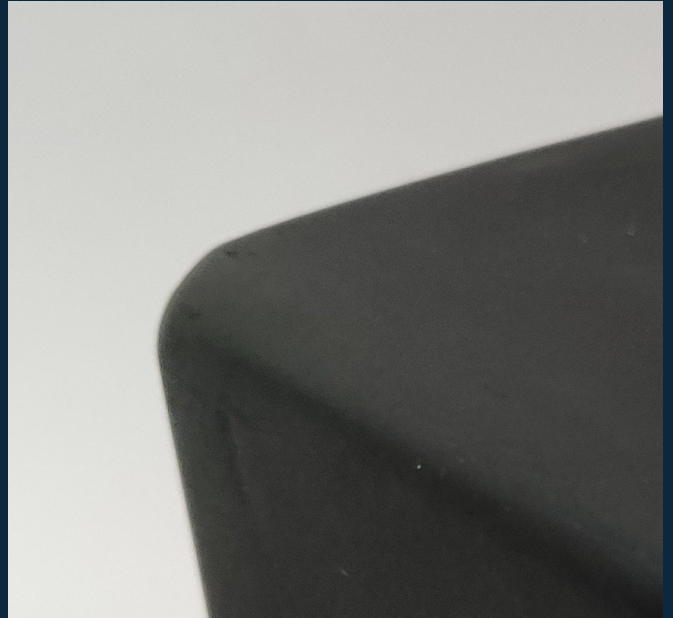
- Advantages of humans
  - 1) Perception can see through complex situations
  - 2) Judgement can use inductive reasoning
  - 3) Flexibility can shift attention rapidly
  - 4) Eye/Brain can make logical distinctions
- Limitation of humans
  - 1) Speed time is needed for decision and movement
- Advantages of Machines
  - 1) Speed can be rapid
  - 2) Accuracy can be high level

Application of ergonomics to the product and the system enhances the quality of the product and helps in the smooth functioning of a system. In our project we have taken care of ergonomics in display, manual controls, grips, colour and environment.

In our game our major visual element is an arrow and hence we taken measures of an arrow close to the ratio of standard symbol of arrow; so one can recognize it easily. We had a constrain, as we have used RGB matrix which can only display red light, but the good part is colour red

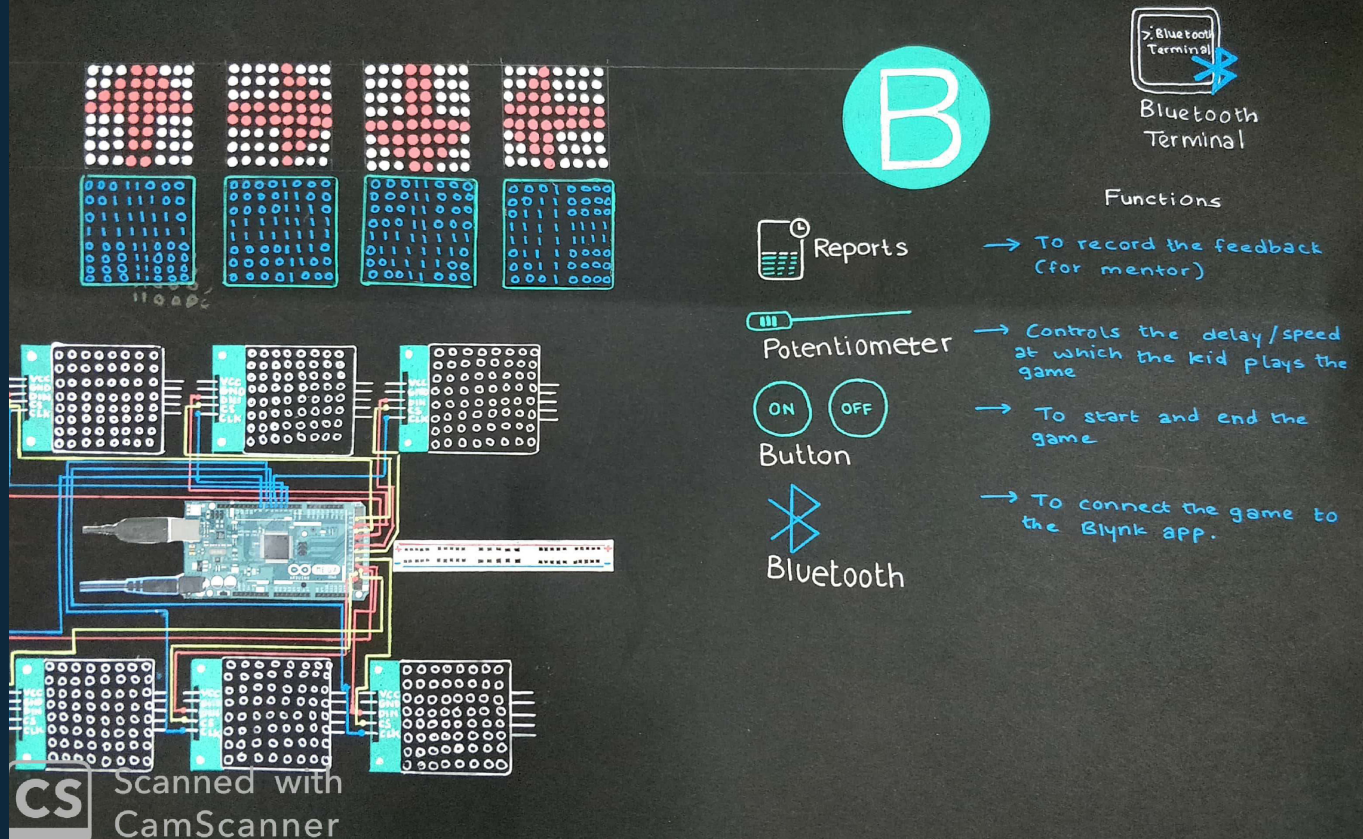
is easiest to recognise and creates a good visual contrast against black background which is the colour of the base of RGB matrix and our product. Our product is derived from cube which helps a kid to understand the spatial difference between the planes X,Y and Z easily compared to any other 3D form. We have further added filets and rounded surfaces to the edges and the corners of the cube so it is easier to grip eliminating the sharp surfaces which might hurt the hands of the user.





# TECHNOLOGY INVOLVED

## TECHNOLOGY INVOLVED



Components used :  
Arduino Mega 2560  
NodeMCU  
Led Matrix 8 x 8  
Jumpers  
2 x 3.7v LiPo battery  
Breadboard

Blynk  
Bluetooth  
Notification System  
Delay Change  
Game Change

## USER FEEDBACK

NAME	VED	NAKSHATRA	SANJANA
AGE	8	7	7
GRADE	3	2	2
DELAY 300	C	Slow	C
DELAY 500	C	C	C

SIZE	8 x 8 (cm)	9 x 9 (cm)	10 x 10 (cm)
------	------------	------------	--------------



Mentor:  
Mrs. Reshma Patel

- 10-11 years of teaching experience
- Institute Name: Learner's Den
- Senior Kg to 4<sup>th</sup> Std.



Co-mentor:  
Drashti Patel  
→ Helper

→ Feedback by Reshma Patel.

- The motion of the led should be similar to the direction of arrow displayed.
- Size of the cube should be smaller (10x10)↓
- Provide a counter feedback.
- Speed should be controllable.

→ 5 → 11  
→ Due to the tendency of CHUNKING!

User Study is an important factor of a design process and hence we conducted a user review at 'Learner's Den' phonic classes. The idea of the test was to check whether the concept of the game is understood by the kid and are the dynamics of the product are in favour of

the user. Some kids depicted a faster learning capacity and were highly sensitive with the rotation of the form. The 3 dimensionality of the product turned out to be an absolute hit as it brought a new perspective entirely.



# WHAT IS IOT?

The point is that connecting things to the internet yields many amazing benefits. We've all seen these benefits with our smartphones, laptops, and tablets, but this is true for everything else too. The Internet of Things is actually a pretty simple concept, it means taking all the things in the world and connecting them to the internet. When something is connected to the internet, that means that it can send information or receive information, or both. This ability to send and/or receive information makes things

smart, and smart is good. In the Internet of Things, all the things that are being connected to the internet can be put into three categories:

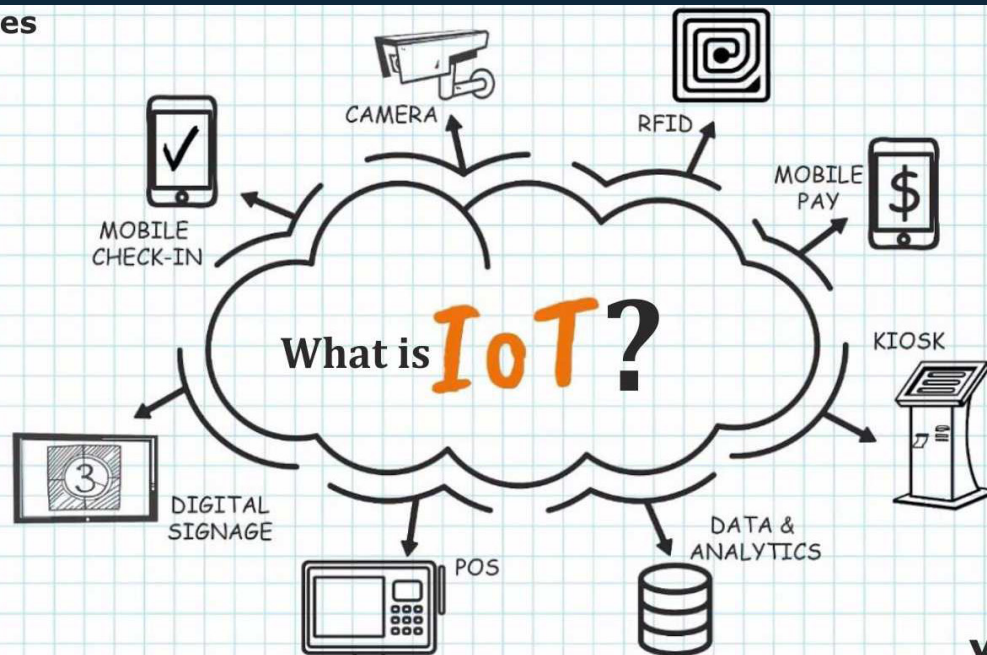
Things that collect information and then send it.

Things that receive information and then act on it.

Things that do both.

And all three of these have enormous benefits that feed on each other.

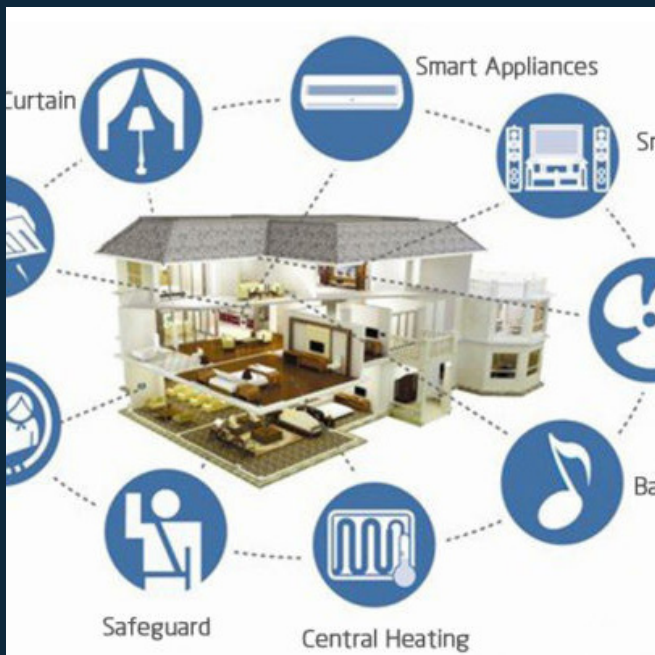
## #ChipNotes

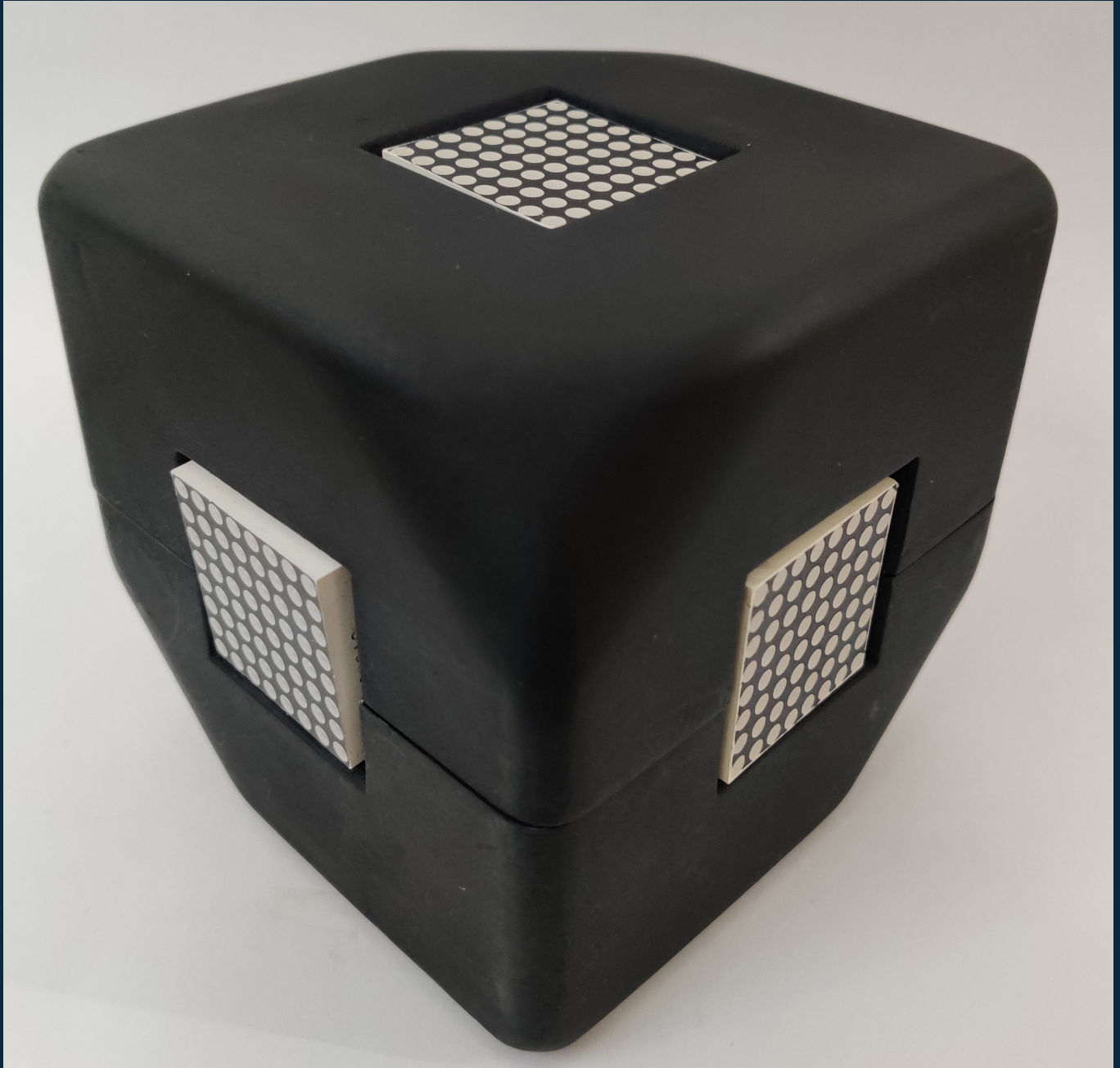


# APPLICATION OF IOT

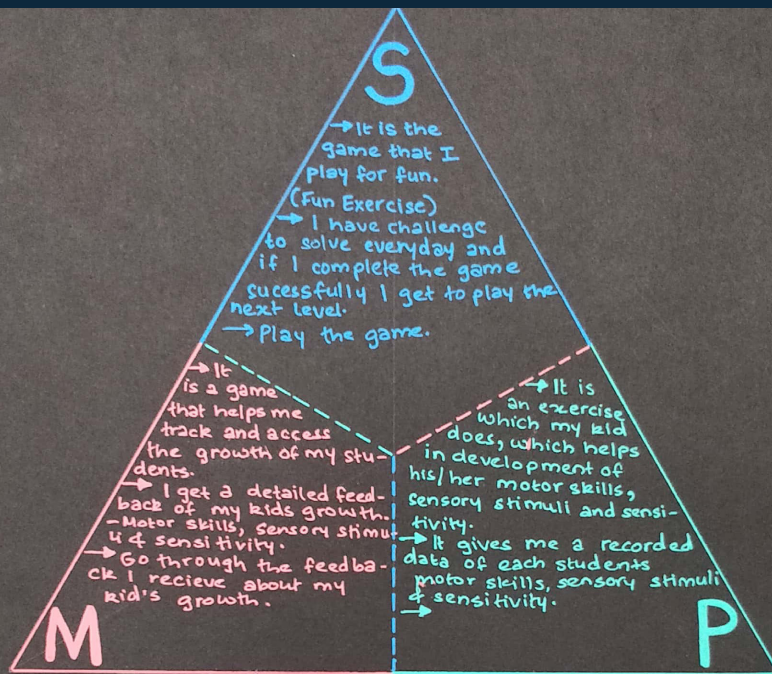


Introducing Internet OF Things to the same project enhances the project as it provides an interface between the user and object and an experience is curated in form of a game. There are three subjects involved now, mentor or a teacher who has full control on the game and receives a detailed feedback after the game is over which helps the teacher to understand each student faster. The parent has a regulated control and can see the progress of their kid using the mind your arrow app which is updated by the teacher on the regular basis. The primary user of the game is the kid, but has no control on it. The kid plays the game on the delays set by the mentor.







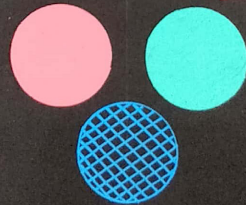


#### Subjects Involved

- Student **S**
- Mentor **M**
- Parent **P**

#### Controls :

- Full access
- Restricted access
- No access

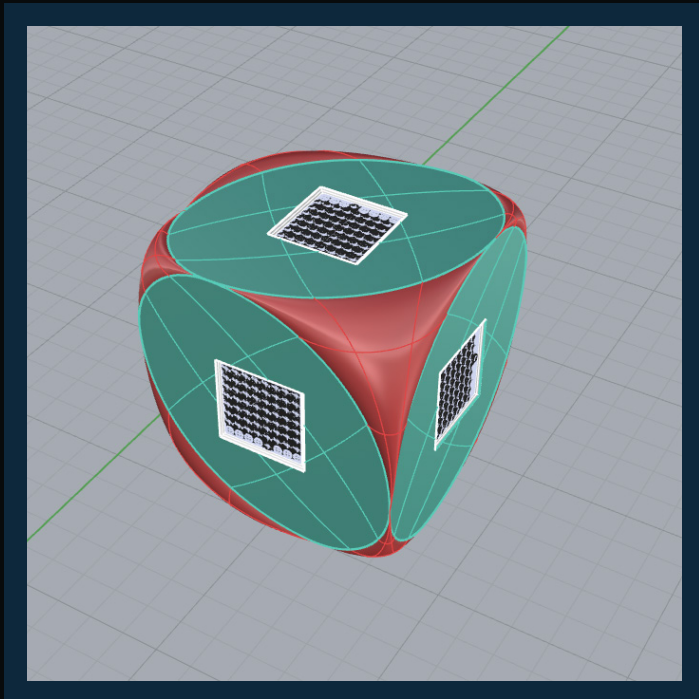
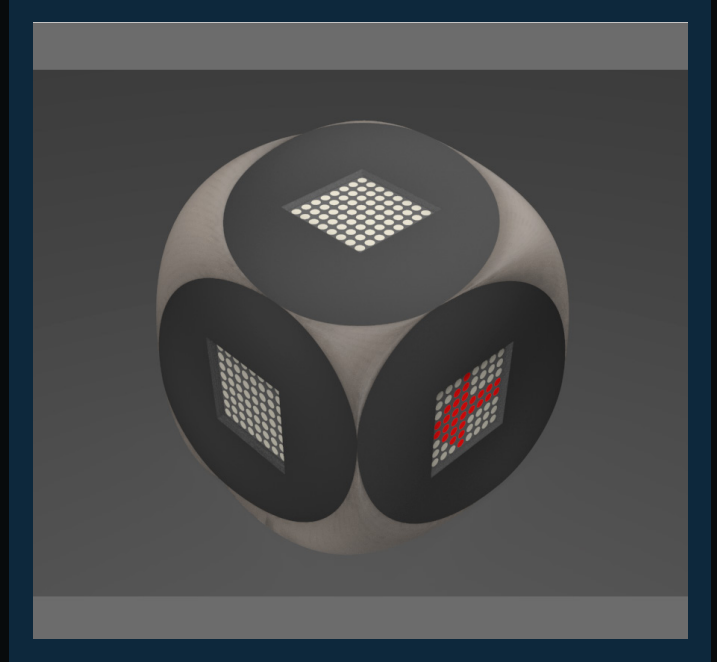


- What do I have to do?
- What it does to me?
- What it is?

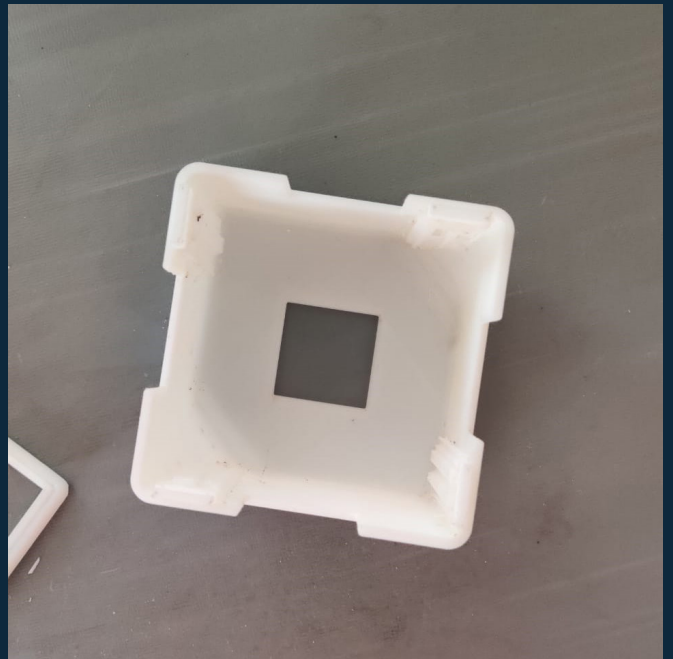
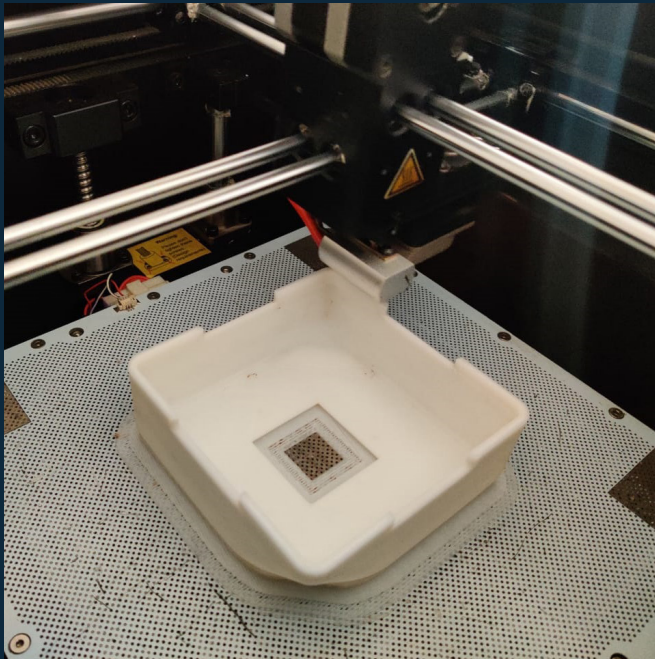
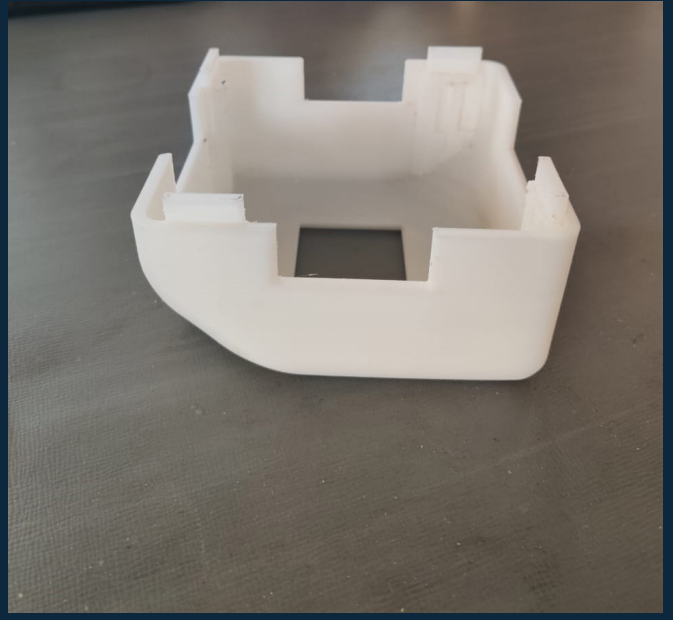
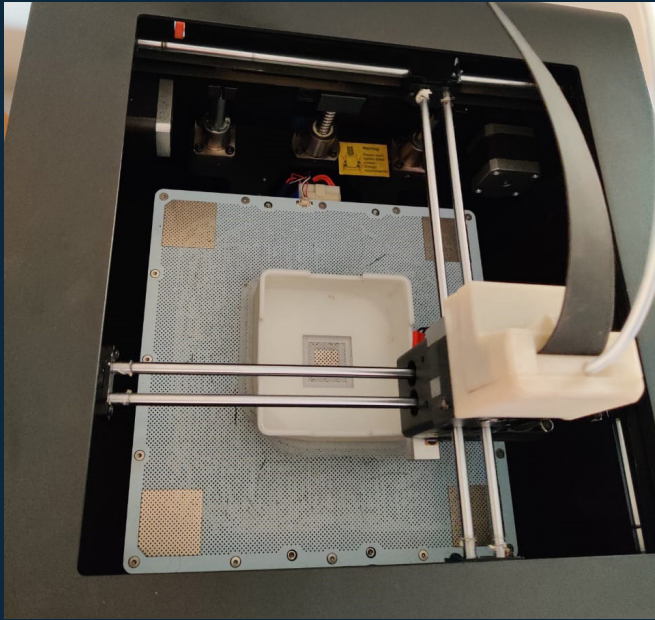
**MIND YOUR  
ARROW**

Mind Your Arrow is a simple game which challenges your reflexes. It includes a basic understanding of the three spatial planes x, y and z and based on which the user has to rotate the hand held cube. To challenge the users reflexes we have made sure that in the game the user has to rotate the cube in the direction opposite to the arrow displayed on the screen. By doing so the hand and eye coordination improves, motor skills of kids is improved and all their sensory stimuli towards vision increases.

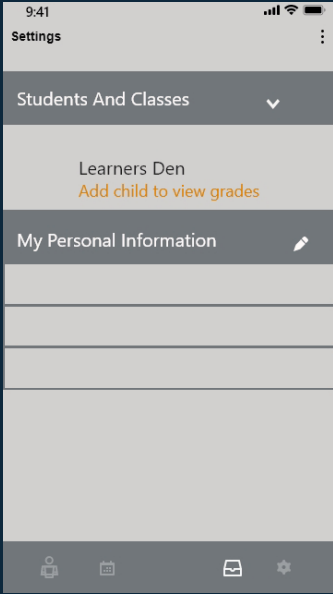
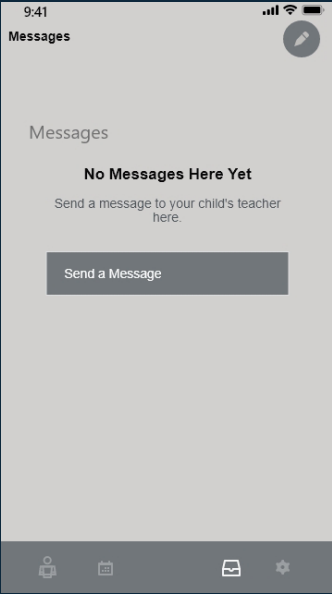
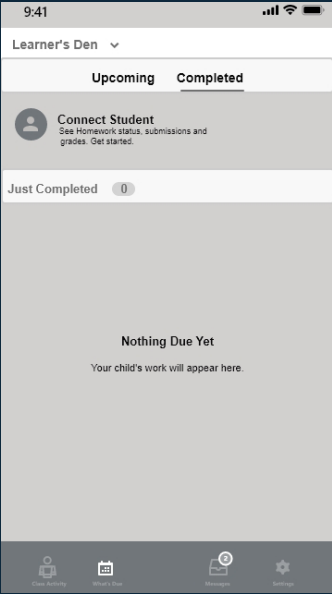
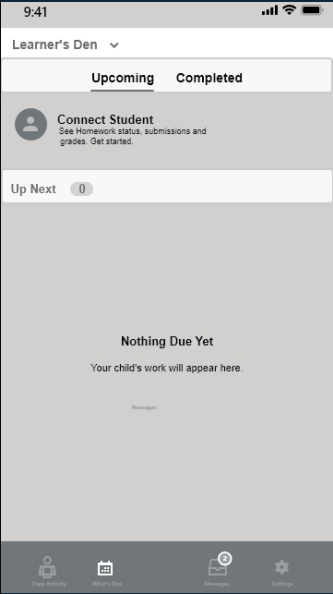
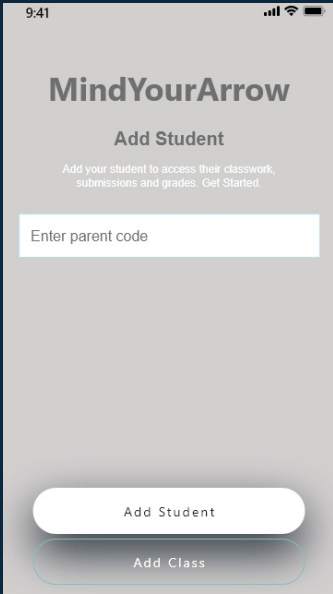
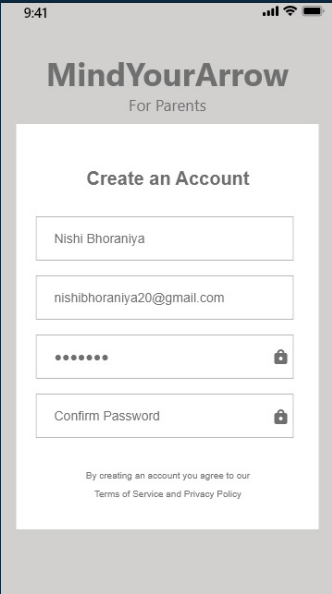
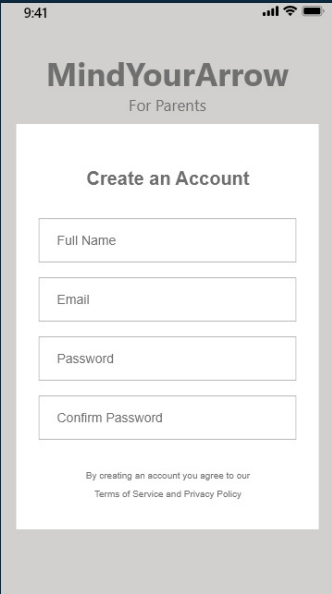
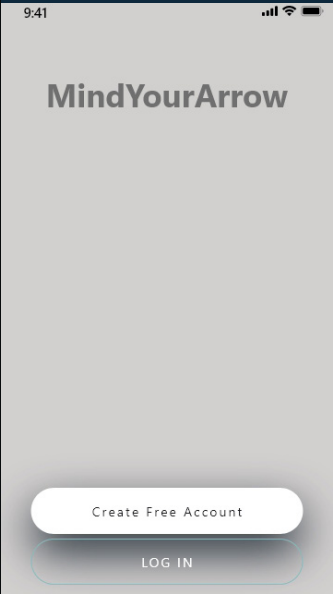
# MODELLING & RENDERING







# STIMULATION OF APP

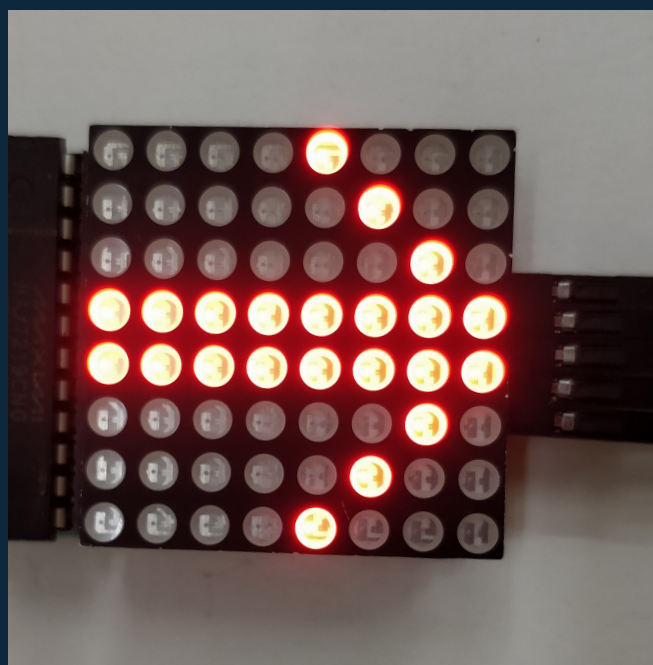
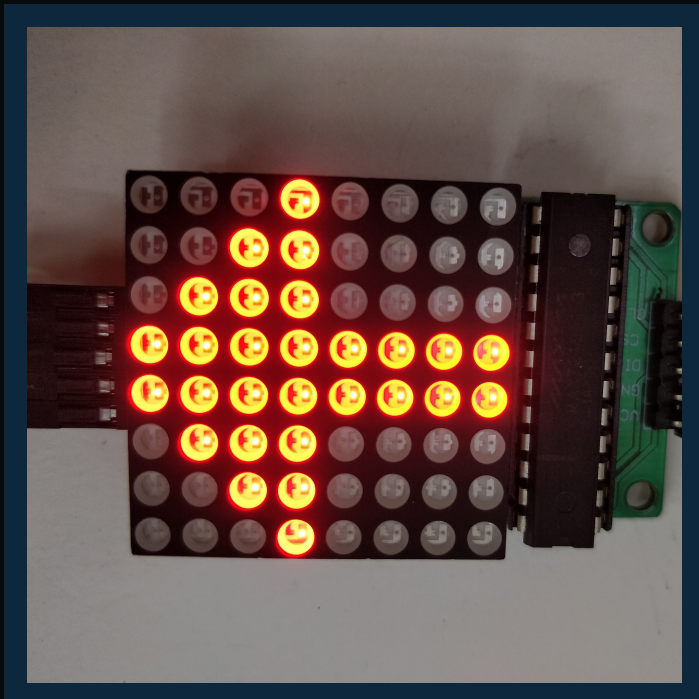
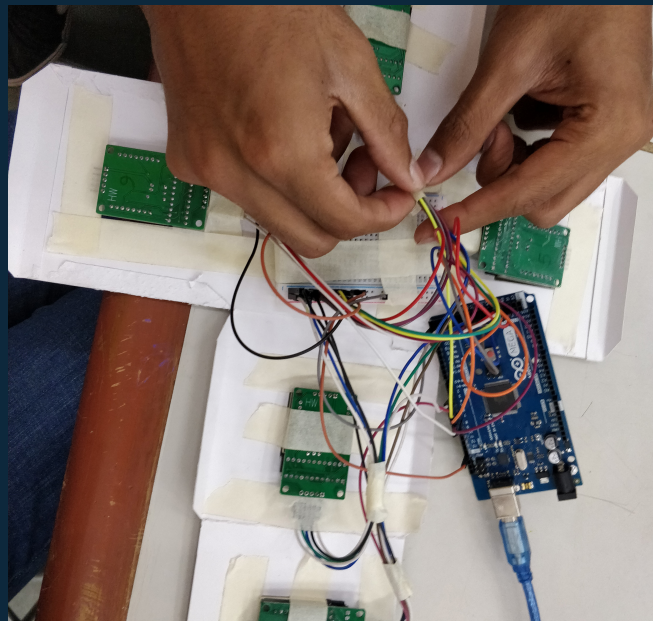
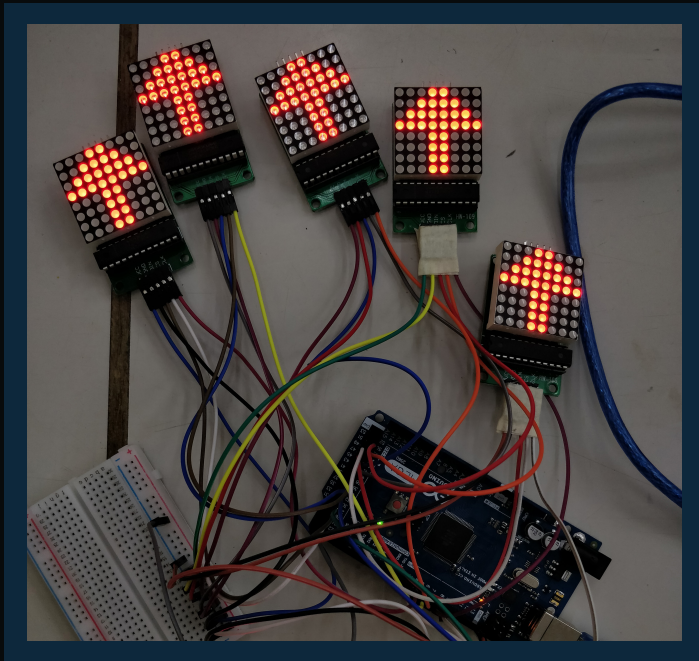


# LEARNING & INSIGHTS

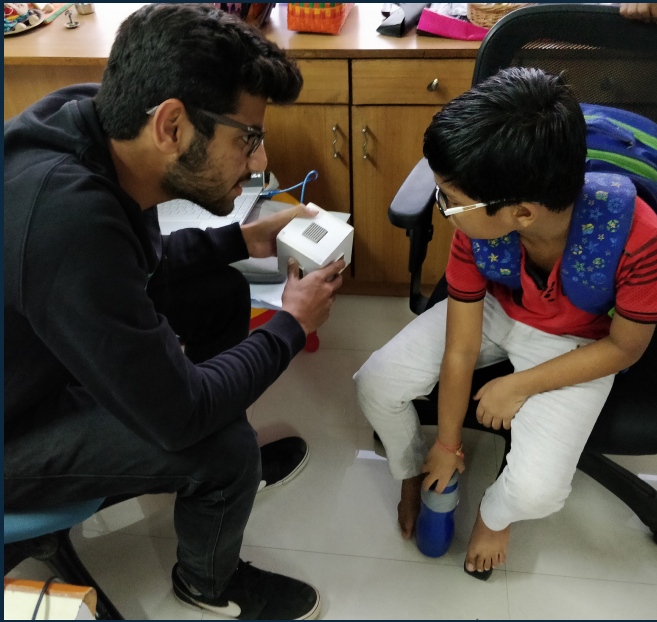
We are all surrounded by several smart objects. Well through this course we got to design a simple smart device using basic understanding of Arduino and Internet of Things. We also got an in depth understanding of the jargon's UI (user interface) – UX (user experience). Well in this world where everything is becoming digital, it is equally important for a designer to make sure that the product or system designed by them should be able to curate a proper interface and experience between the product/system and user. Through this course we realised that while designing a product we not only take care about functionality, aesthetics and ergonomics but also the experience that is generated while the user uses the product. We also realised the importance of cognitive psychology while designing product and its impact on the user. Last but not the least as it was a pair project we learnt from each other's strengths and weakness.



# GALLERY







# REFERENCES

[https://www.google.com/search?q=application+of+iot&rlz=1C-1CHZL\\_enIN814IN814&sxsrf=ACYBGNRfon9-RizLSADCA0sYsgFG-FlcHTA:1576418596200&source=Inms&tbm=isch&sa=X&ved=2ahUKEw-jqhcbz6LfmAhVE4XMBHb1mCu4Q\\_AUoAXoECBMQAw&biw=1383&bih=621#imgsrc=mMh5Wyj9VWedCM:](https://www.google.com/search?q=application+of+iot&rlz=1C-1CHZL_enIN814IN814&sxsrf=ACYBGNRfon9-RizLSADCA0sYsgFG-FlcHTA:1576418596200&source=Inms&tbm=isch&sa=X&ved=2ahUKEw-jqhcbz6LfmAhVE4XMBHb1mCu4Q_AUoAXoECBMQAw&biw=1383&bih=621#imgsrc=mMh5Wyj9VWedCM:)

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