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# Product Design

## Team 3 - Final Presentation

# Sixth Sense

## Haptic Rubik's cube

Providing a pleasing haptic experience for the visually challenged, while being aesthetically pleasing for everyone



Logo design-Sumin Park

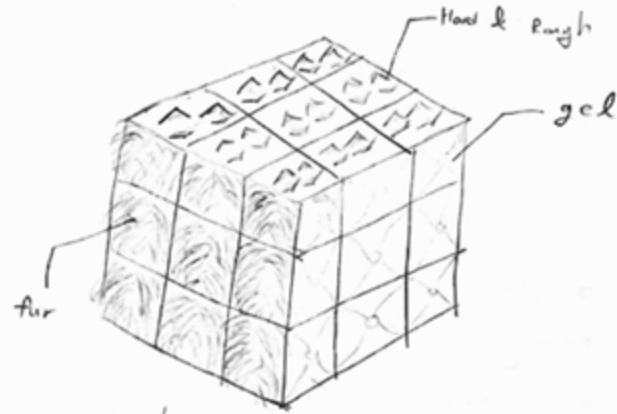
# 213 INC.



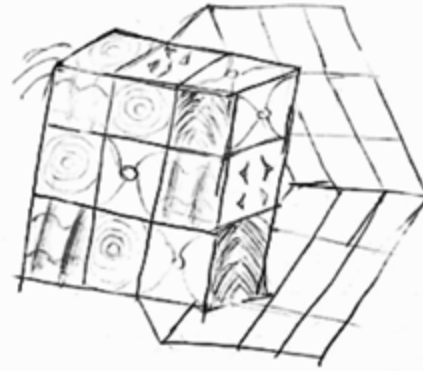
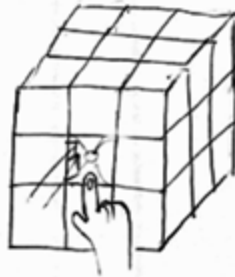
# Sketch and Ideation

Cube for Blind with different texture

Slowly Enjoy touching feeling



make easily by seicker



- ▷ Problem - Existing cube is only for people who have sight
- ▷ Idea - Attach 6 variable and distinct textures (velvet, rubber, glass) on existing cube
- ▷ Expectation - Usable by the visually challenged
- ▷ Challenge - Making experience equivalent to that of the standard cube



# Research and Interview

# Paper Research

[표 3] 전시예술품 감상 패턴

[Table 3] Pattern of art exhibitions attendance

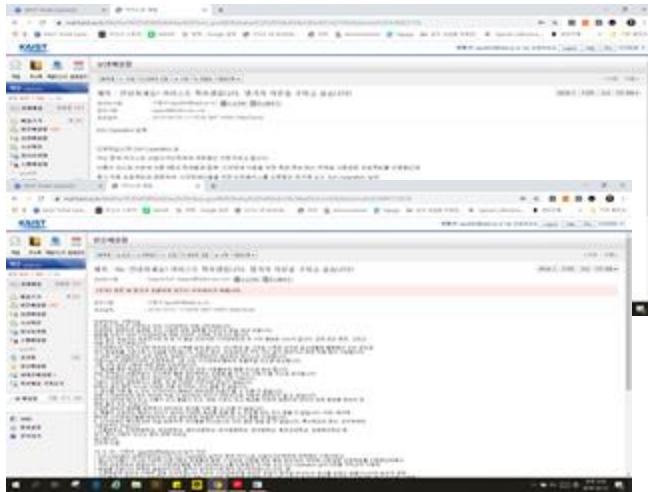
		빈도(명)	%			빈도(명)	%
잔존시각 이용여부	해당 없음	24	28.9	감상 시 주된 사용감각	해당 없음	3	3.6
	전혀 그렇지 않다	9	10.8		시각	40	48.2
	그렇지 않은 편이다	7	8.4		청각	19	22.9
	그런 편이다	24	2.9		미각	1	1.2
	매우 그렇다	19	22.9		촉각	20	24.1
	전체	83	100		후각	0	0.0
촉각이 감상에 영향	해당 없음	15	18.1	촉각 사용 시 중요한 것*	전체	83	100
	예	61	73.5		해당 없음	11	9.7
	아니오	7	8.4		재료에 의한 질감	62	54.9
	전체	83	100		깊이(레이어)에 의한 질감	21	18.6
					온도를 이용한 색 인지	7	6.2
					진동에 의한 자극 및 색 인지	12	10.6
					전체	113	100

\*다중응답. 응답이 113개 응답함

- ▶ Despite their desire to experience art pieces, the visually challenged cannot because exhibitions are highly dependent on sight.
- ▶ They prefer to appreciate art works by touching them.
- ▶ Texture of material, followed by the texture of depth, are the main factors.

# Expert Interviews

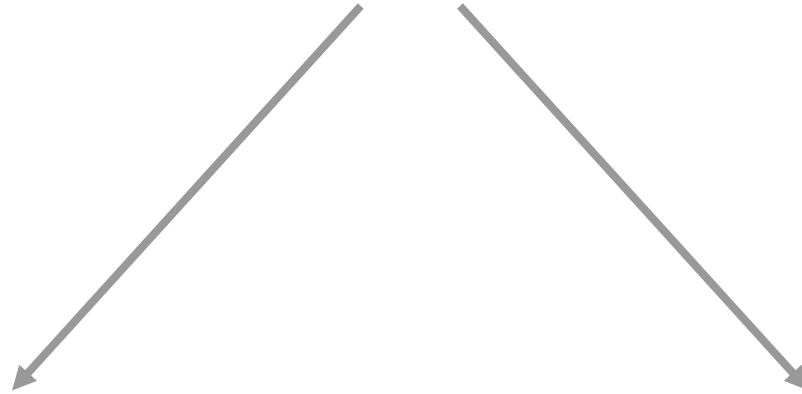
대전 시립 산성 종합 복지관 역량 강화 지원팀  
시각 장애 아동 미술 교실 담당 교사 김동숙님



E-mails to expert

- ▶ The visually challenged have a hard time experiencing art works, because they are not allowed to be touched.
- ▶ They don't understand natural phenomena.
- ▶ They are curious about the sense of touch.
- ▶ They won't recognize 3D printed textures.
- ▶ Their preference of texture is similar to those with full sight (they like smooth, and soft texture).
- ▶ Using natural materials is a good idea.

# Making the Cube



Cube Mechanism

Conceptual Haptic Tiles





# Mechanics Development

# Finding the best Cube mechanism



How can we make a working cube?

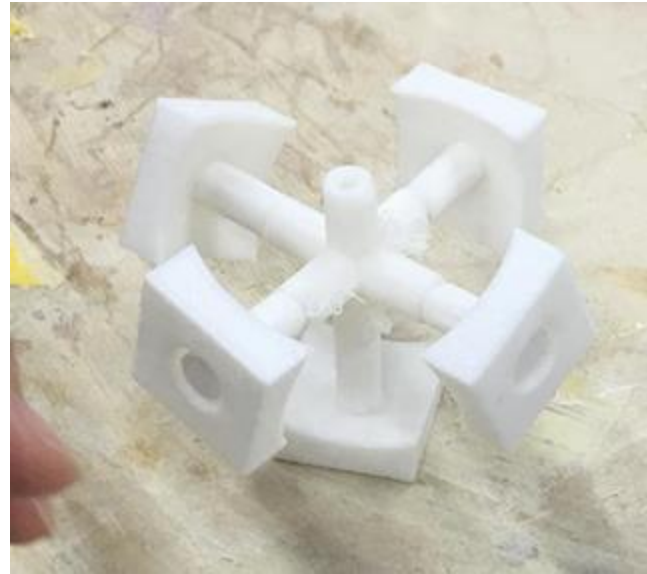
1. Find the best design of the core part to find smooth movement.
2. Find the best mechanism for the cube to last a long time.
3. Iterating the original Rubik's Cube mechanism that works best in our project

# Cube Mechanism: Core

The Core Part assembly (video)

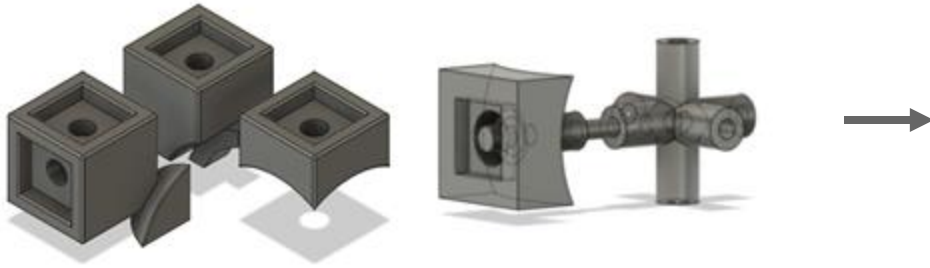


Complete core part



# Cube Mechanism: Full

The full assembly



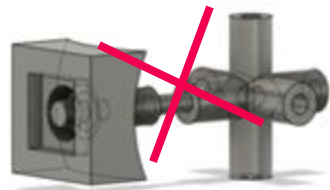
Rotation - Video



# Core Mechanism: Iteration 1 by 이승준 / 양성현 / 지영현

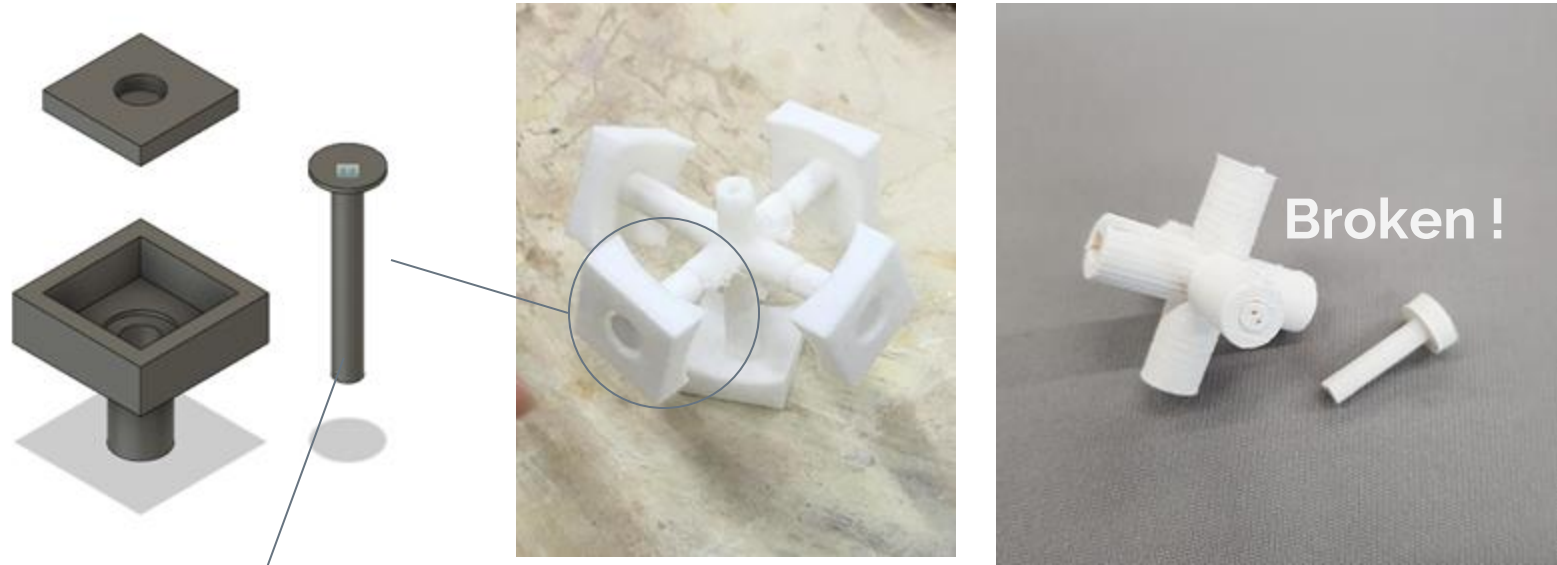


Core part



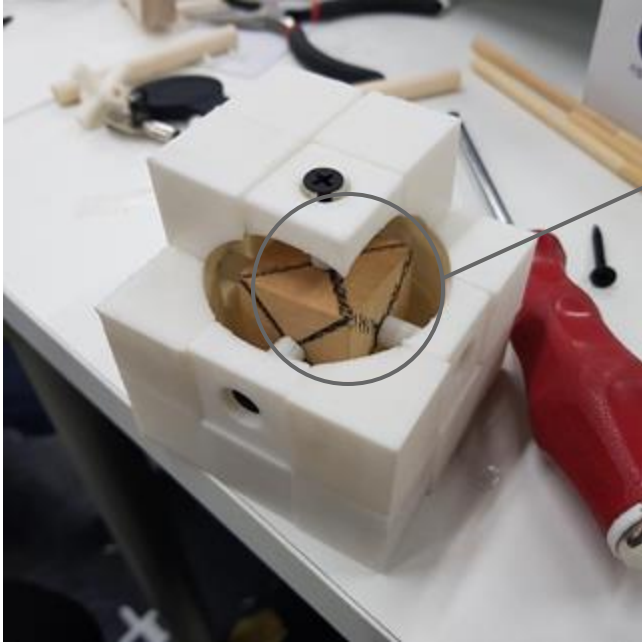
Problem:  
Does not stick well together

# Core Mechanism: Iteration 2 by 이승준 / 양성현



Problem : Stick breaks too easily when assembling the whole cube

# Core Mechanism: Iteration 3 by 이승준 / 양성현



## Final solution

1. Make a cube-shaped core part!
  - Does not break.
  - Does not explode.
2. Use metal nails!
  - Does not break easily.
  - Can bear the strength.



# Concept Development



# Selection criteria for textures

- ▷ Each of the 6 textures must share a certain unity.
- ▷ They should definitely be distinguishable.
- ▷ They must be pleasing both tactually and visually.

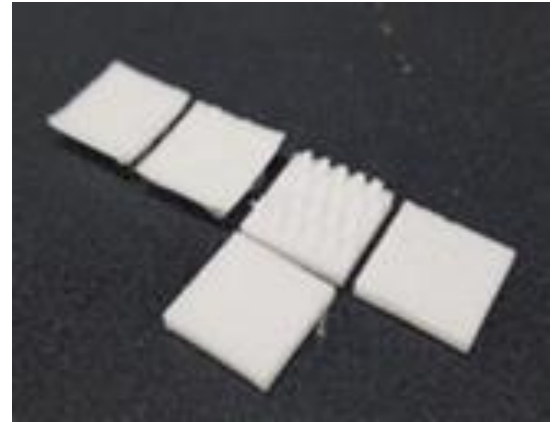
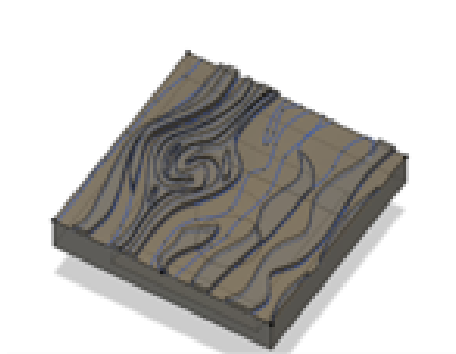
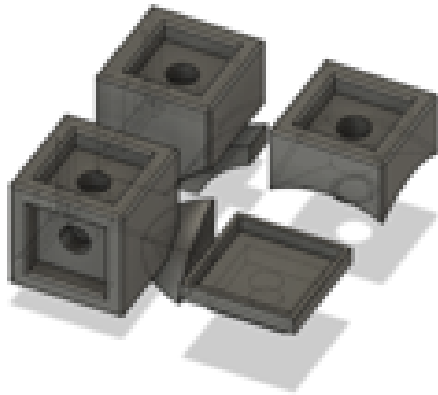
## Concept 1

# Nature

- ▷ To educate the visually challenged, especially children, about natural features
- ▷ To provide an emotional experience for everyone

# Method 1

- ▷ Patterns from tree barks were recorded and recreated on tiles using CAD.
- ▷ The tiles were 3D printed.



# Method 2

- ▷ Actual tree bark samples were cut and shaped to fit tiles.
- ▷ 6 different tree types were used.
- ▷ The tiles were pasted onto the cube.



# Critique

- ▷ The 3D printed tiles were not easily distinguishable.
- ▷ The organic tiles cannot be easily reproduced and were not durable.
- ▷ Overall, the cube size was too small to properly appreciate the different textures.

## Concept 2

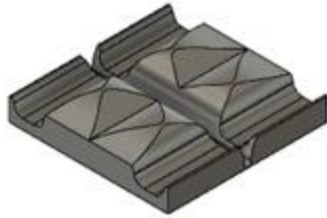
# Places

- ▷ To provide a
- ▷ Functions as a collectible as well

# Concept refinement

- ▷ 2 contrasting locations were selected - Paris and Honolulu
- ▷ Tiles were modelling using CAD and then 3D printed
- ▷ Overall cube size was increased

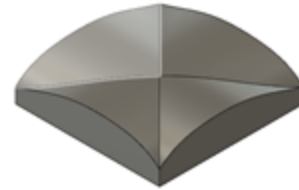
# Tile modelling - Paris attractions



Seine River  
Hyunkoo Lee



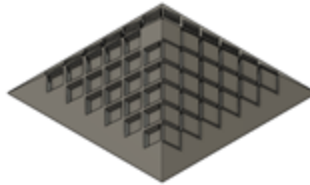
Montmartre  
Seungjun Lee



Mona Lisa Smile  
Hyunkoo Lee



Pompidou Centre  
Sumin Park



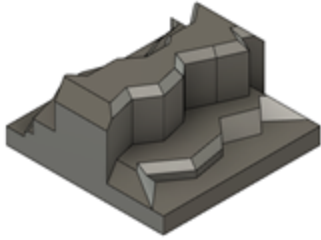
Louvre Museum  
Sumin Park



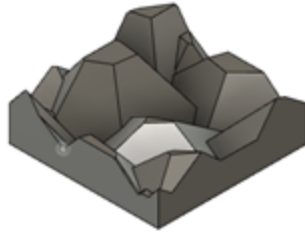
Eiffel Tower  
Seungjun Lee



# Tile modelling - Honolulu nature



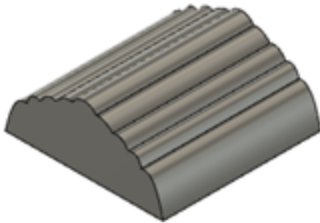
Cliff  
Kiran SK



Rock  
Sunghyun Yang



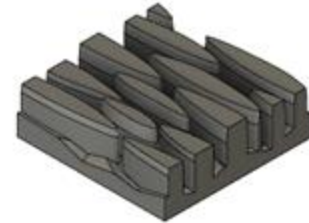
Wave  
Yeonghyeon Ji



Seashell  
Kiran SK



Wind  
Yeonghyeon Ji

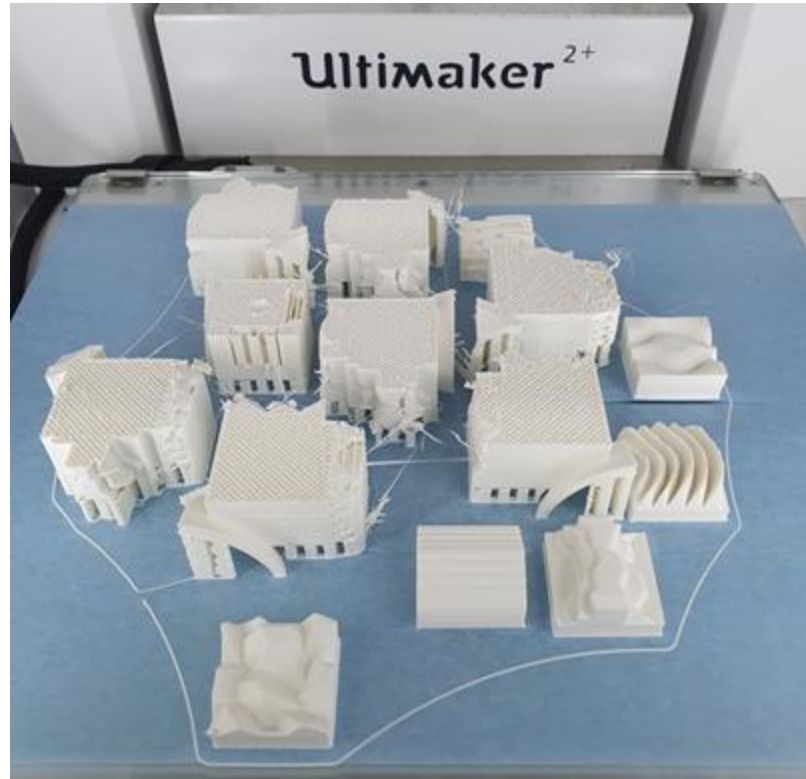


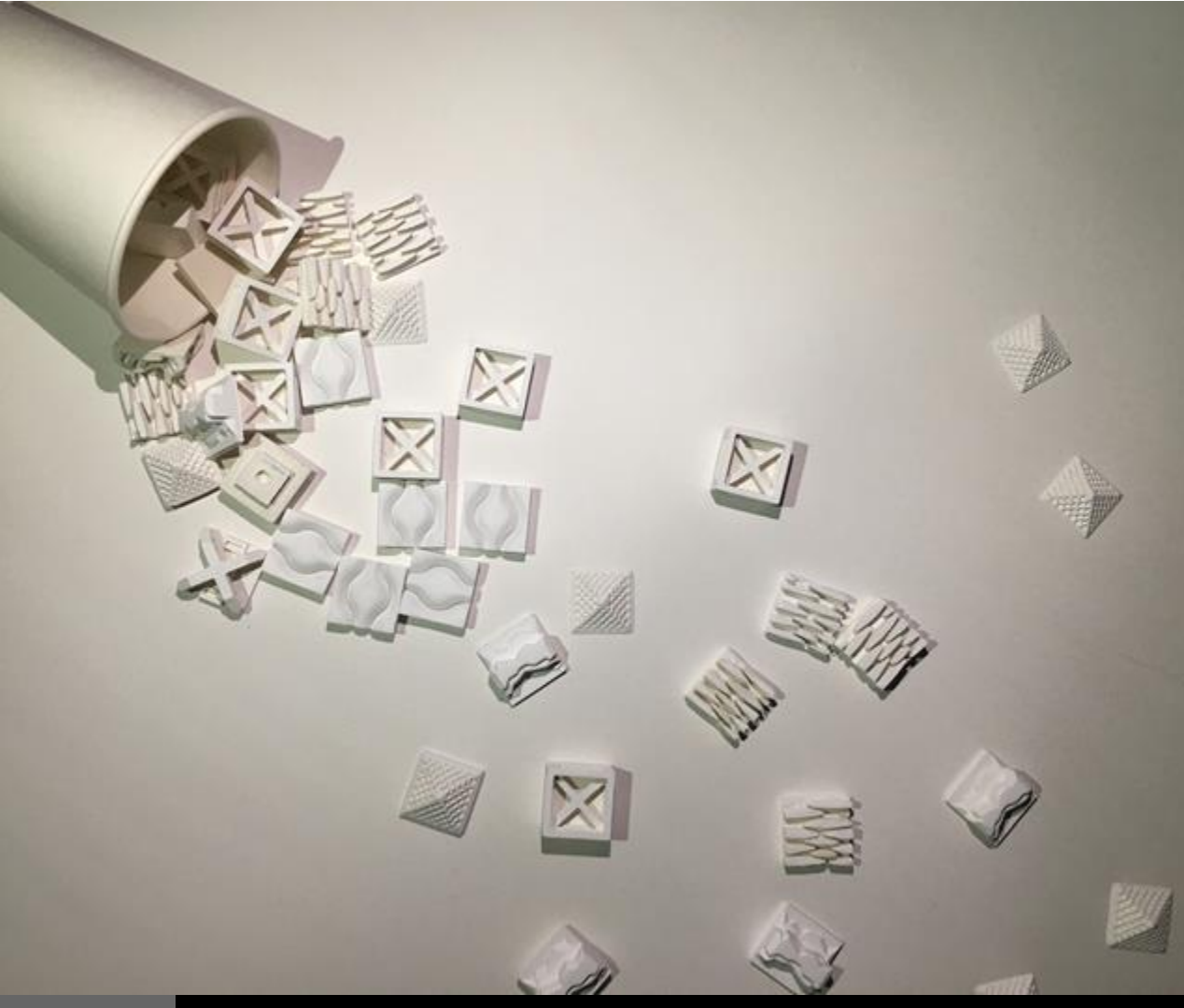
Palm tree trunk  
Sunghyun Yang



# Constructing the Cube

# Printing the tiles

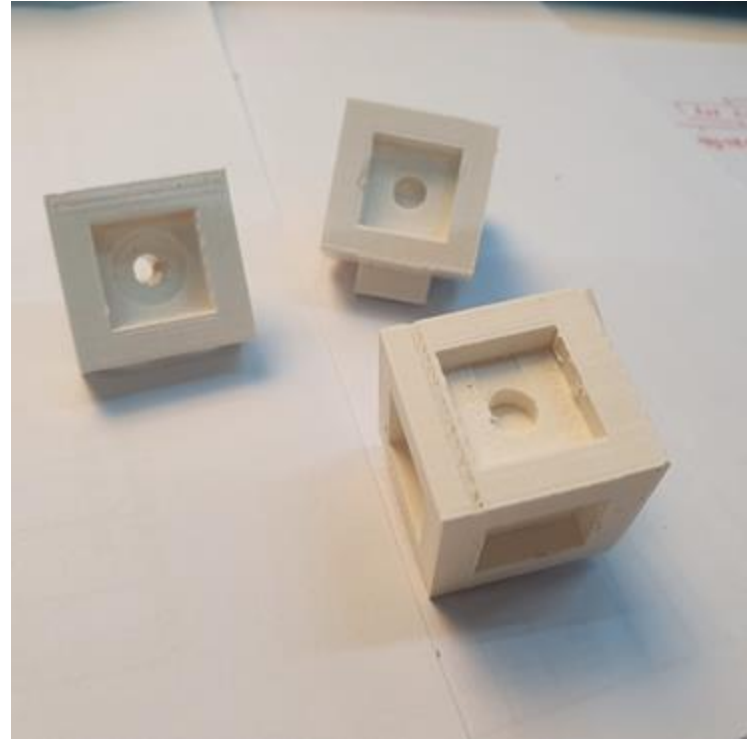
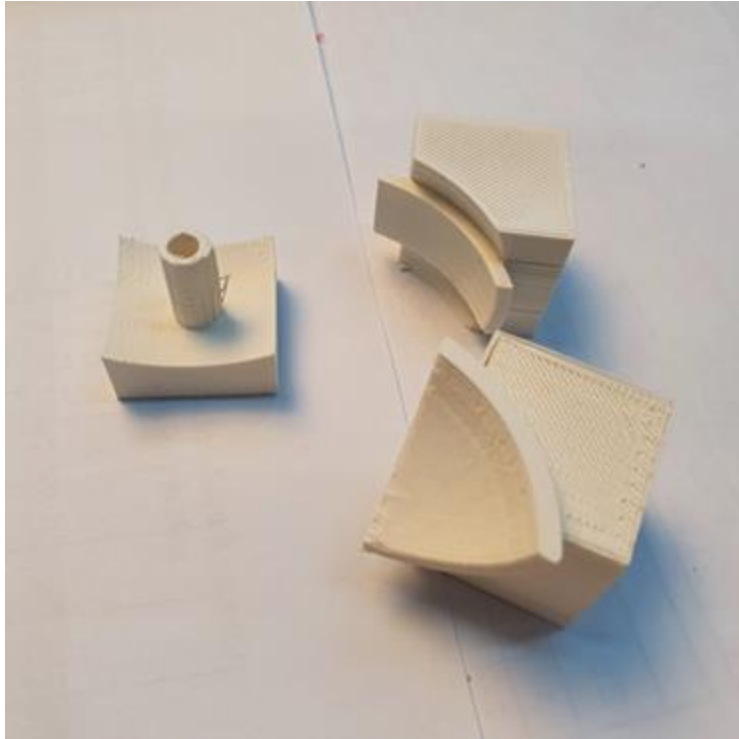




# Refining the parts

- ▷ All the cube parts and tiles were sanded multiple times
- ▷ The tiles were painted with white paint

# Cube pieces



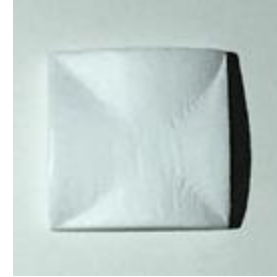
# Final tiles - Paris attractions



Seine River



Montmartre



Mona Lisa Smile



Pompidou Centre



Louvre Museum



Eiffel Tower

# Final tiles - Honolulu nature



Cliff



Rock



Wave



Seashell



Wind



Palm tree trunk



# Assembling the Cube



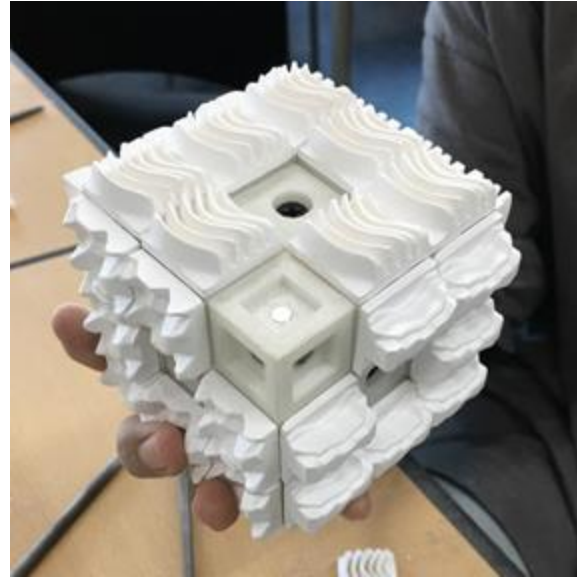
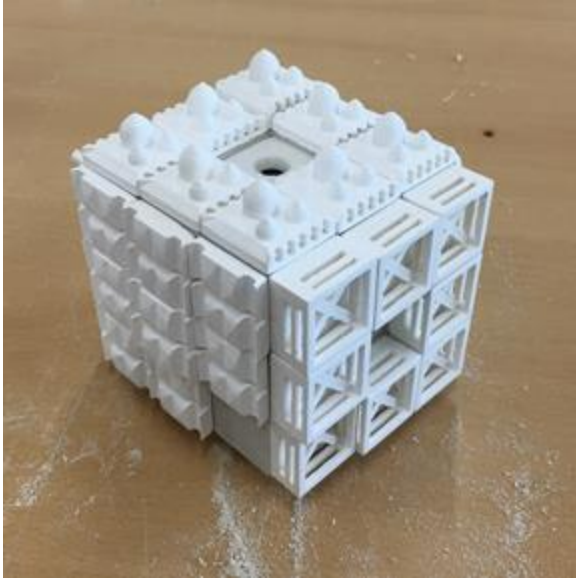
# Method

- ▷ The cube pieces were screwed on to the wooden core.
- ▷ The tiles were attached to the cube using glue.

# Assembling the main structure



# Attaching the tiles

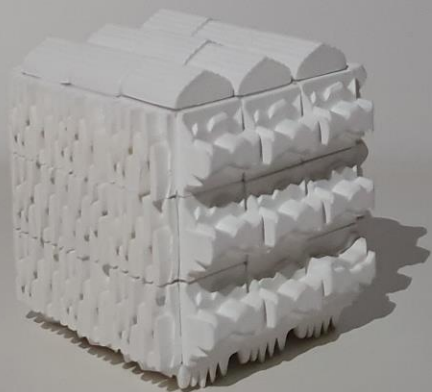


# Final Cube





SIXTH SENSE



# Thank you!



PPT by Sumin Park, Kiran SK  
Final Video by Kiran SK