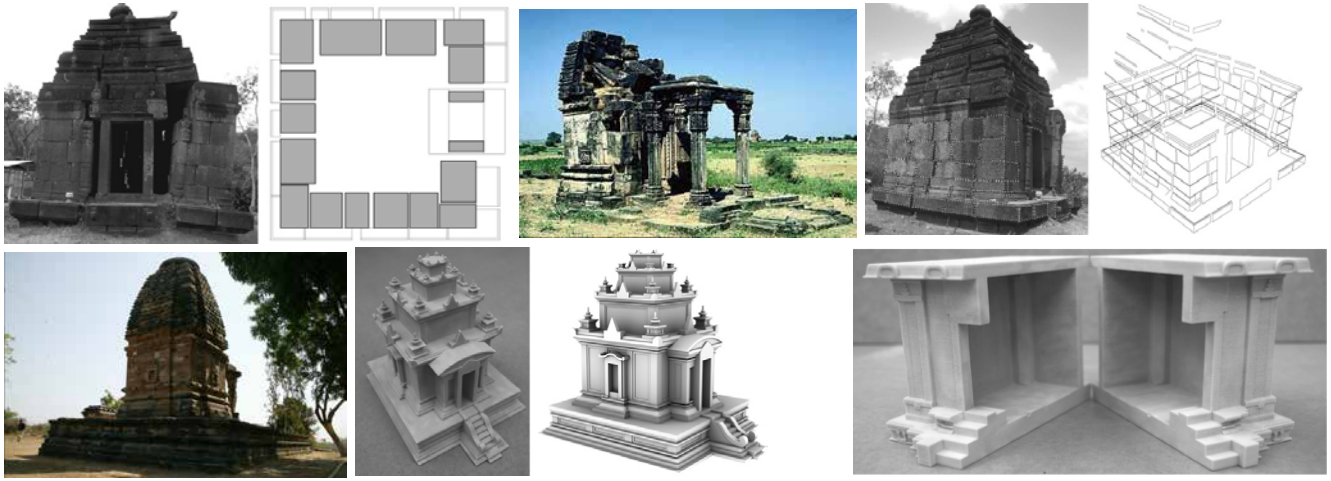
11 December, 2019

NDLI-UNSESCO International Symposium on Knowledge Engineering for Digital Library Design, IIT Delhi



The architectural evolution of Indic temples across Southeast Asia

SAMBIT DATTA

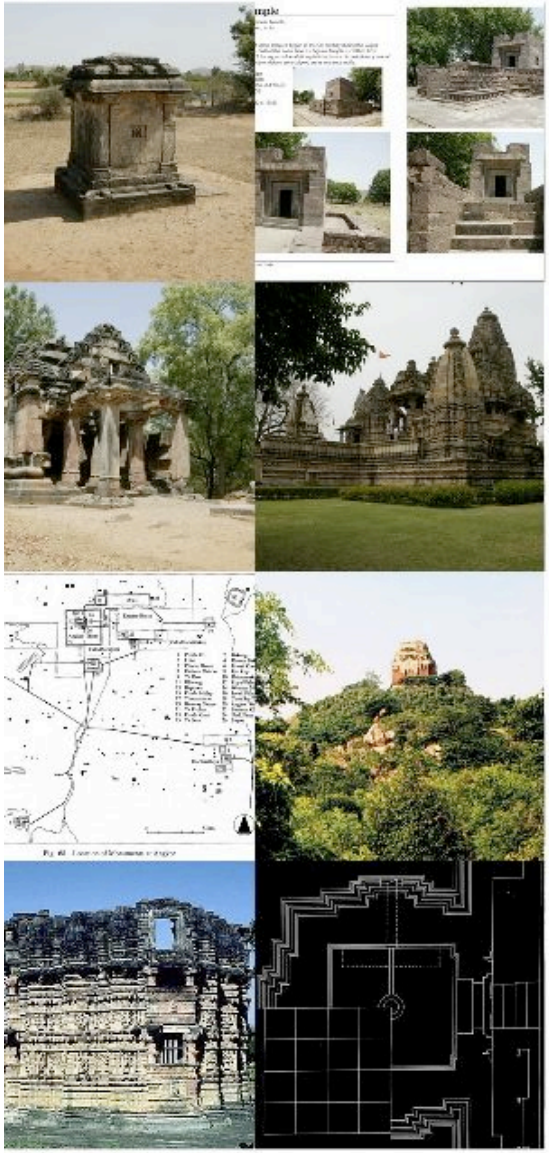
Architecture and Urban Science Laboratory

DiplArch (Cept), MArch (Nus), PhD (Adel)

Dean International | Faculty of Science and Engineering

Curtin University

The architectural evolution of Indic temples across Southeast Asia 400 – 1500 CE



Motivation

understand the spatio temporal spread

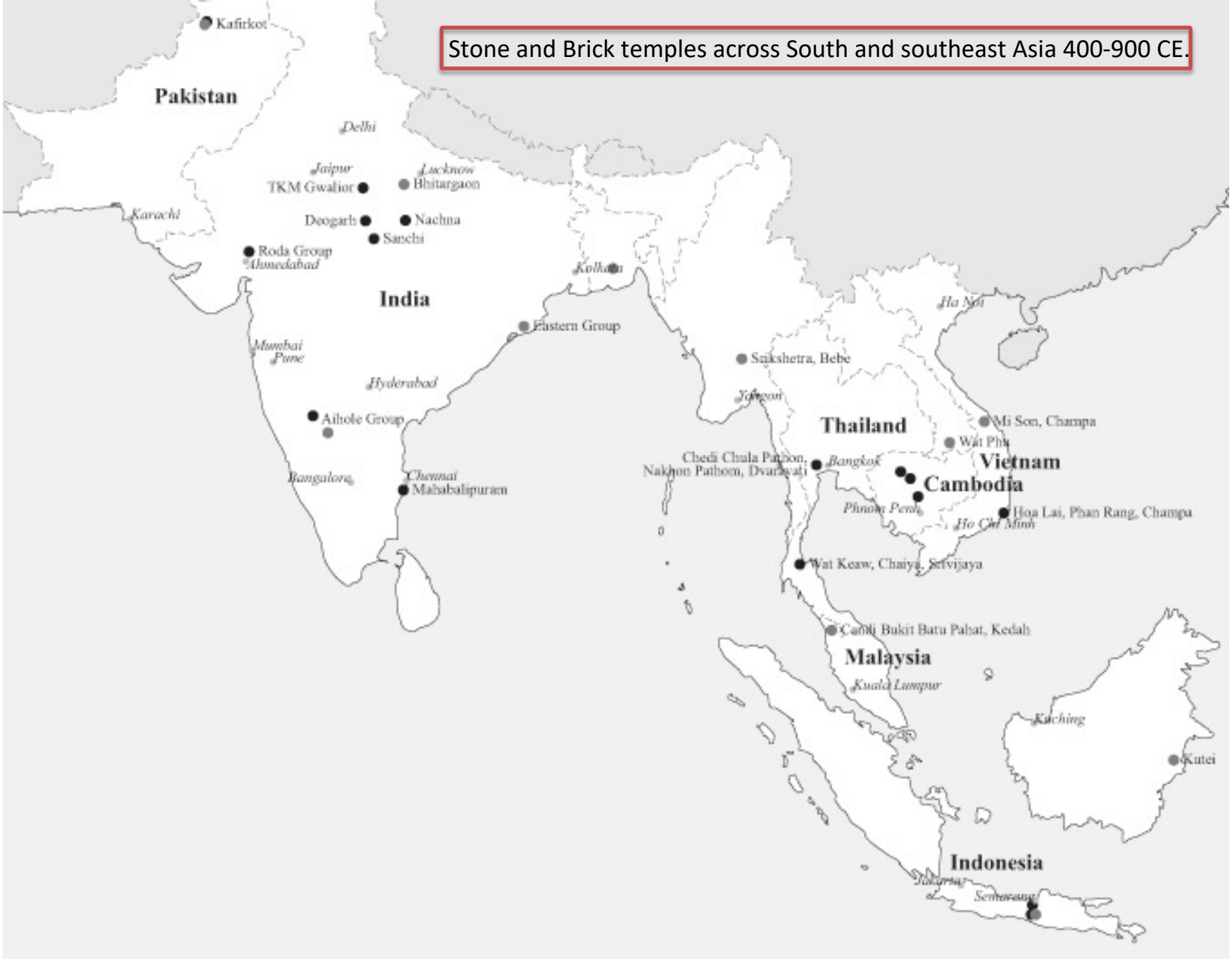
- corpus, variations on a theme
- temple typology and morphology
- 400 -1100 CE

digital reconstructions

- fill in the missing information
- constructive geometry
- part-whole relationships
- fragments
- keep up with emerging technologies

socio economic role

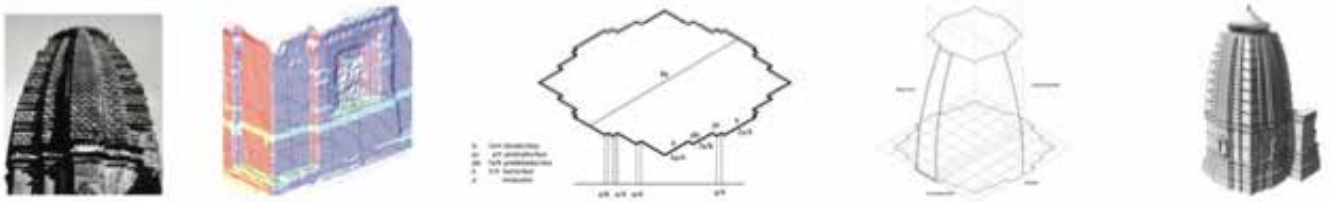
- heritage as "cultural capital"
- living communities
- environmental knowledge (water, land, place)


Stone and Brick temples across South and southeast Asia 400-900 CE.
Kafirkot
Pakistan
Delhi
Jaipur
Lucknow
TKM Gwalior
Bhitargaon
Karachi
Deogarh
Nachna
Sanchi
Roda Group
Ahmedabad
Kolkata
India
Ha Noi
Eastern Group
Mumbai
Pune
Hyderabad
Sukshetra, Bebe
Yangon
Aihole Group
Thailand
Mi Son, Champa
Wat Phu
Chedi Chula Pathon,
Nakhon Pathom, Dvaravati
Bangkok
Vietnam
Cambodia
Bangalore
Chennai
Mahabalipuram
Phnom Penh
Hoa Lai, Phan Rang, Champa
Ho Chi Minh
Wat Keaw, Chaiya, Srivijaya
Candi Bukit Batu Pahat, Kedah
Malaysia
Kuala Lumpur
Kuching
Kutei
Indonesia
Jakarta
Semarang

datasets of related building corpus at multiple spatial scales and multiple modes of representation.

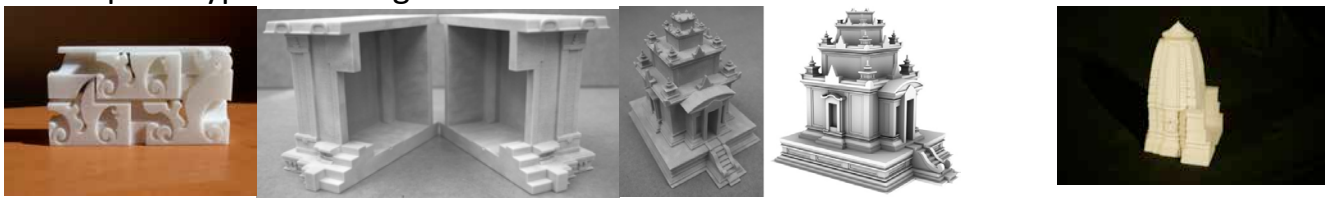
TOPICS

Digital Reconstructions
the selection, preservation, collection and archiving of digital datasets.

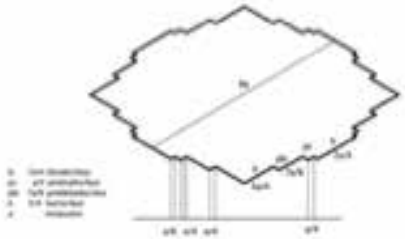


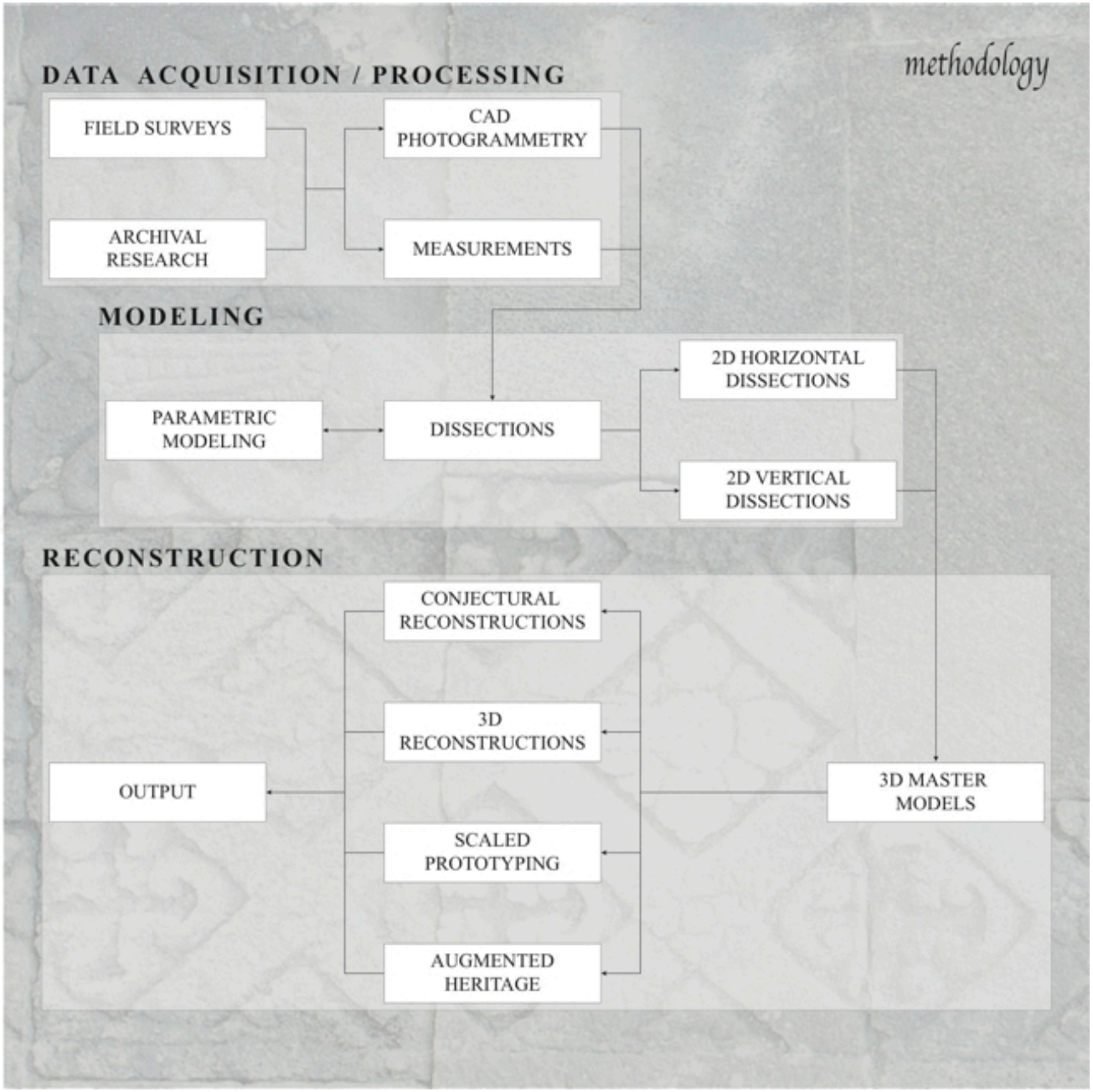
Immersive Stereoscopic Environments
visualisation, simulation, communication and sharing of digital datasets.

Physical Prototyping
Scaled prototypes from digital data

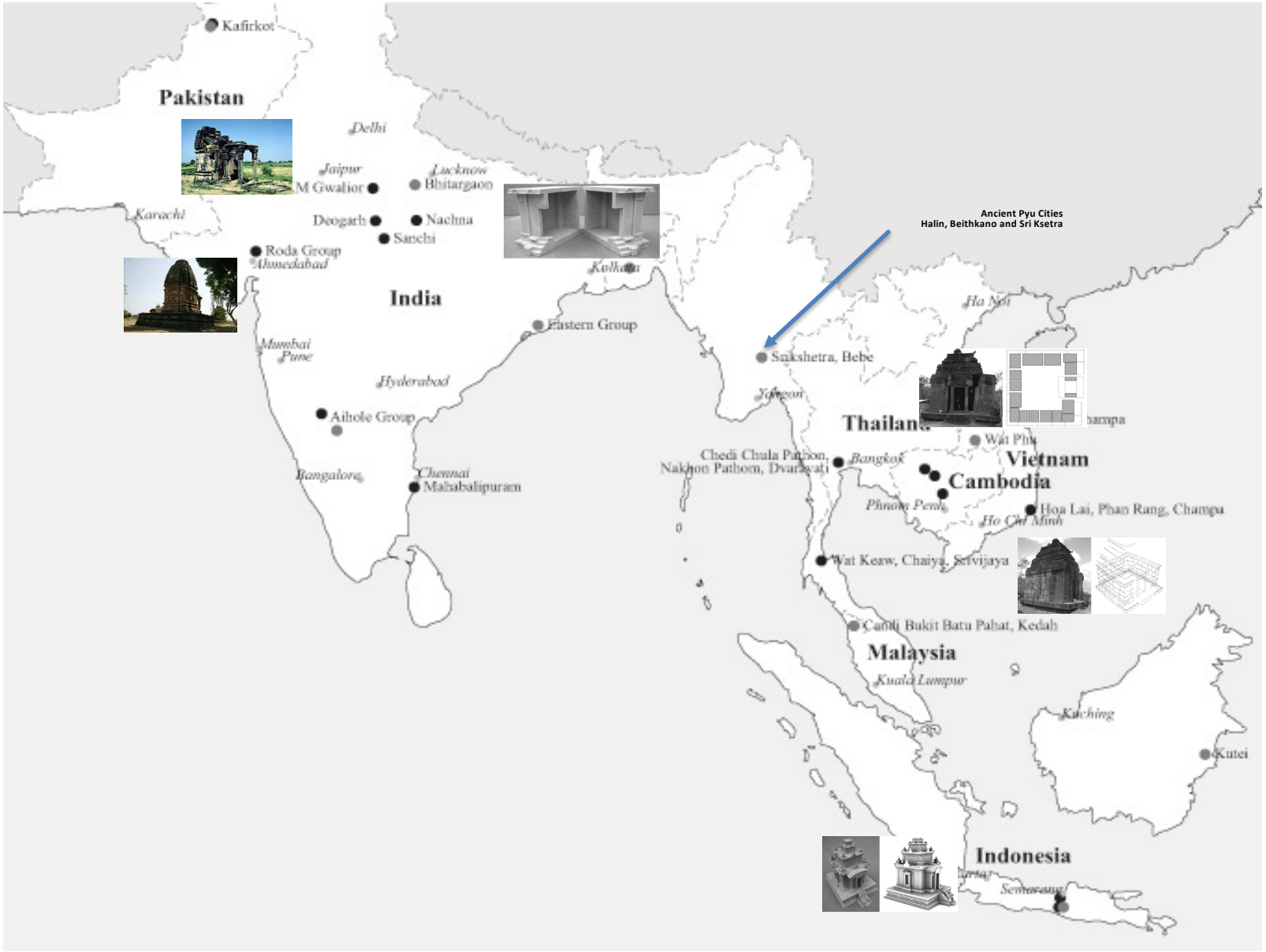


DIGITAL RECONSTRUCTION

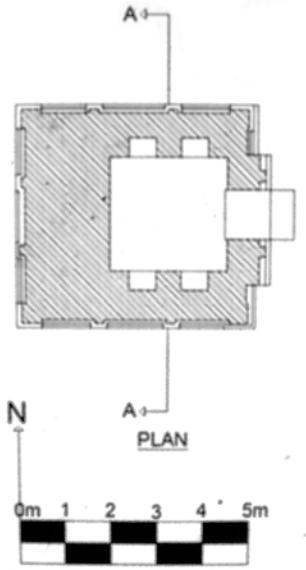




Indic temples across South and southeast Asia 400-900 CE.



Map
Sat
Google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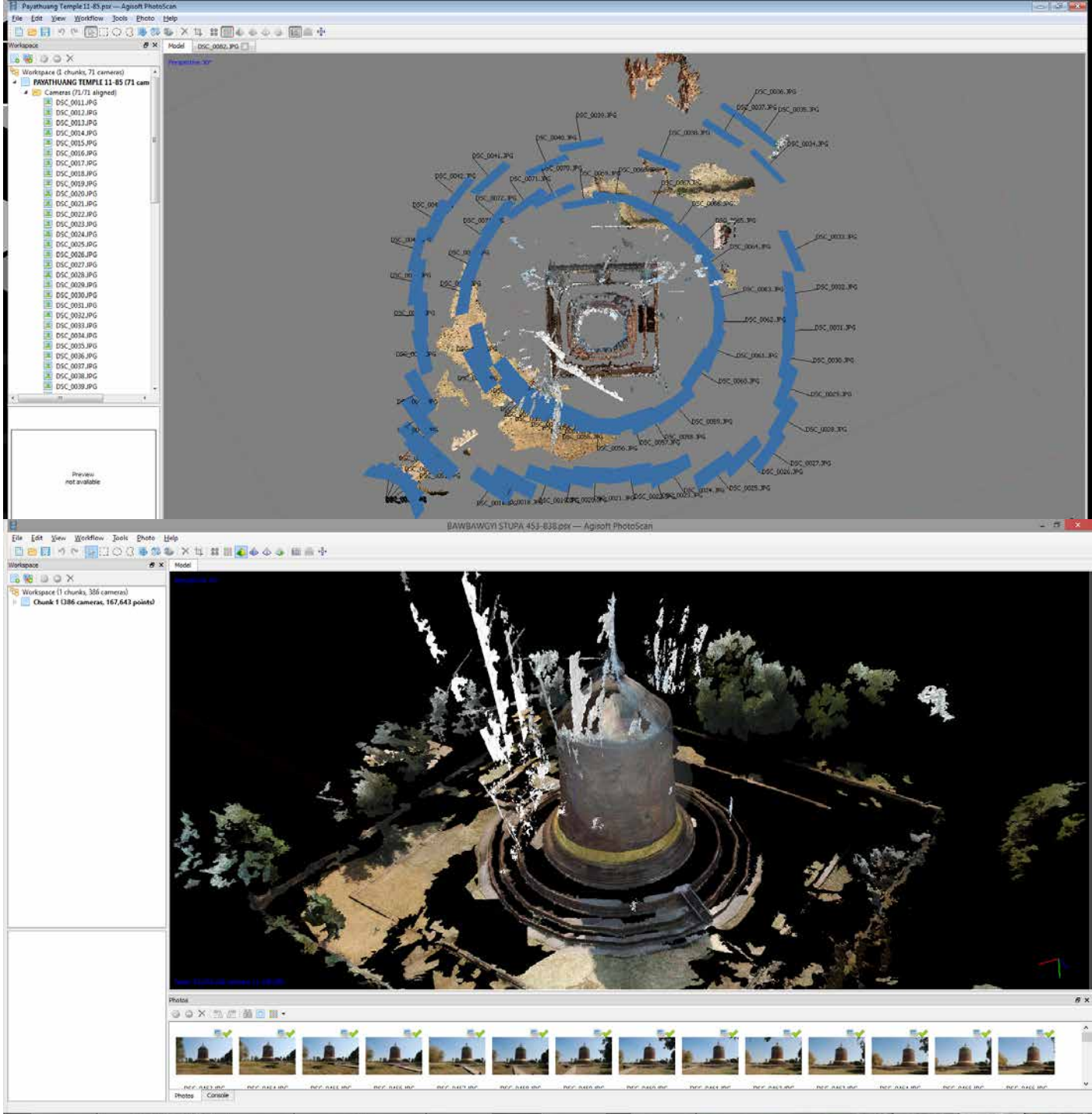
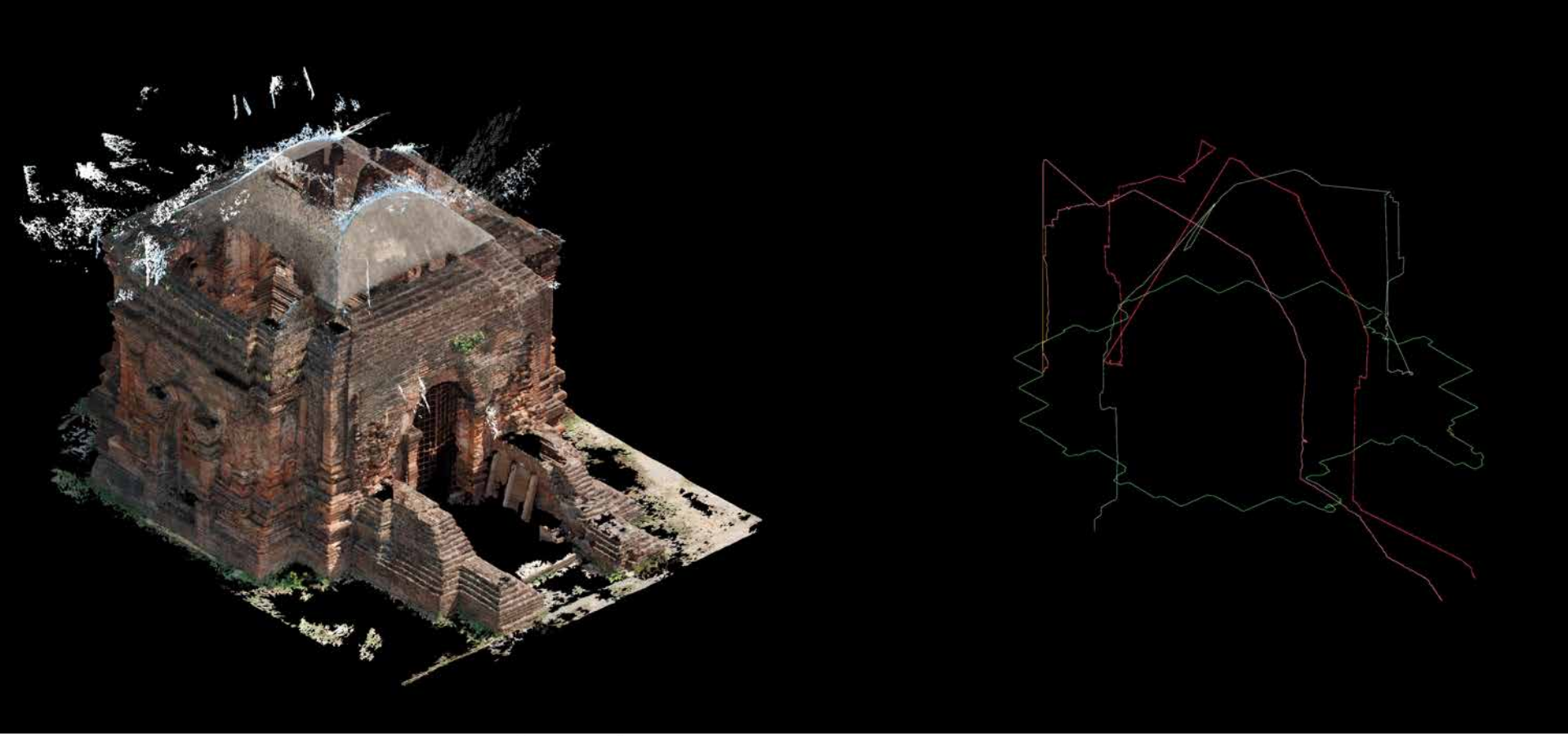
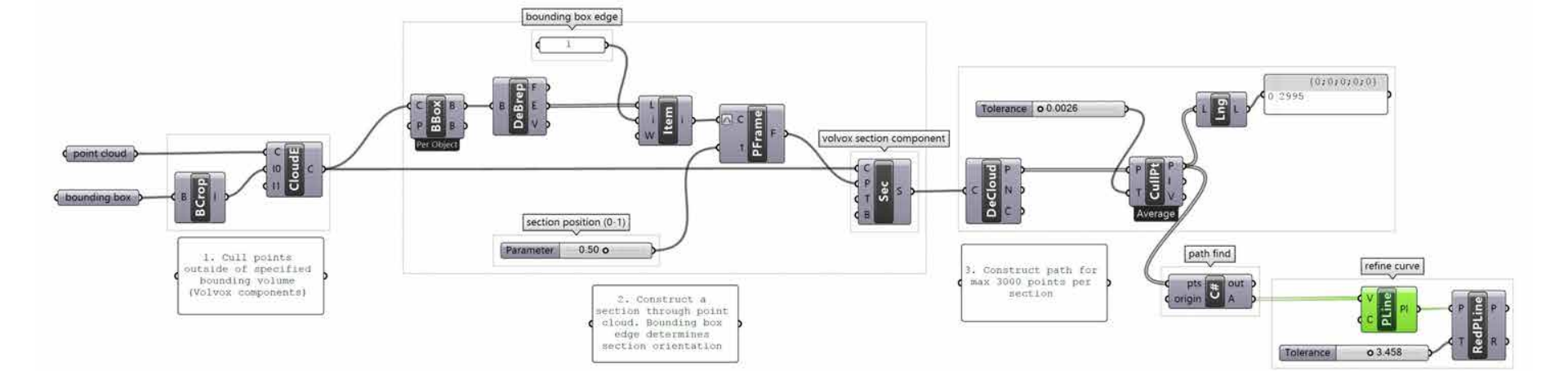
PLAN
0m 1 2 3 4 5m

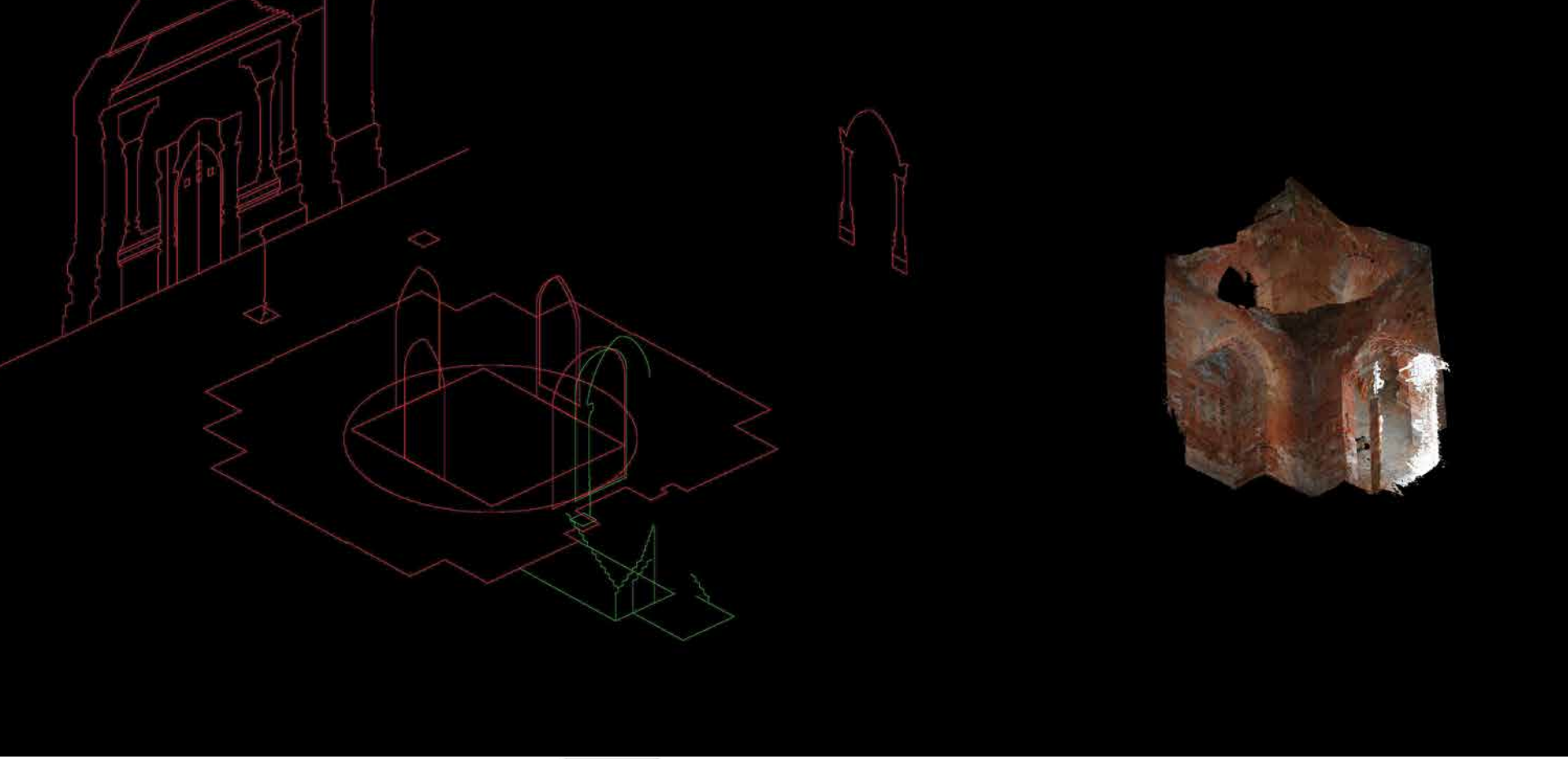
1.1 Creation of solids from point clouds

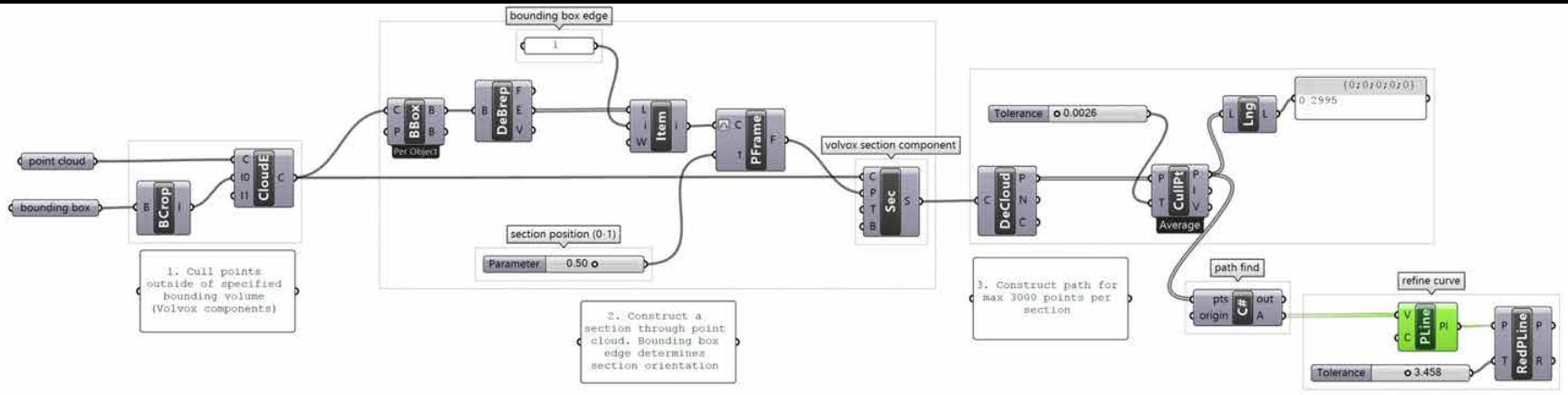


Paya Thuang Temple Sri Ksetra




bounding box edge
1
point cloud
bounding box
BCrop
CloudE
BBox
Per Object
DeBrep
Item
PFrame
volvox section component
Sec
section position (0-1)
Parameter
0.50
1. Cull points outside of specified bounding volume (Volvox components)
2. Construct a section through point cloud. Bounding box edge determines section orientation
Tolerance
0.0026
DeCloud
CullPt
Average
Lng
0.2995
3. Construct path for max 3000 points per section
path find
pts
origin
out
A
refine curve
PLine
RedPLine
Tolerance
3.458

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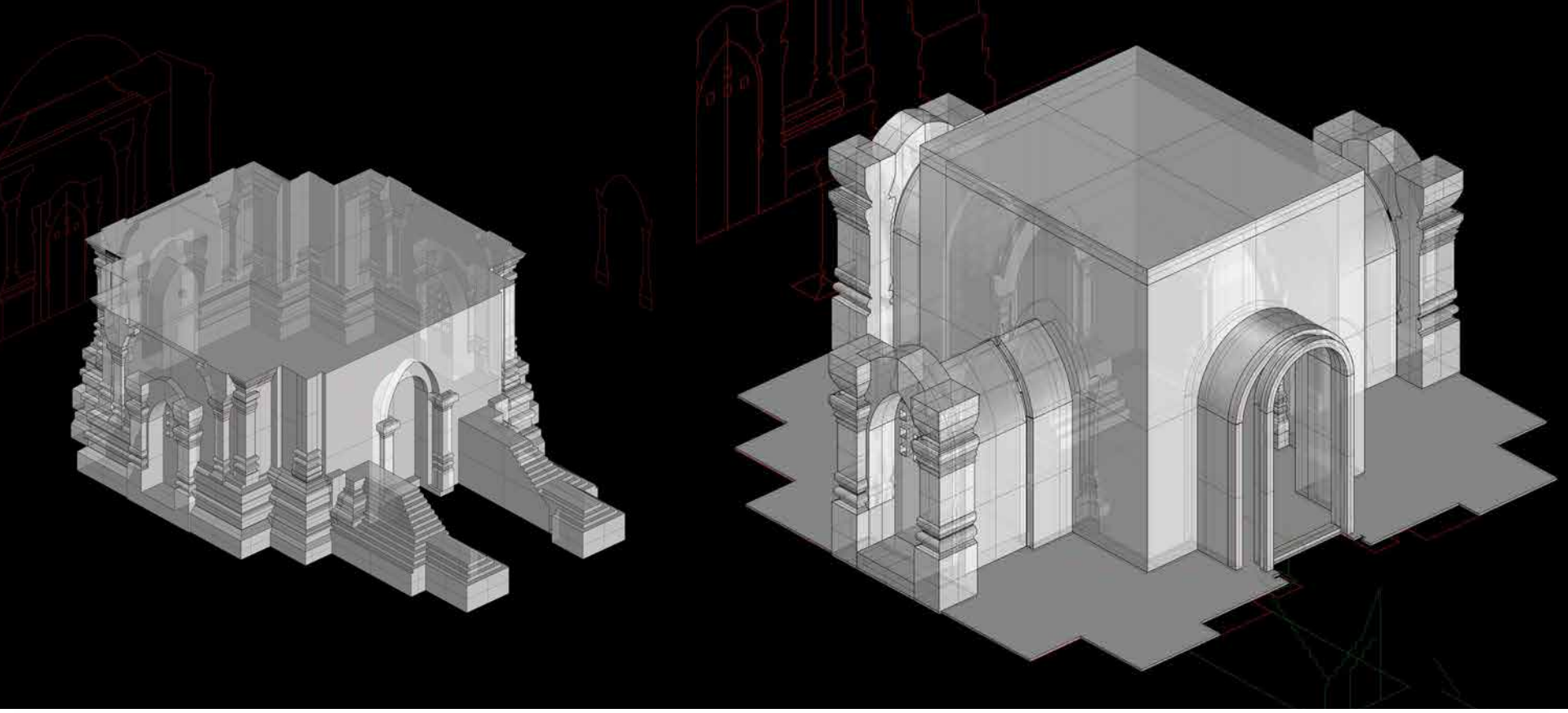

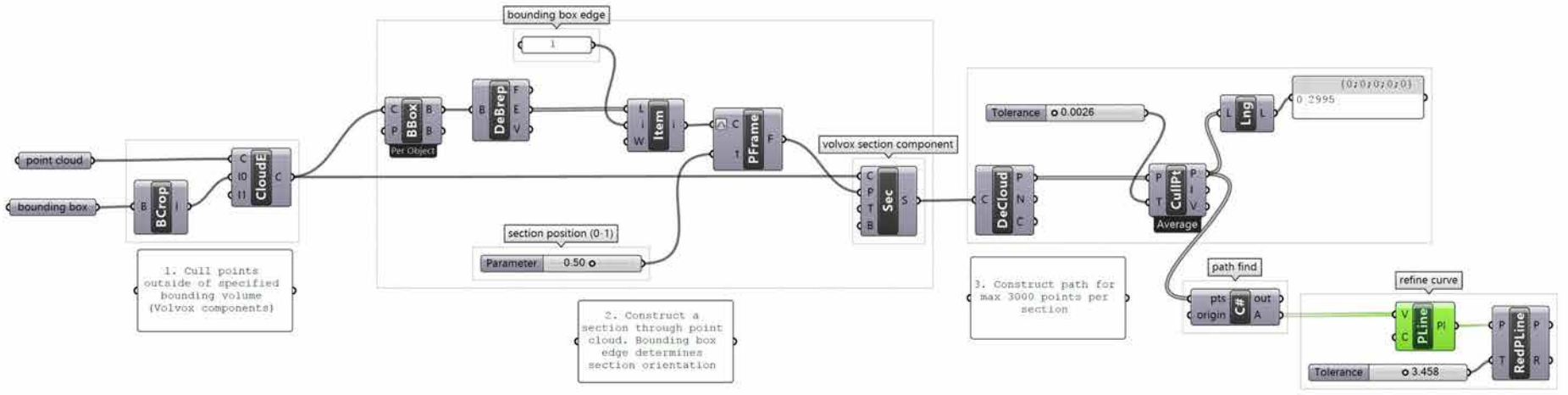
bounding box edge
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Tolerance
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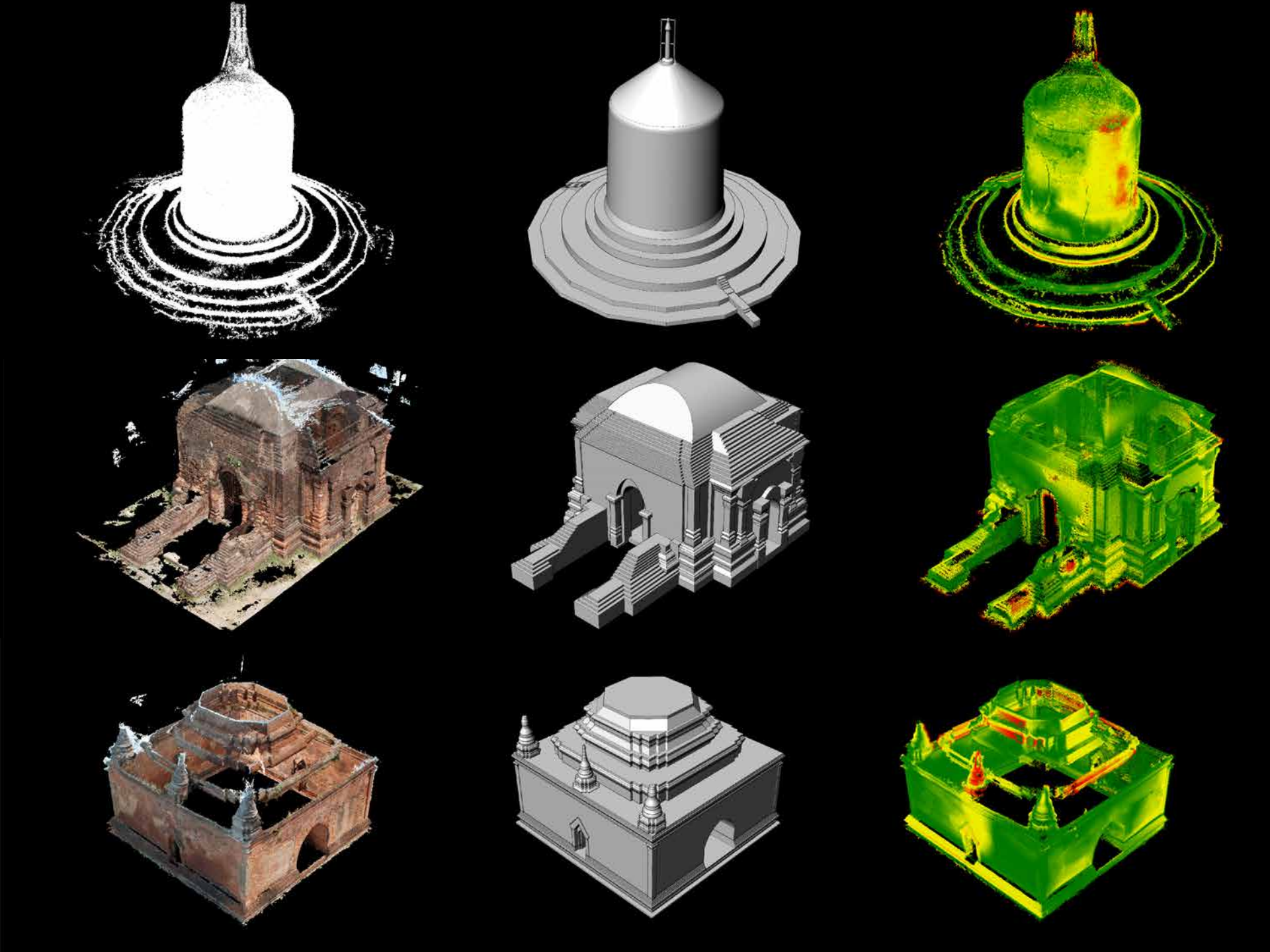
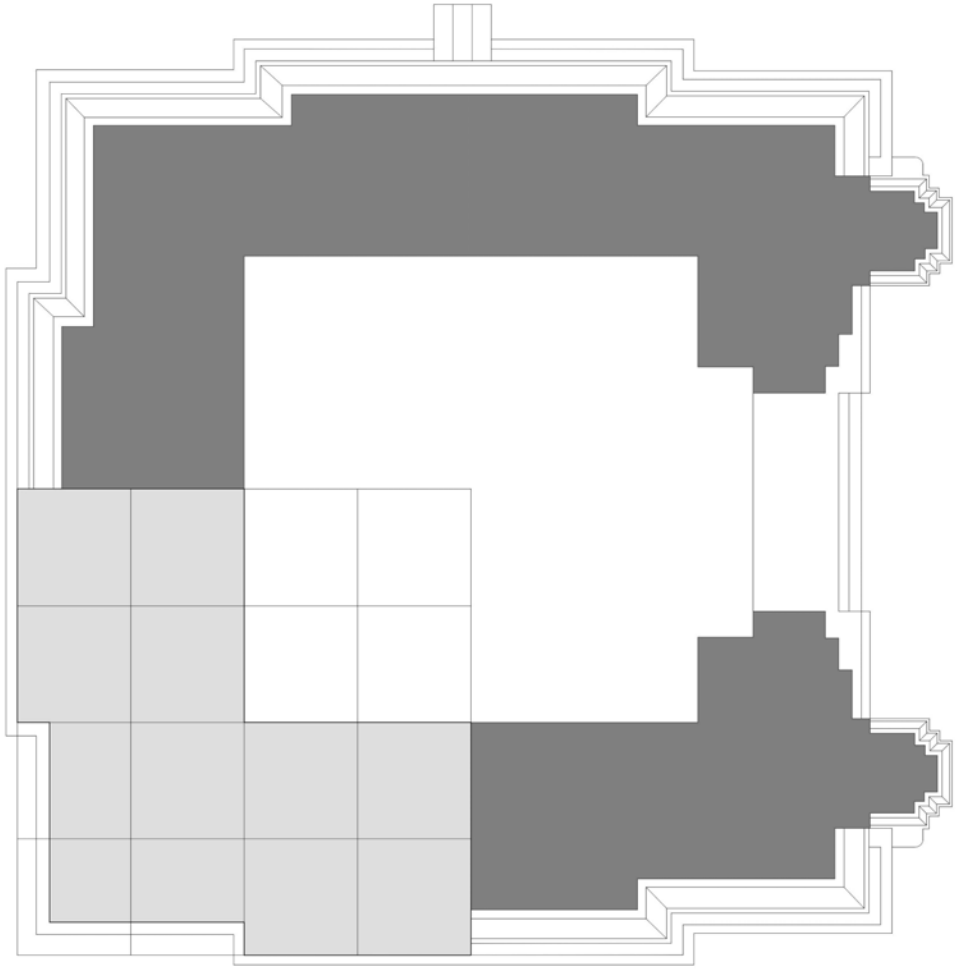
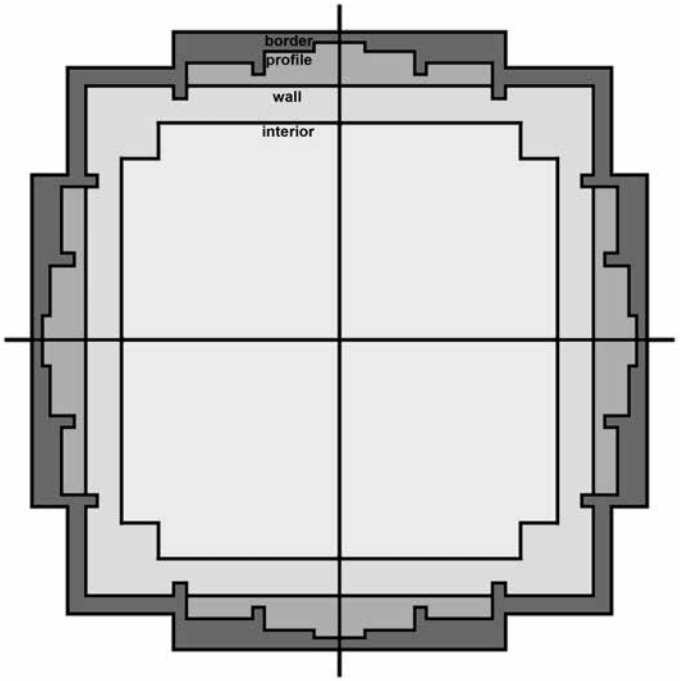


CANON AND TEMPLE
CONSTRUCTIVE GEOMETRY



Brihat Samhita 6th century AD
Vastupurushamandala

10th century AD
Temple, Roda Gujarat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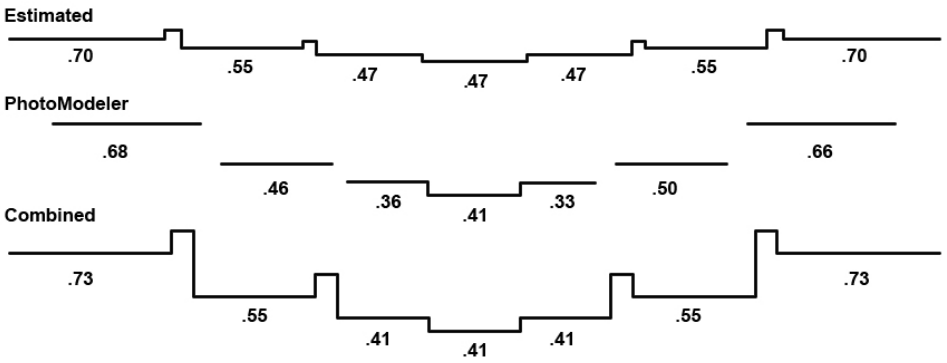
profile
wall
interior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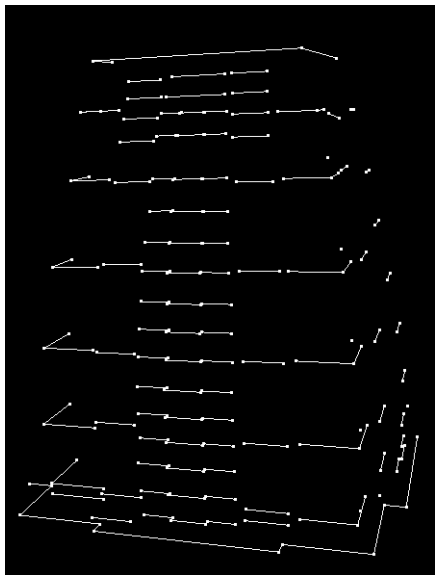

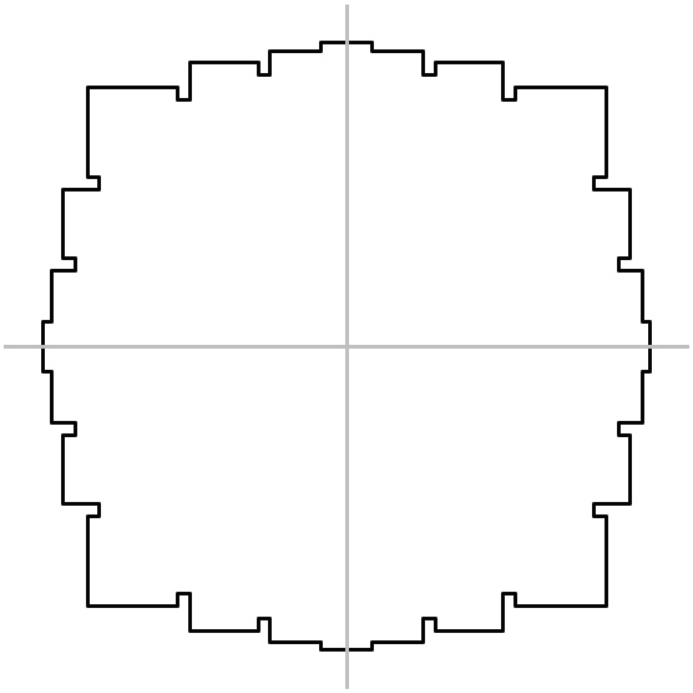

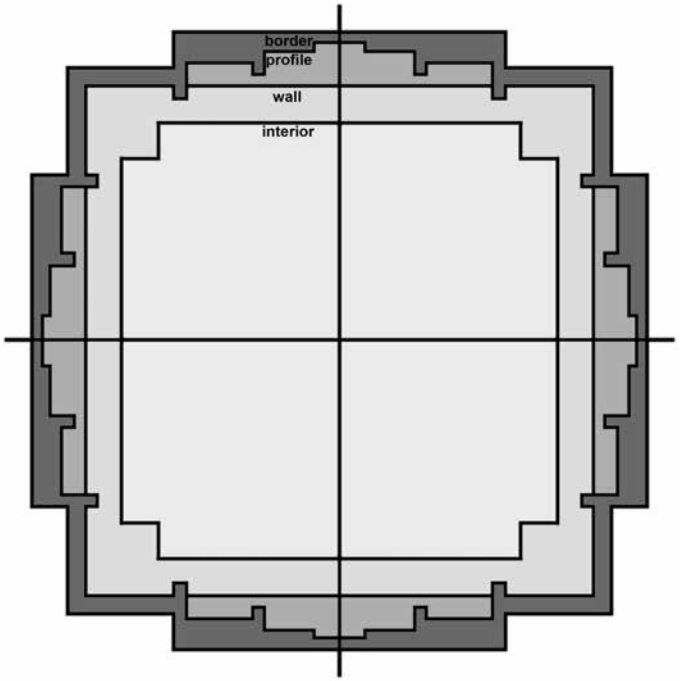
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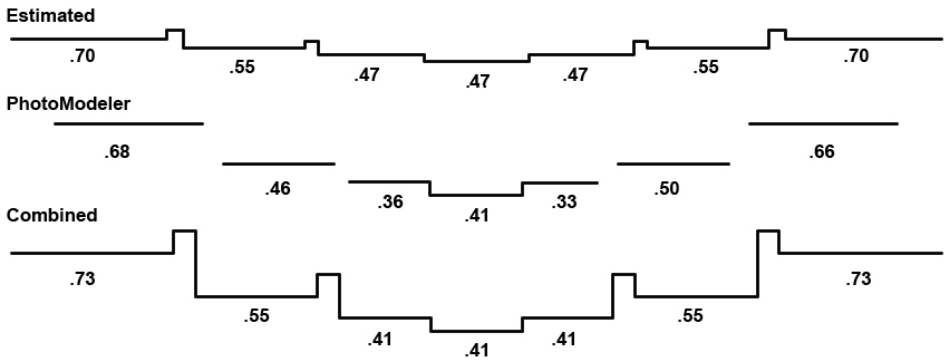
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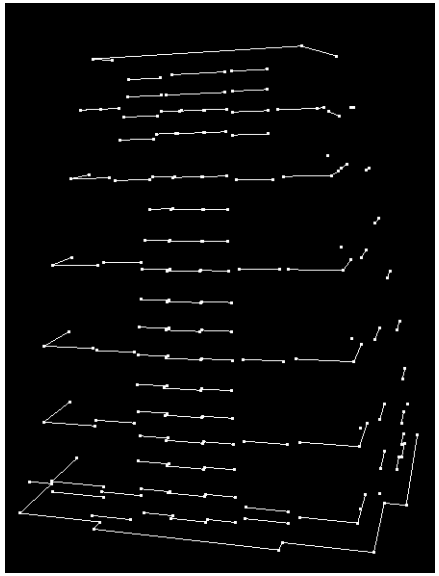
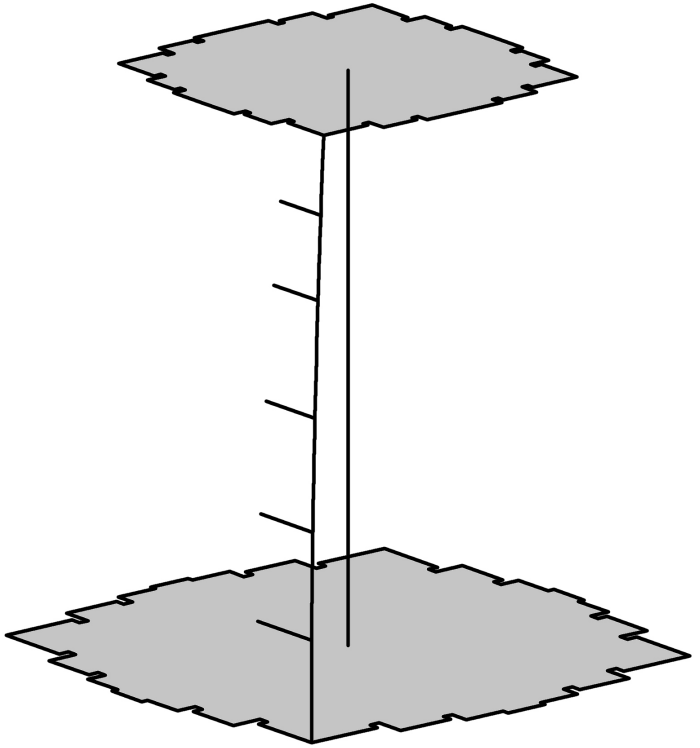
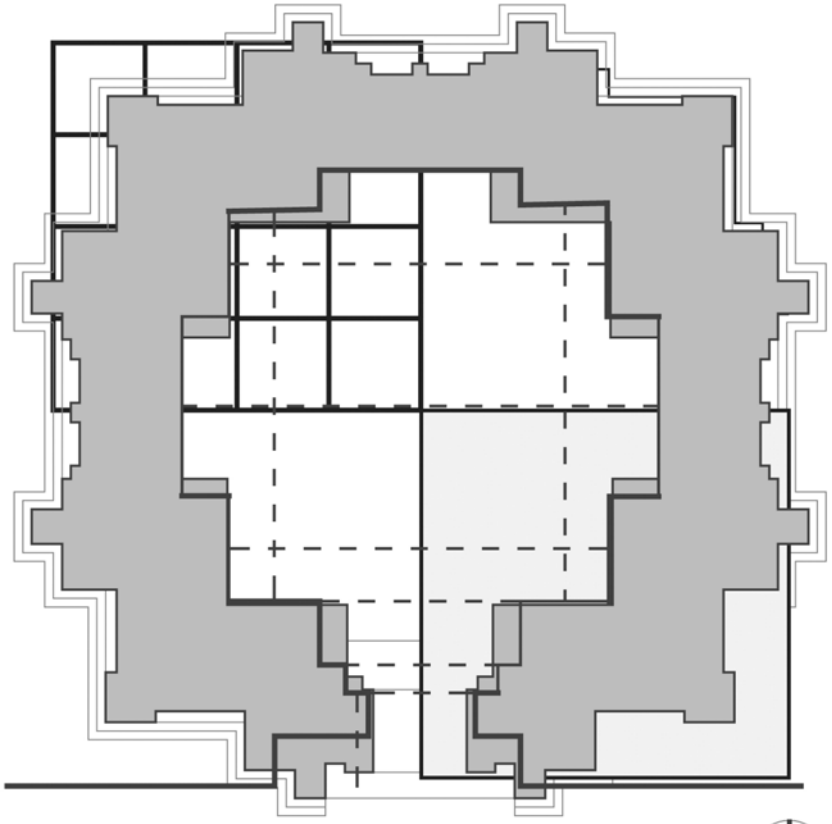
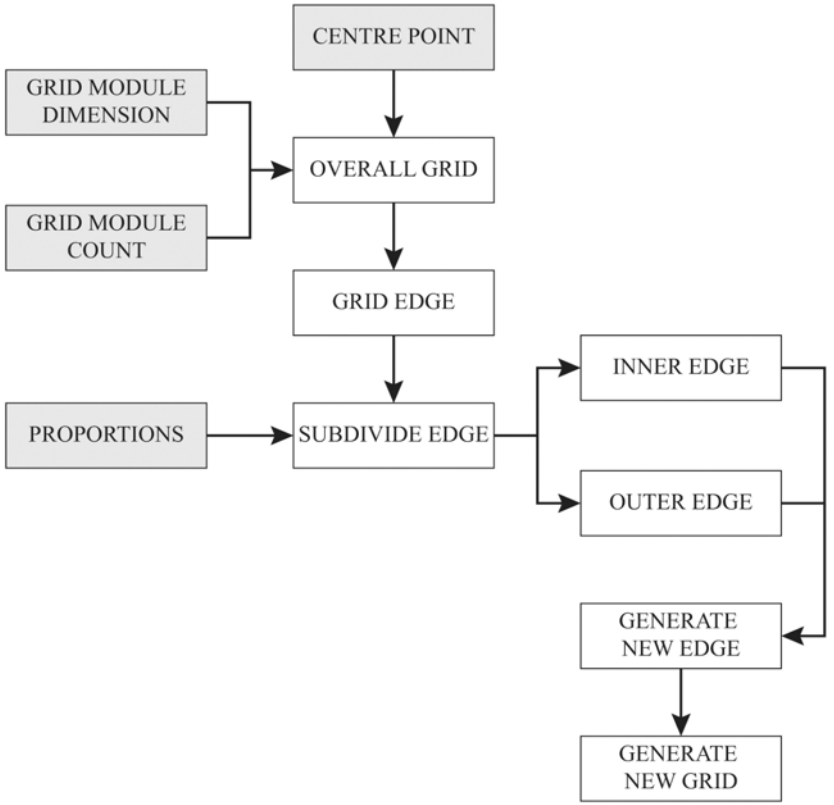
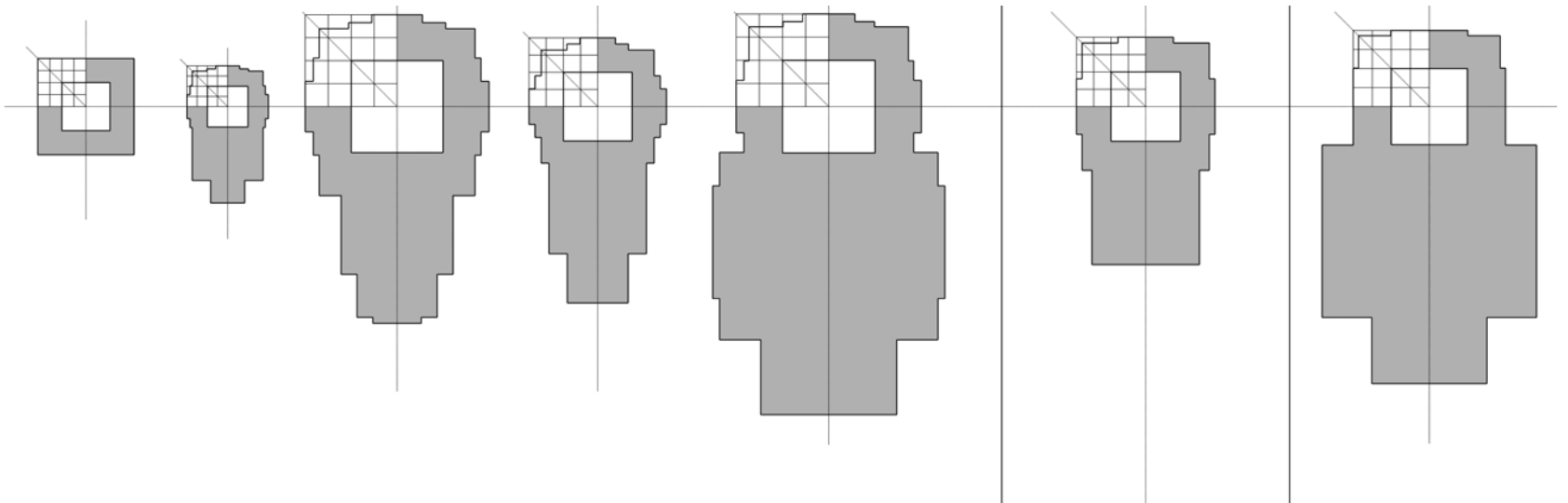






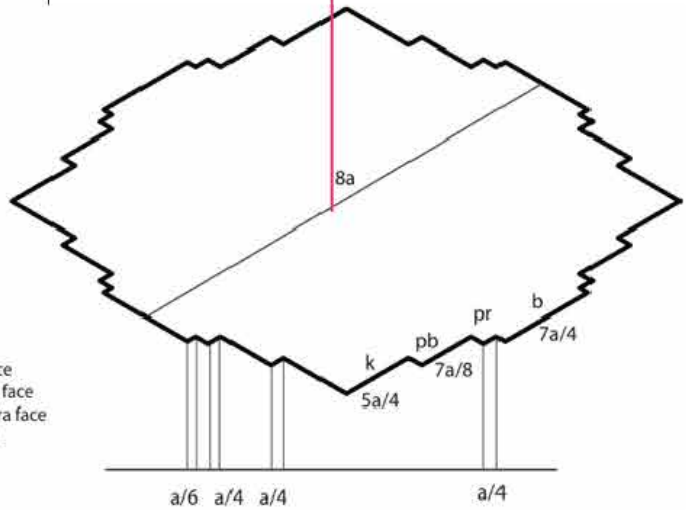

CENTRE POINT
GRID MODULE DIMENSION
GRID MODULE COUNT
OVERALL GRID
GRID EDGE
PROPORTIONS
SUBDIVIDE EDGE
INNER EDGE
OUTER EDGE
GENERATE NEW EDGE
GENERATE NEW GRID



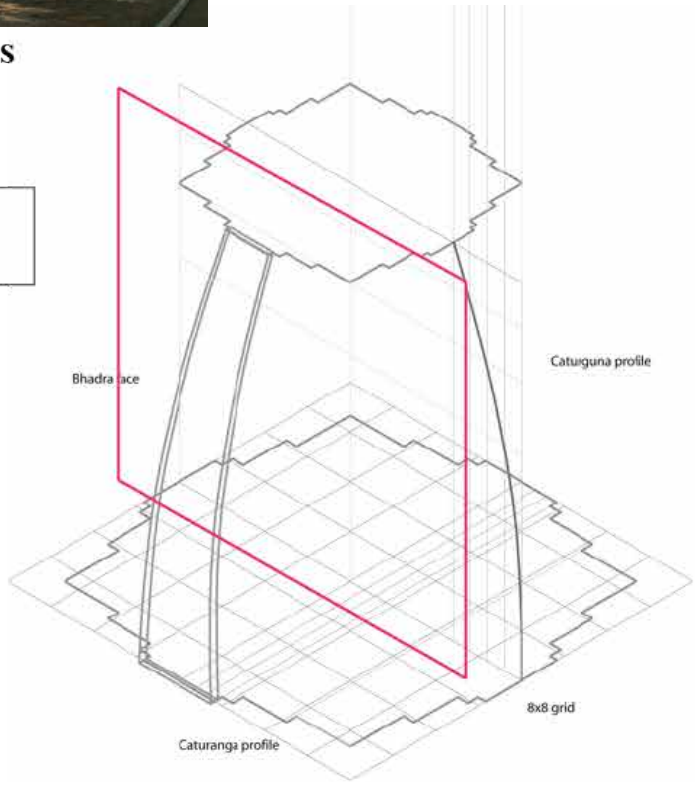
Planar Oriented Dissections

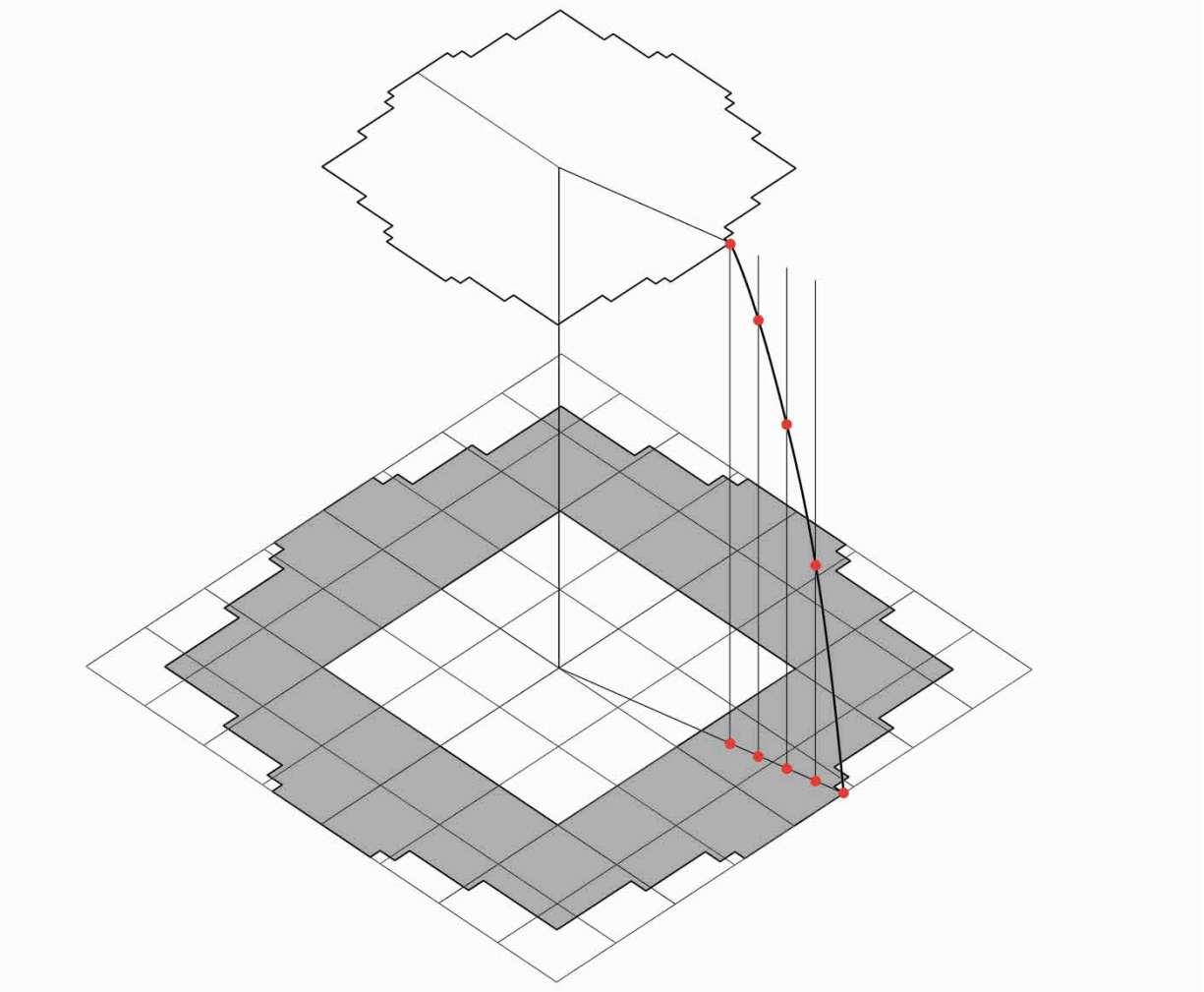
HORIZONTAL
ISSECTIONS

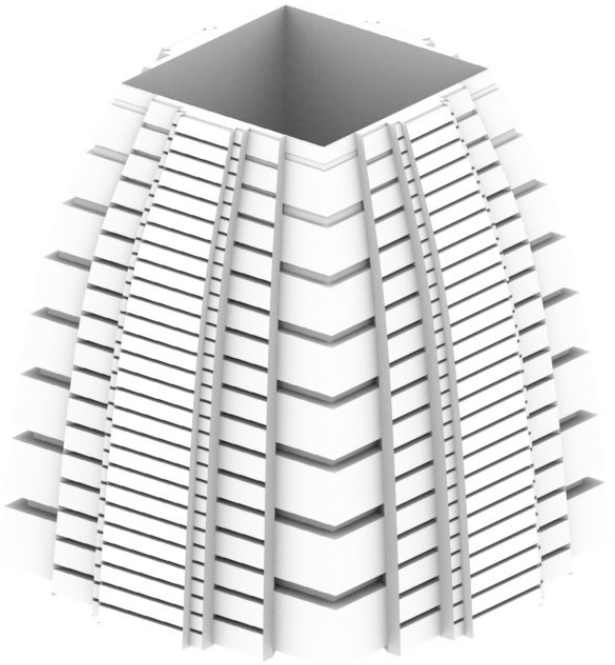
2D VERTICAL
DISSECTIONS

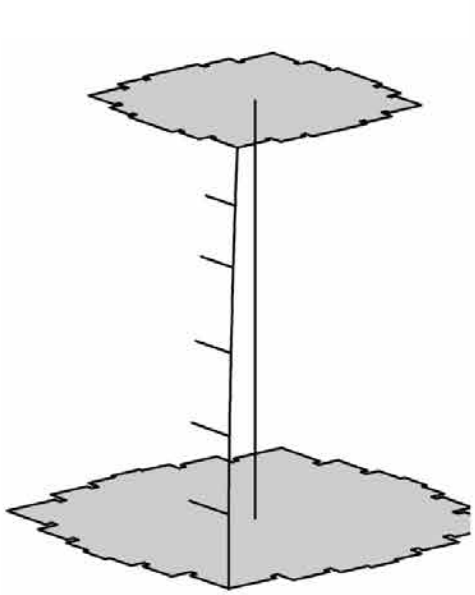


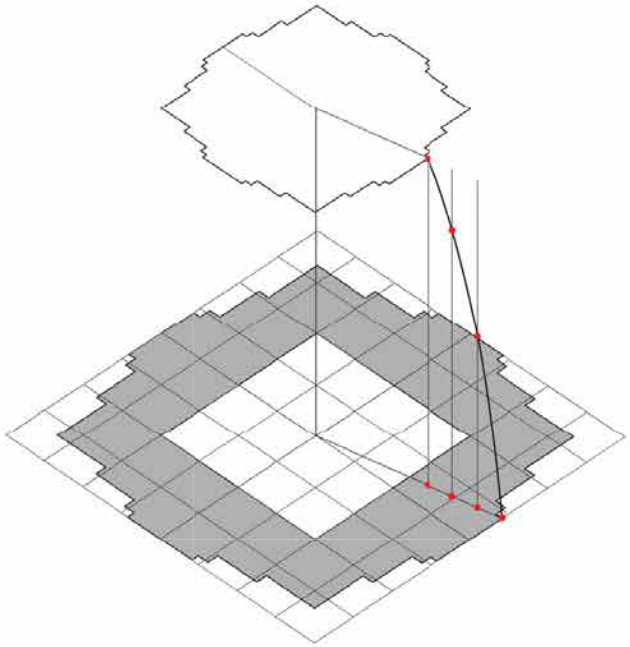
b 7a/4 bhadra face
pr a/4 pratiratha face
pb 7a/8 pratibhadra face
k 5/4 karna face
a mulasutra

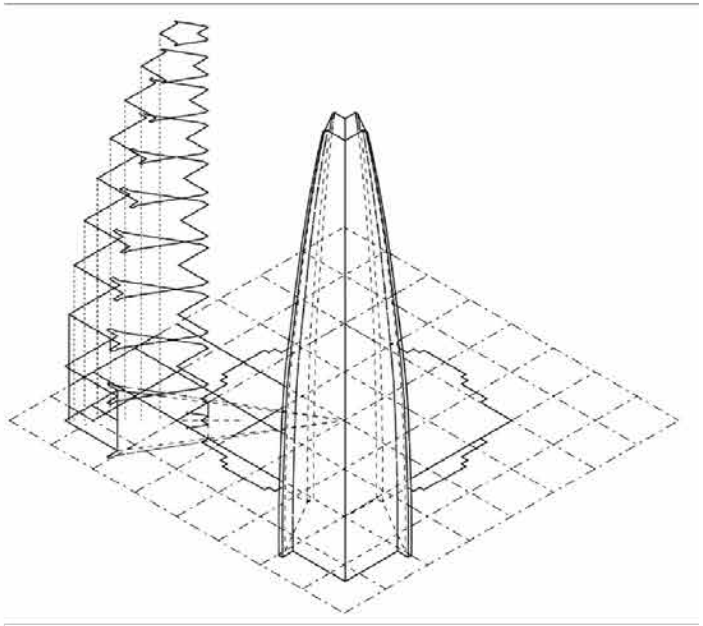


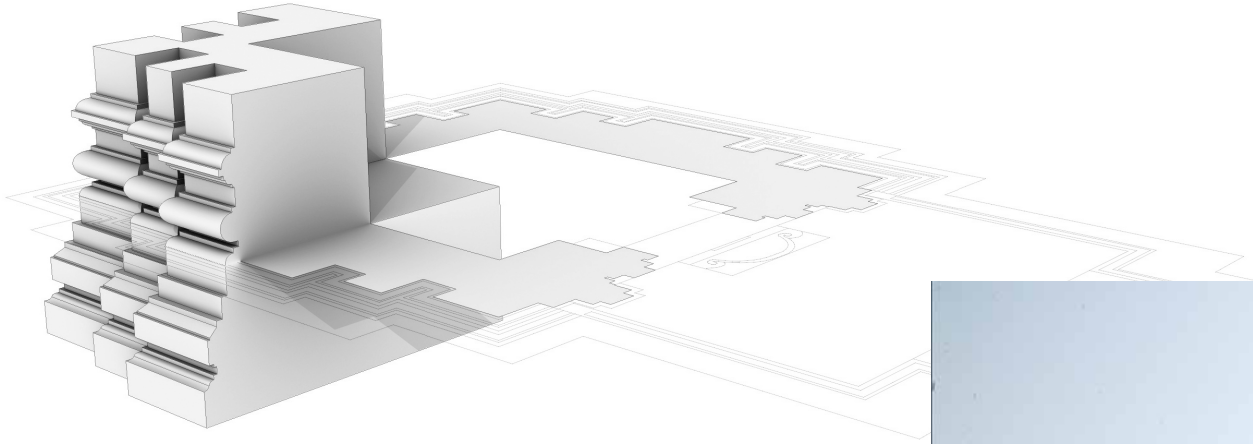


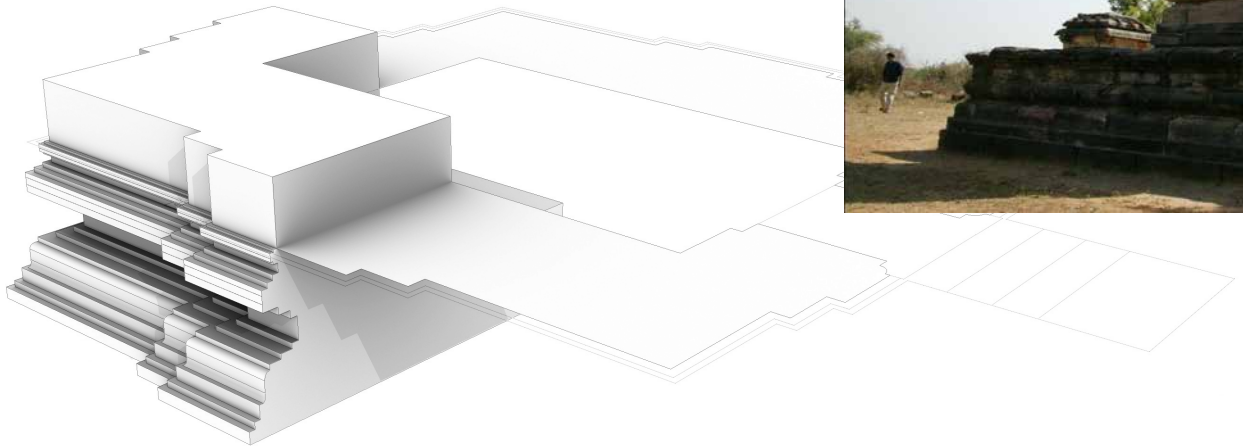




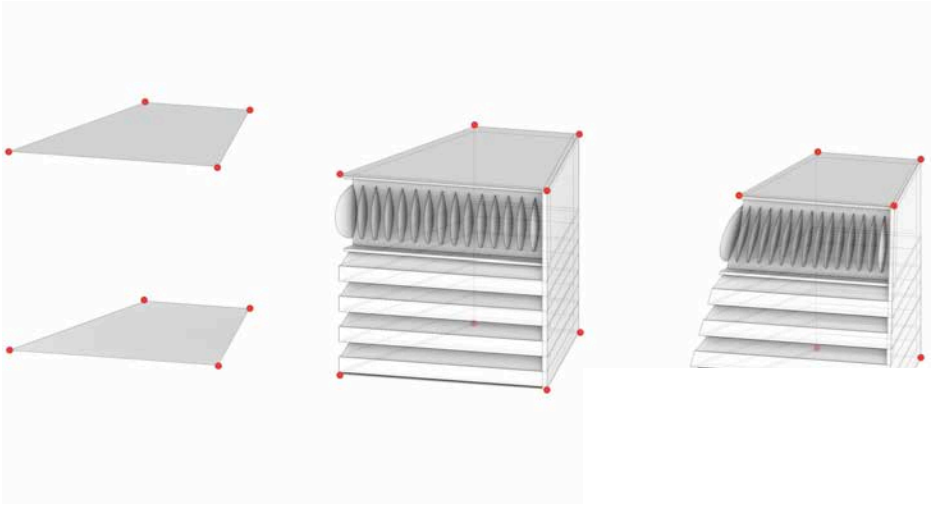


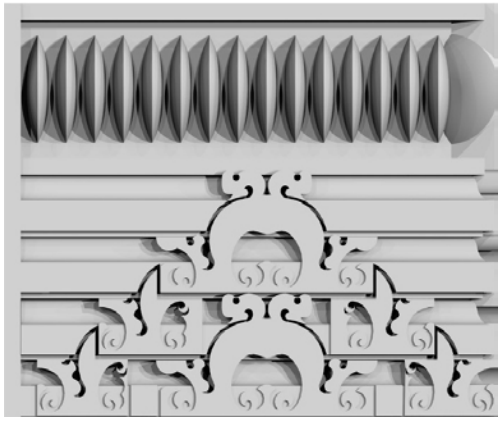


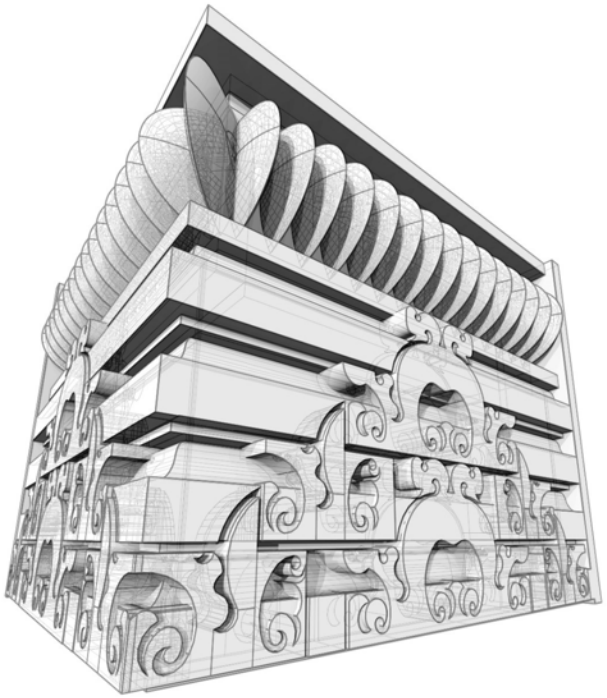




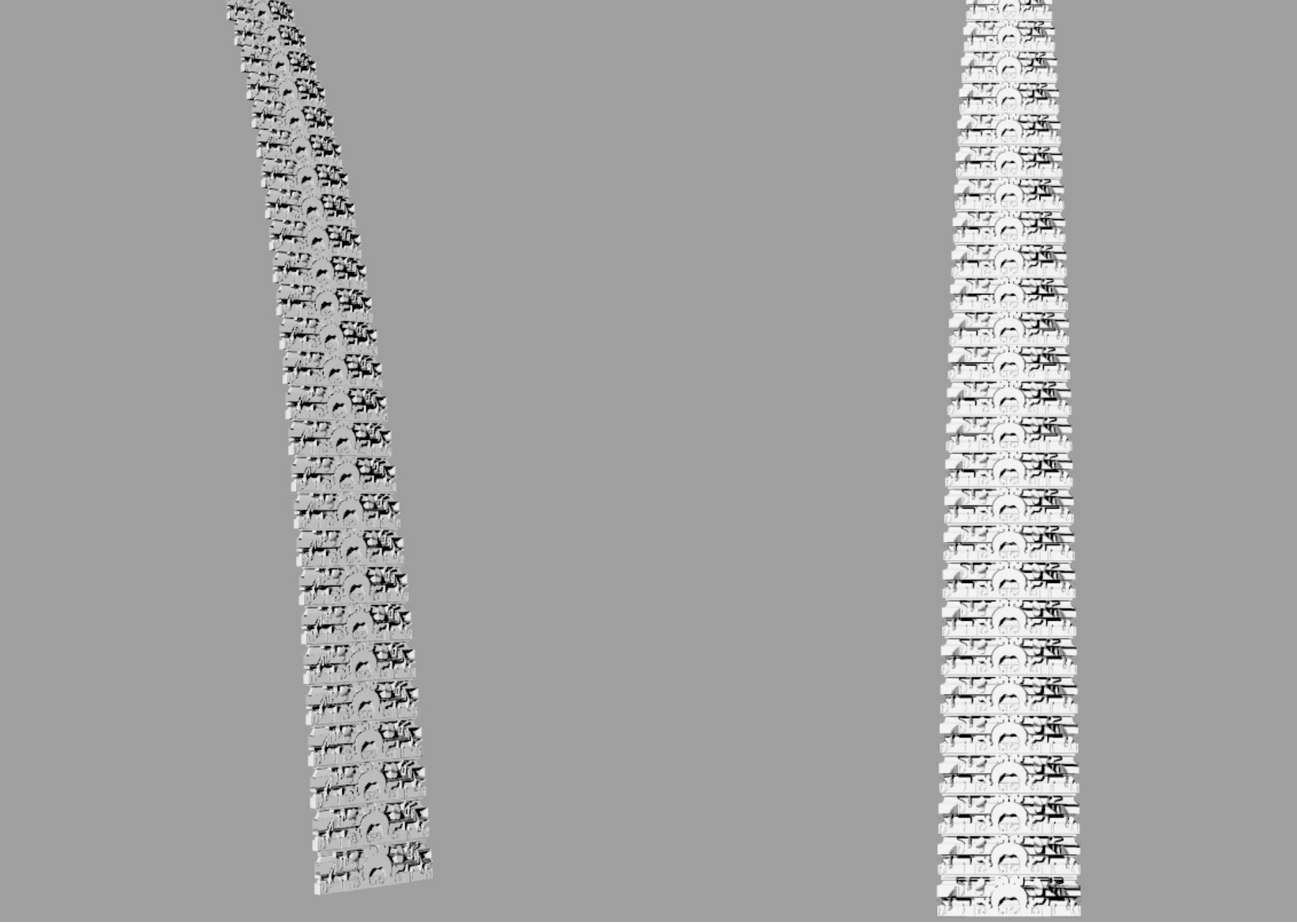
Mouldings



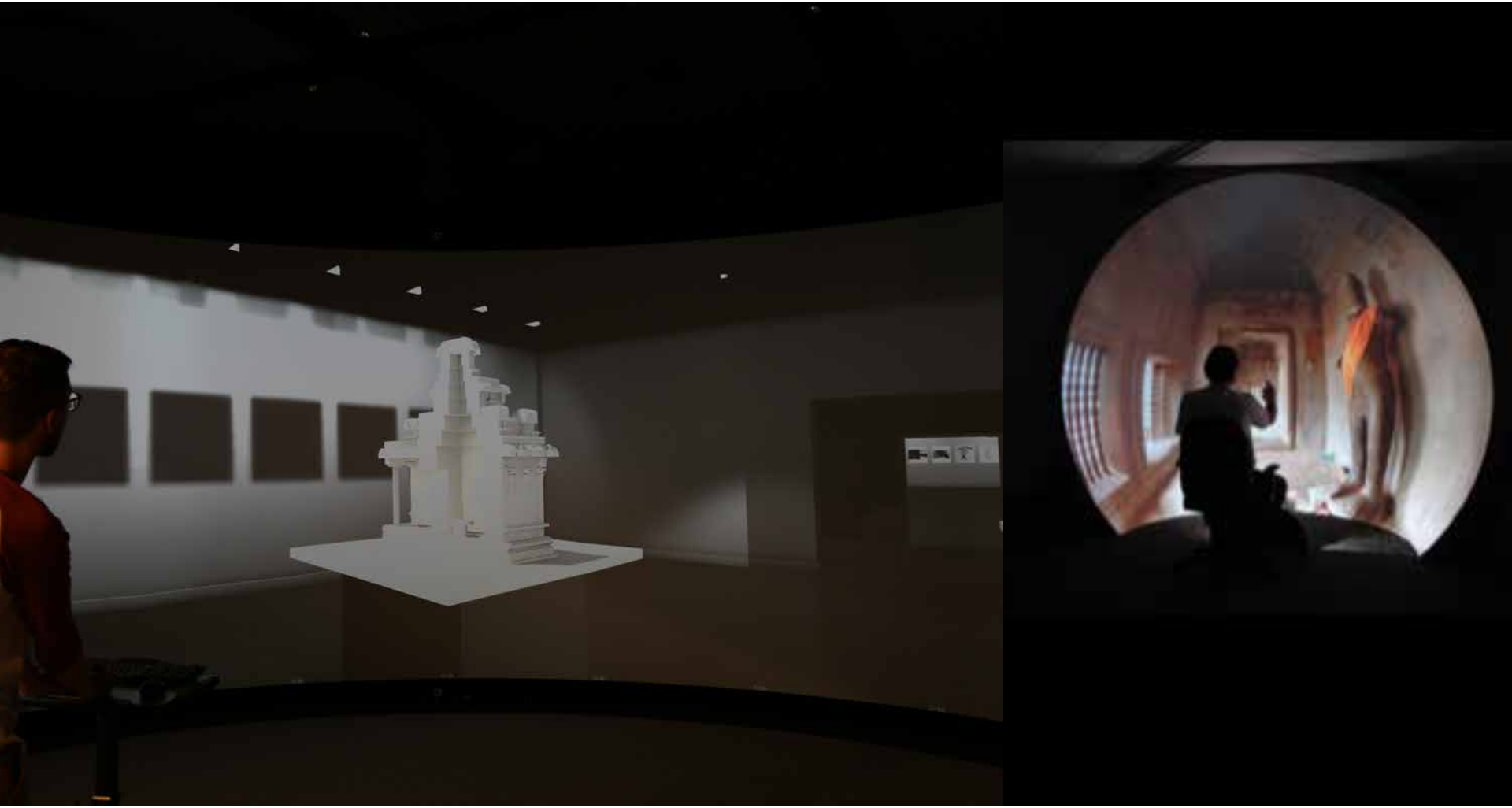




Fragments

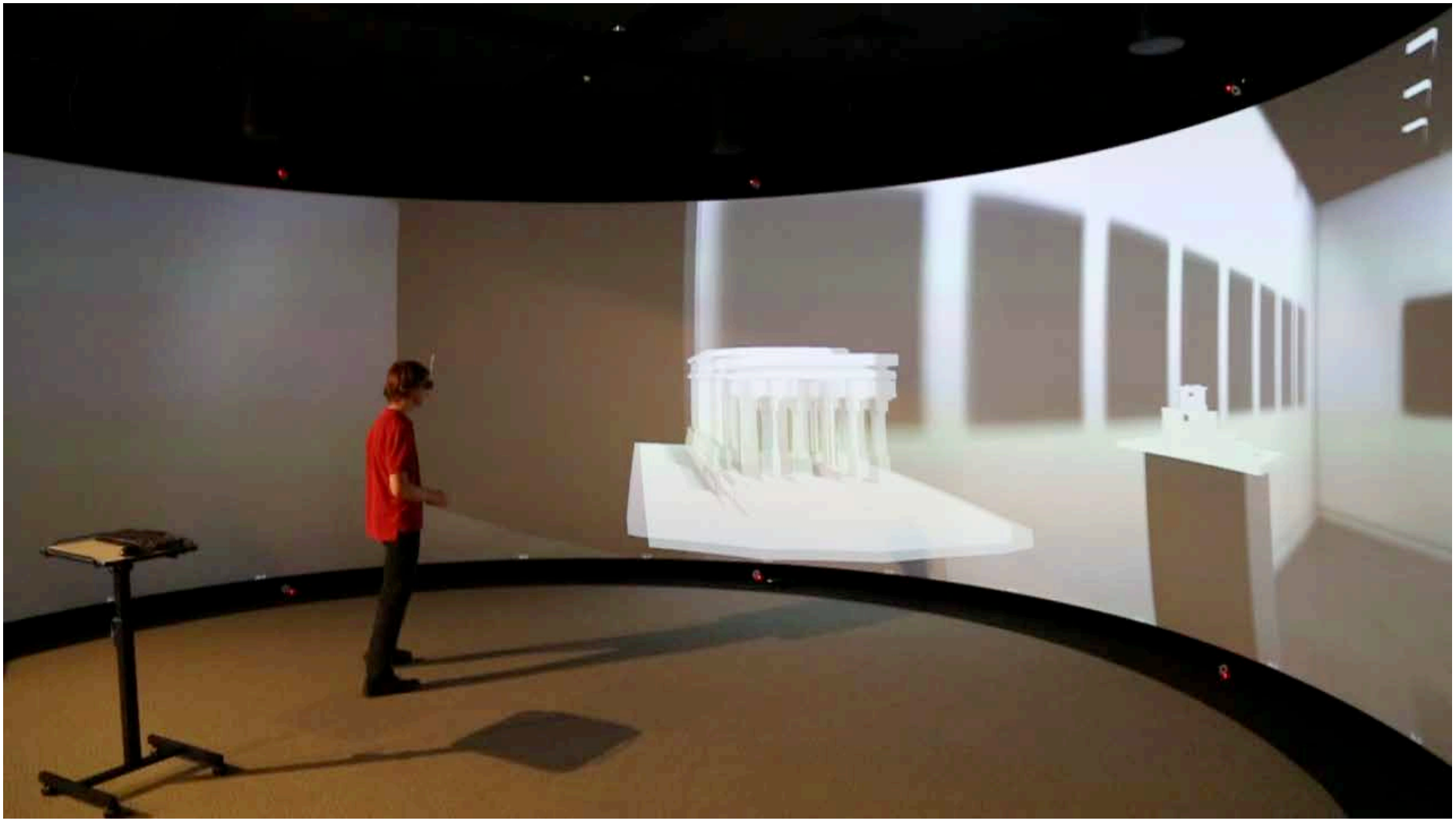


Immersive Stereoscopic Environments
visualisation, simulation, communication and sharing of digital datasets.



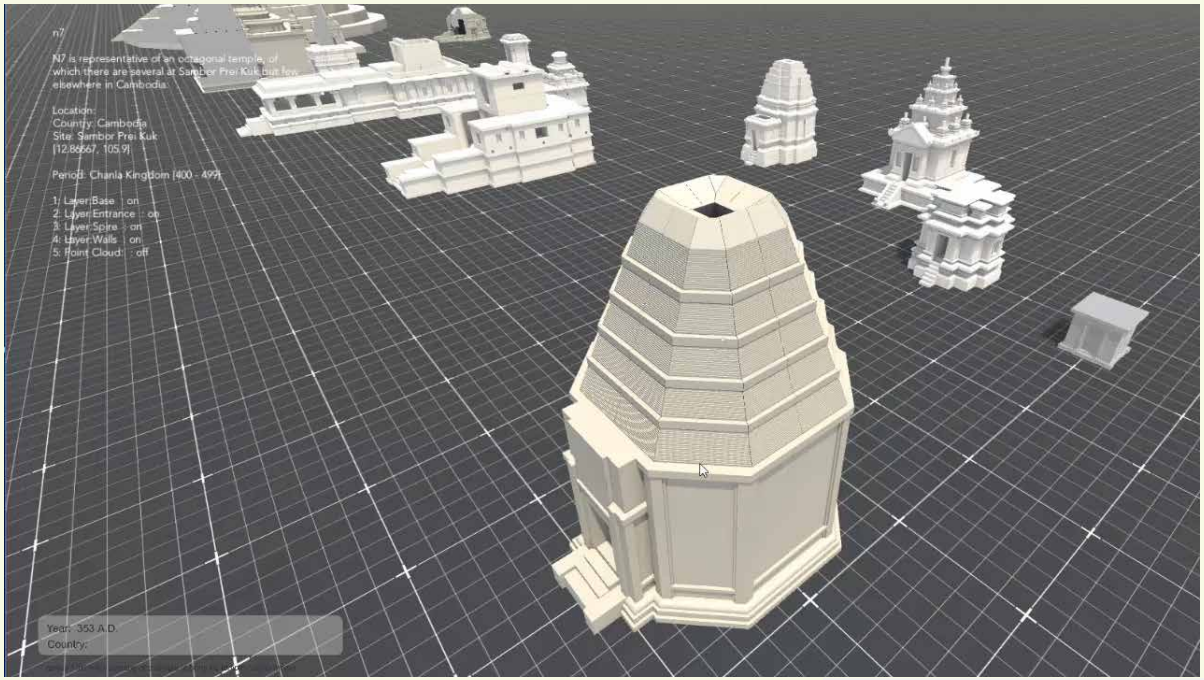
interaction with virtual collections.

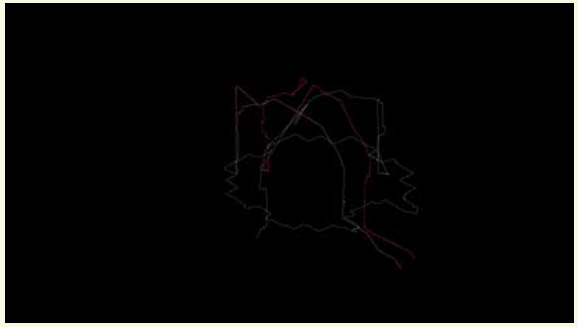
Immersive Environments

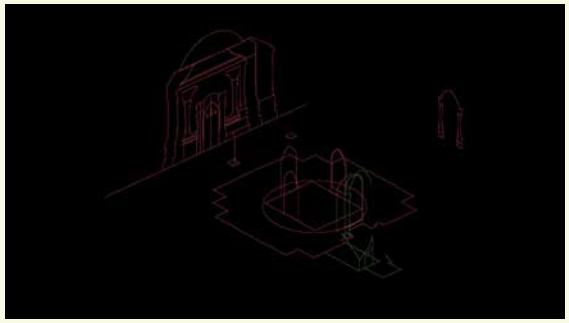


interaction with virtual collections.

Immersive Environments

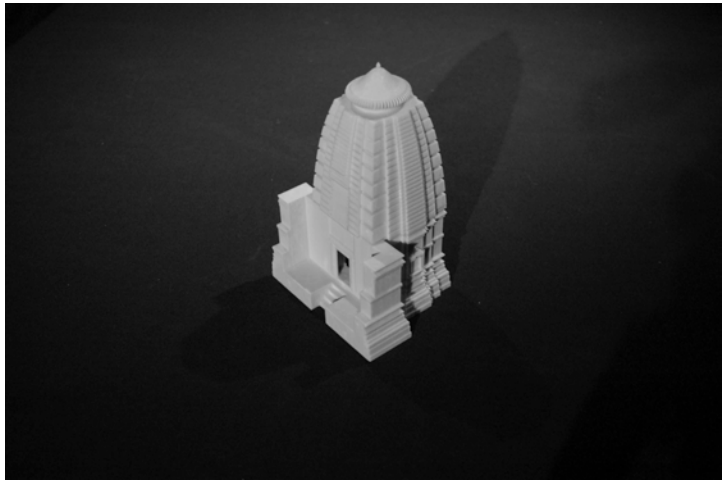


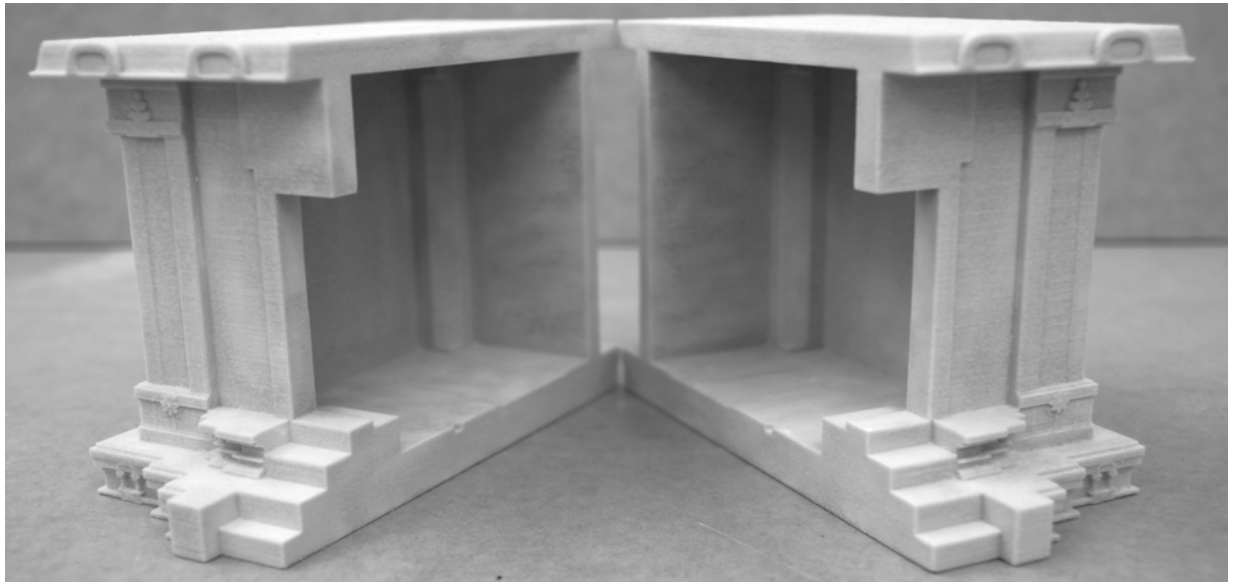


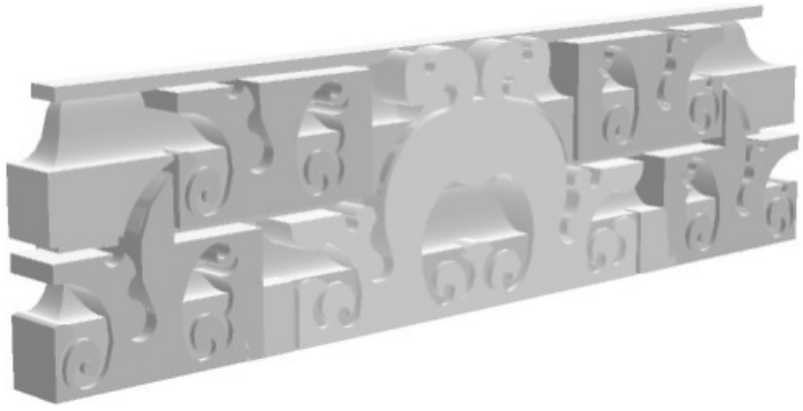


- Development of tools and interfaces
- Multiple datasets and slicing analysis

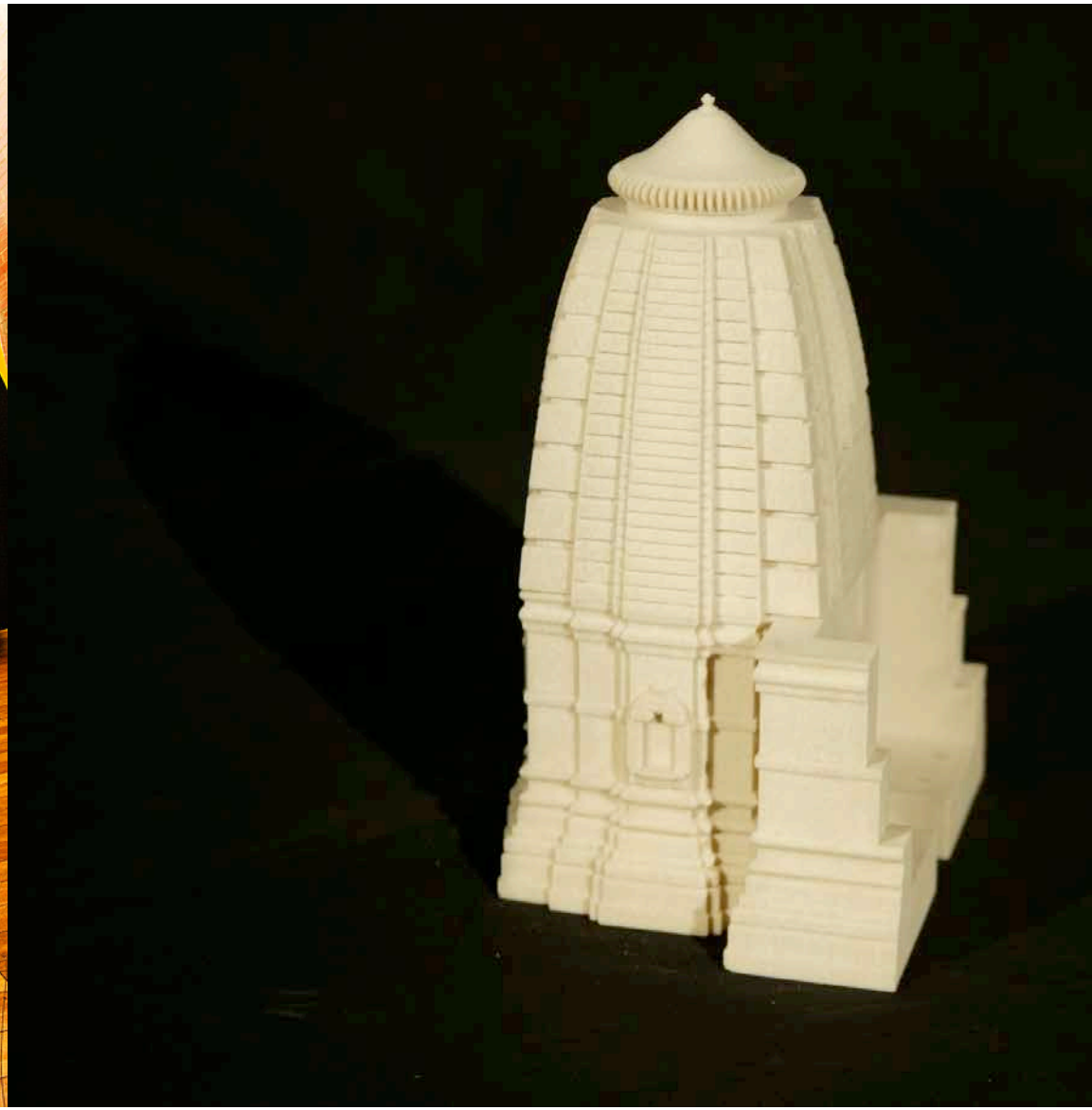
Physical models

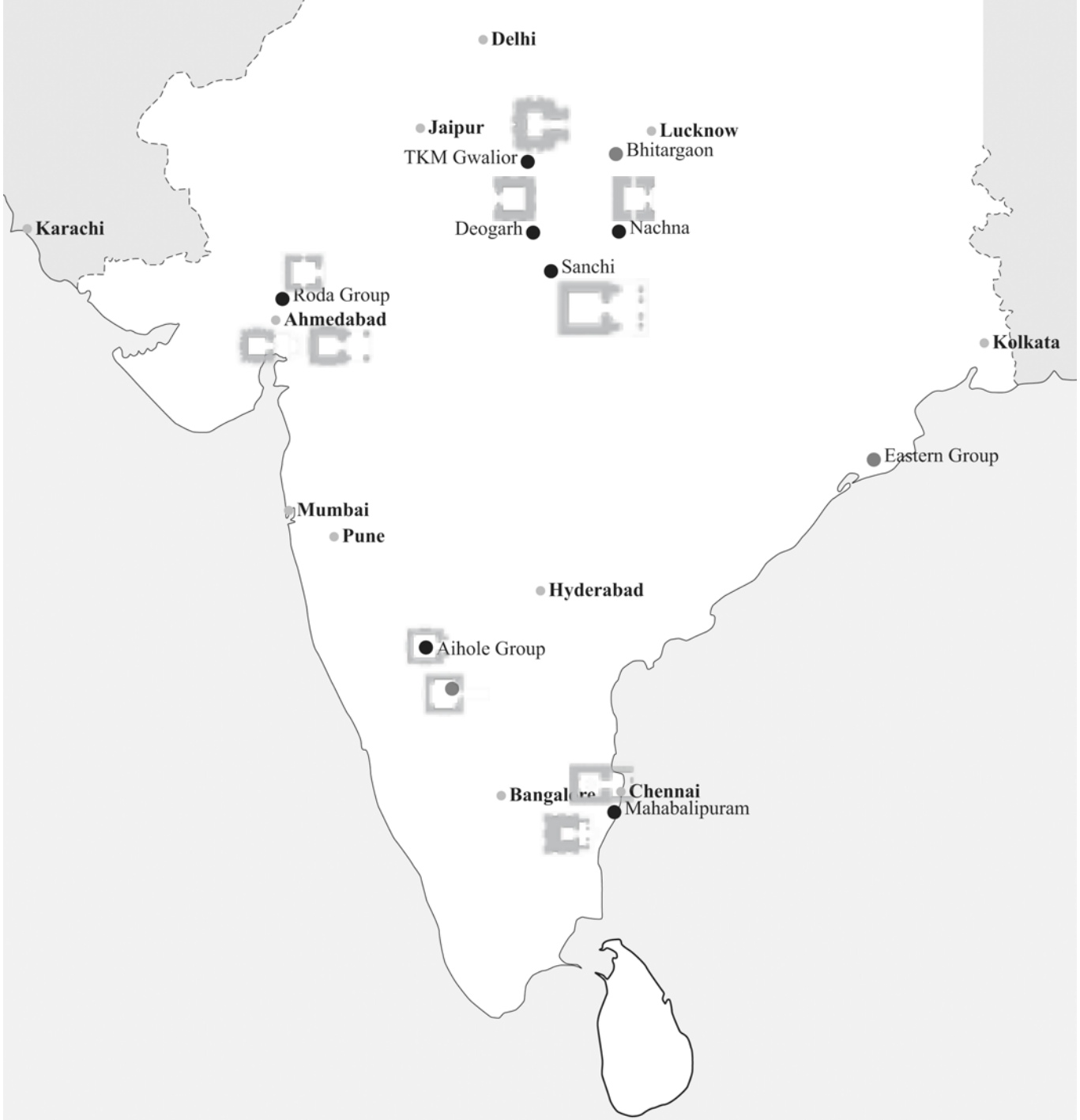






Physical prototypes

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Jaipur
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TKM Gwalior
Bhitargaon
Karachi
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Eastern Group
Mumbai
Pune
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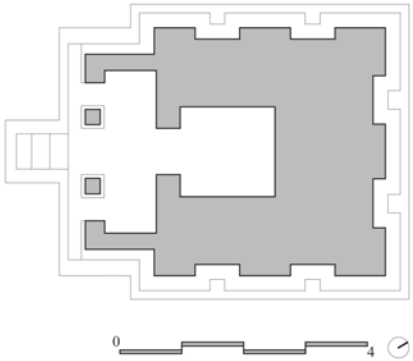
Chennai
Mahabalipuram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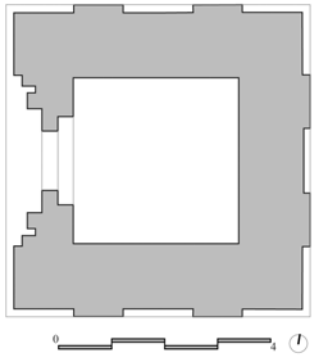
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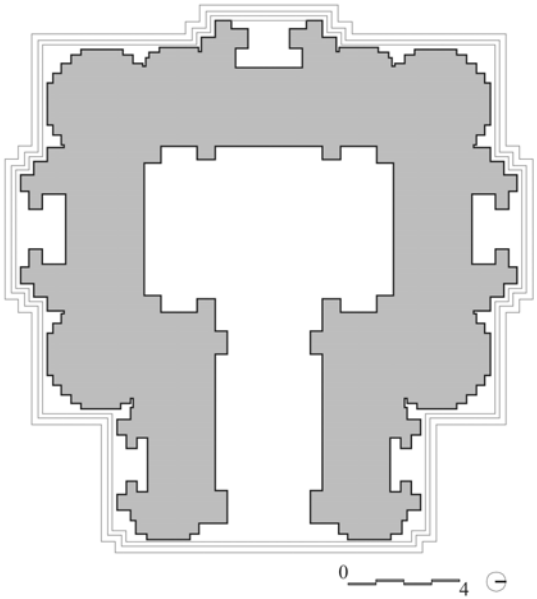
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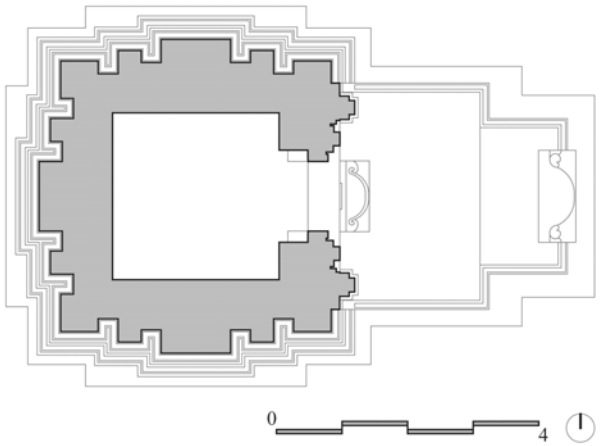
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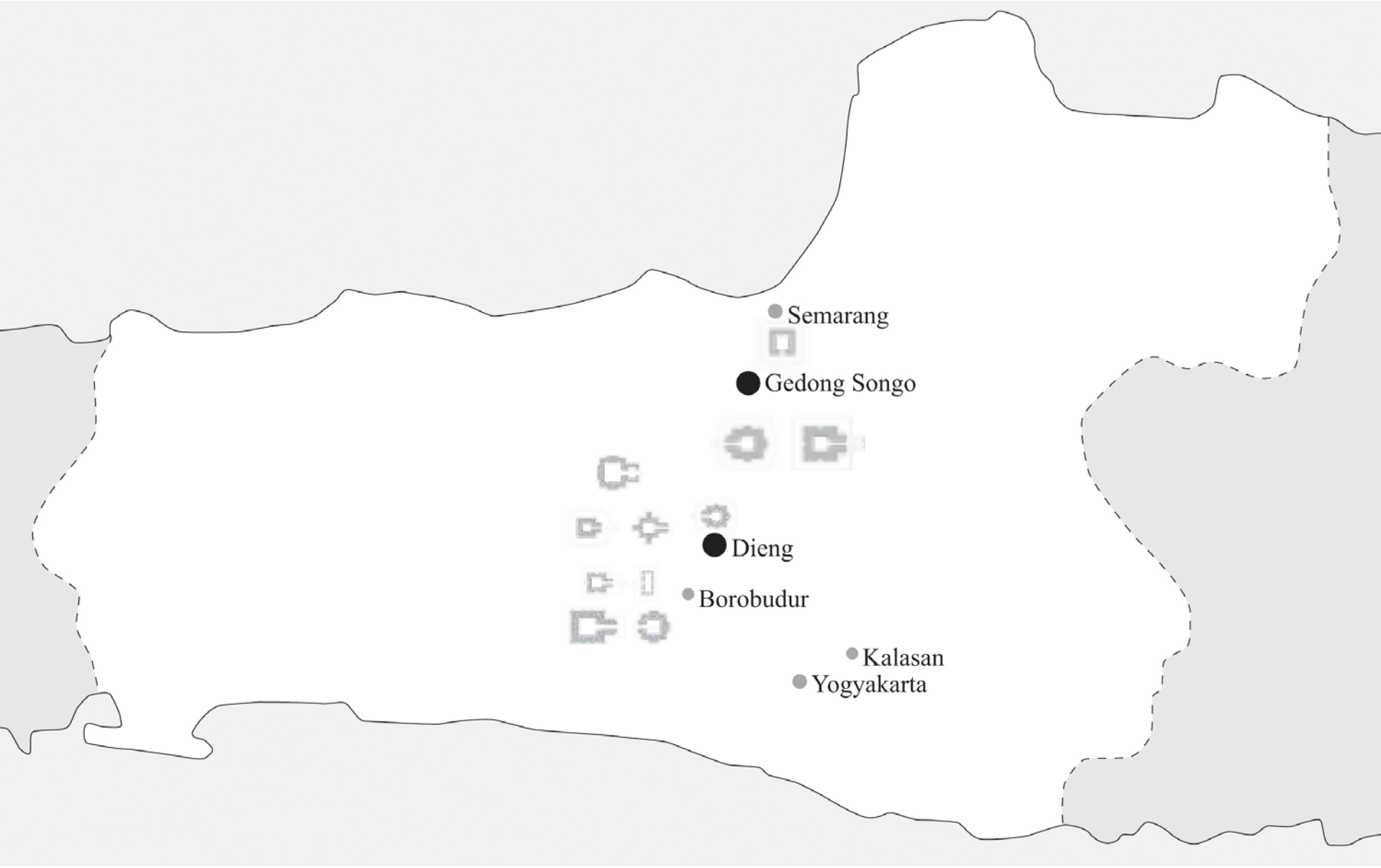
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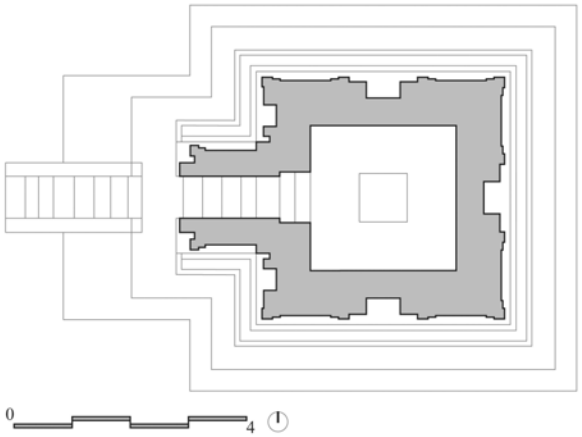
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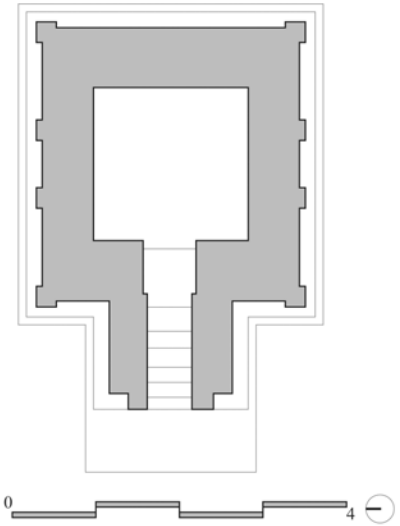
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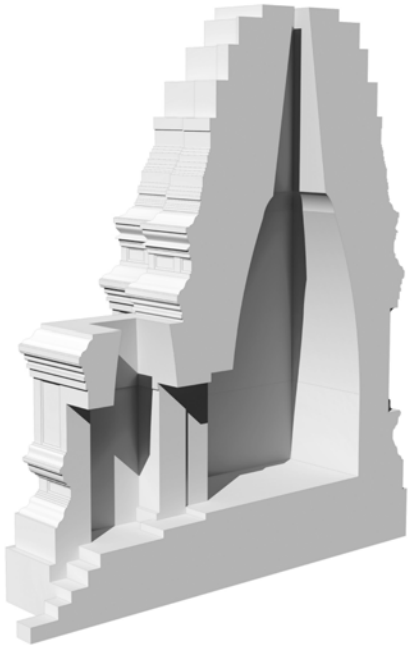

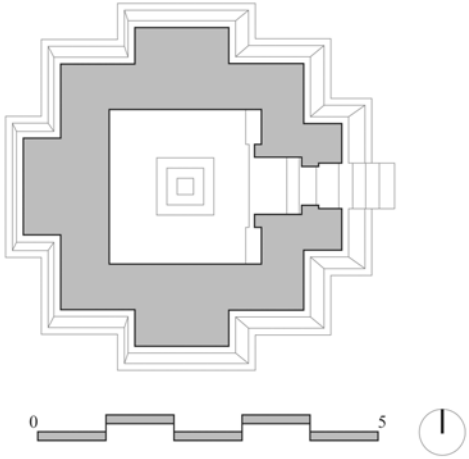
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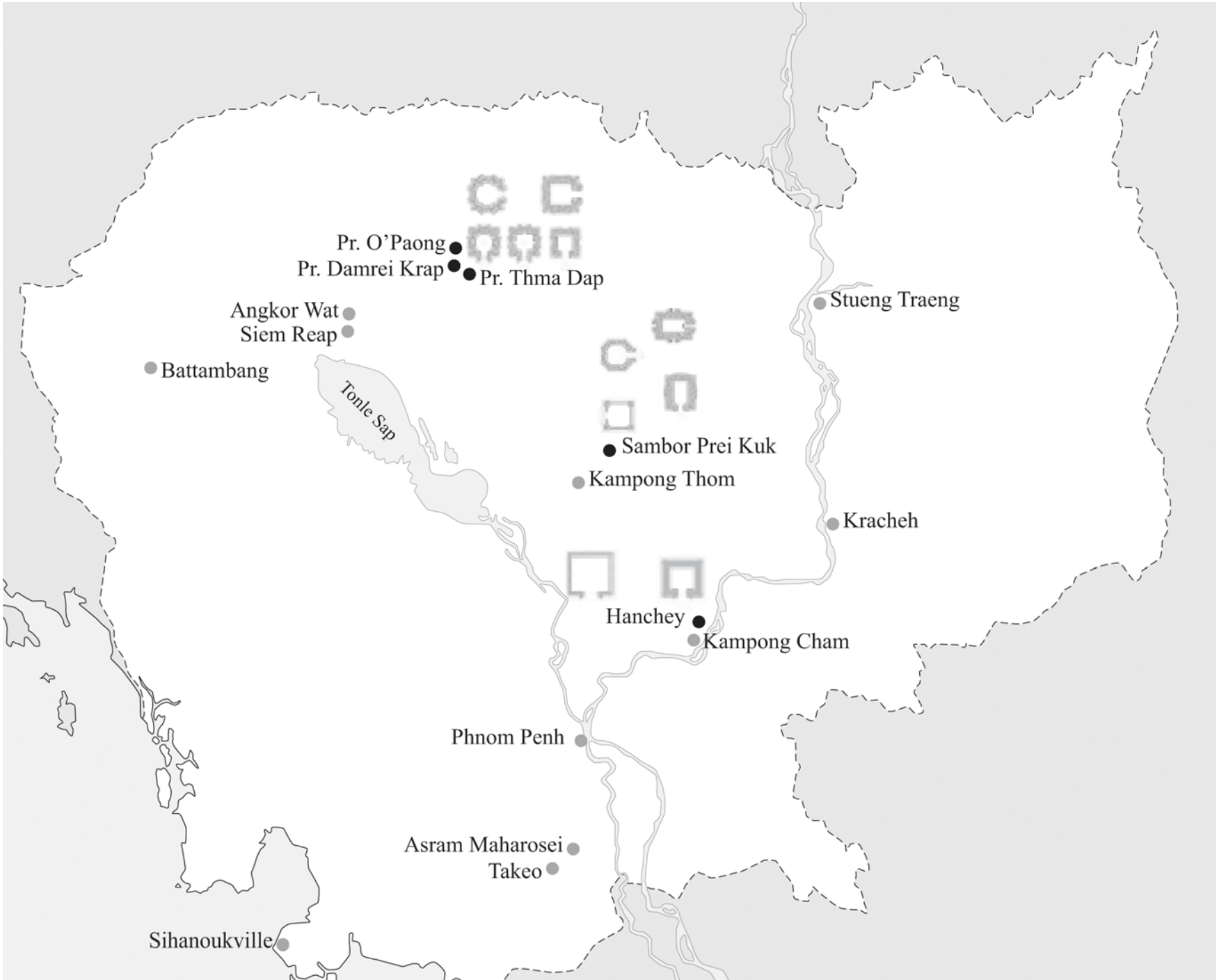
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Battambang
Tonle Sap
Stueng Traeng
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Phnom Penh
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Takeo
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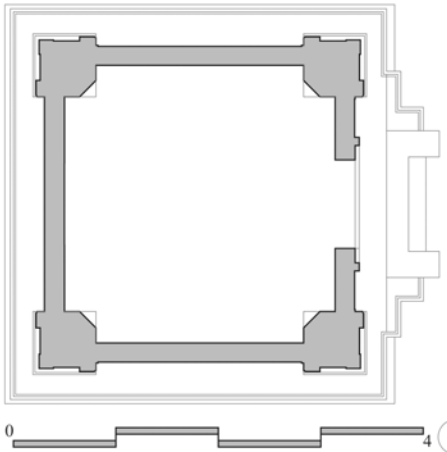
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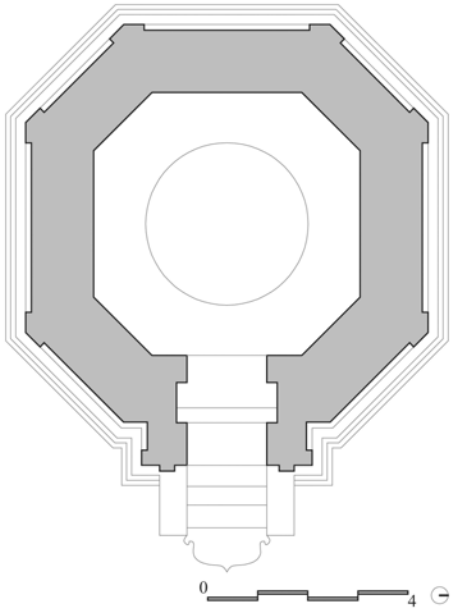
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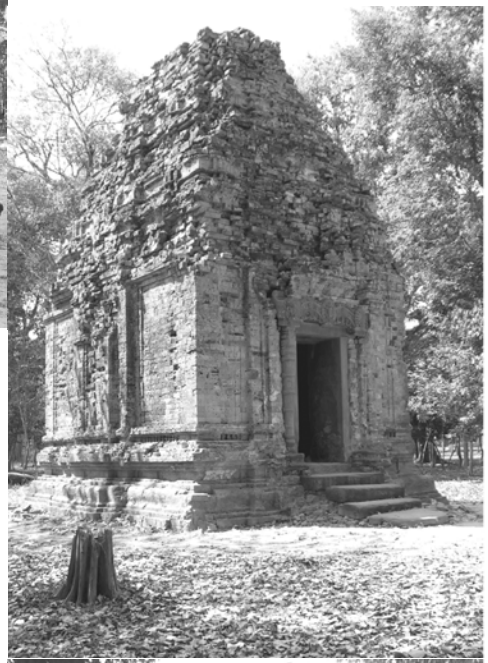

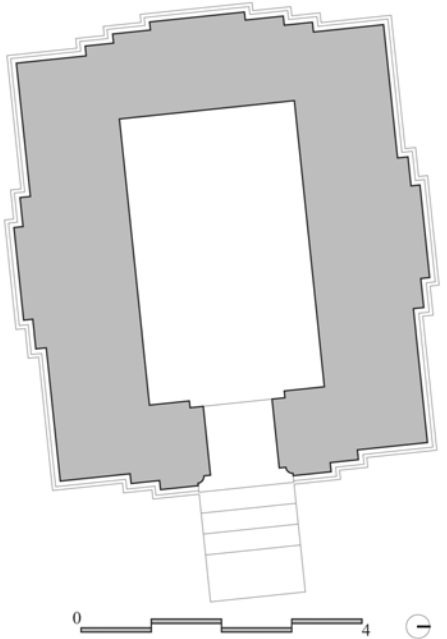
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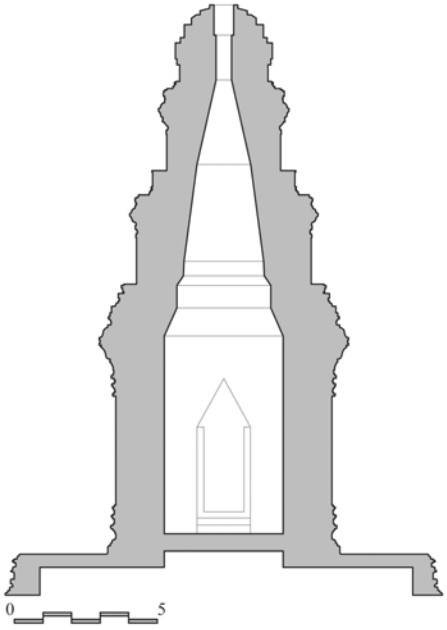
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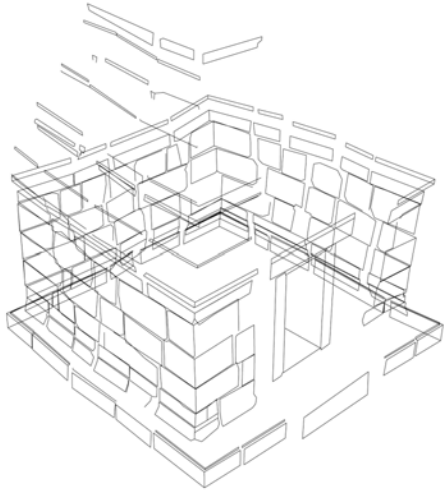

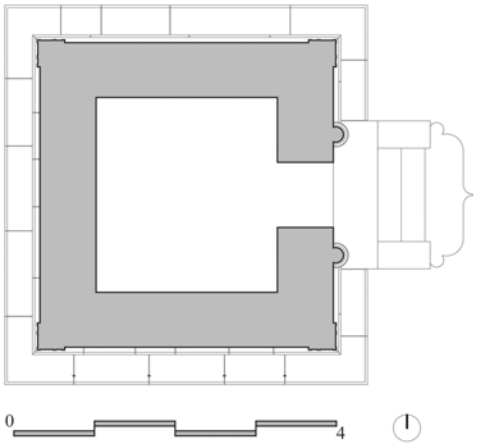
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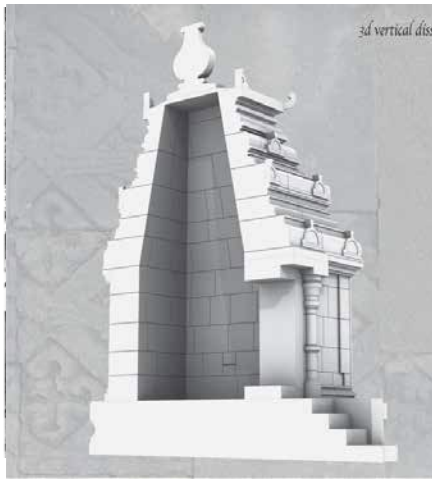
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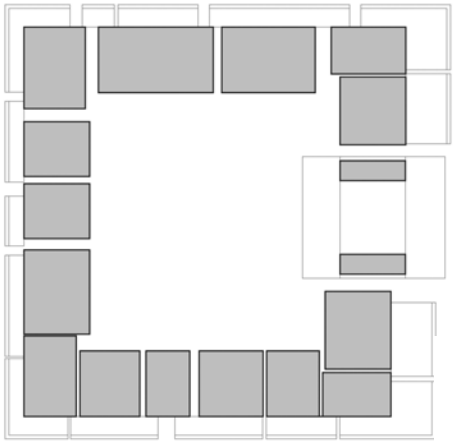
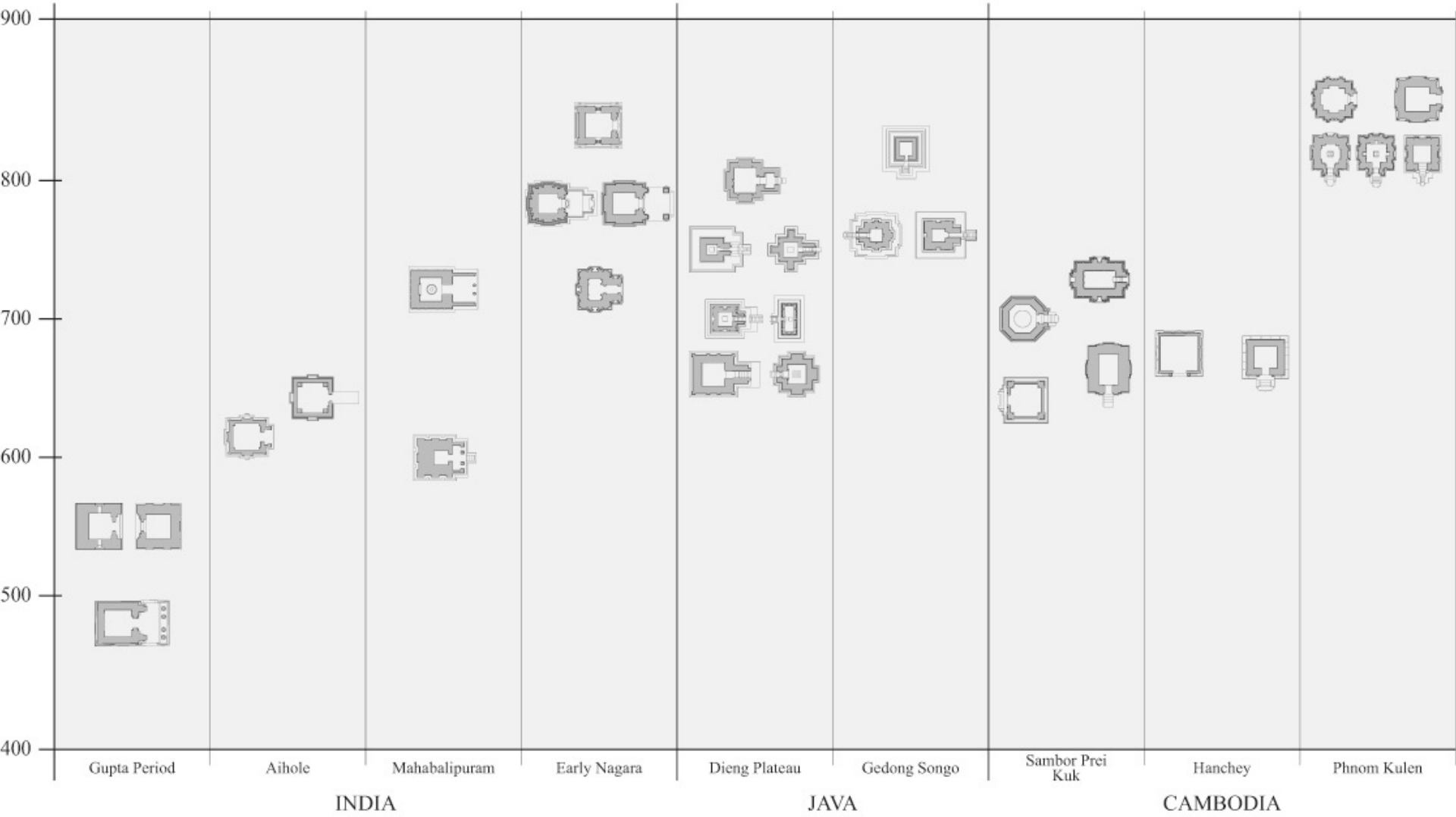
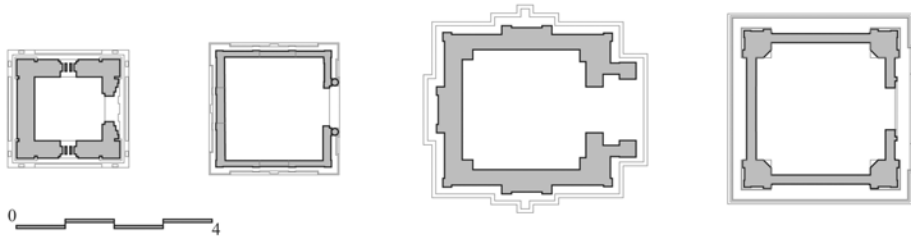


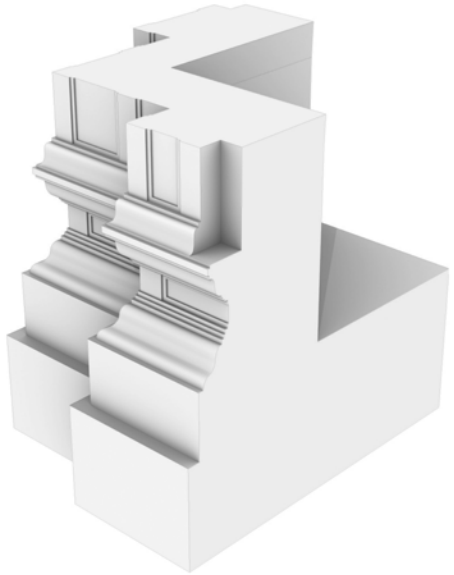


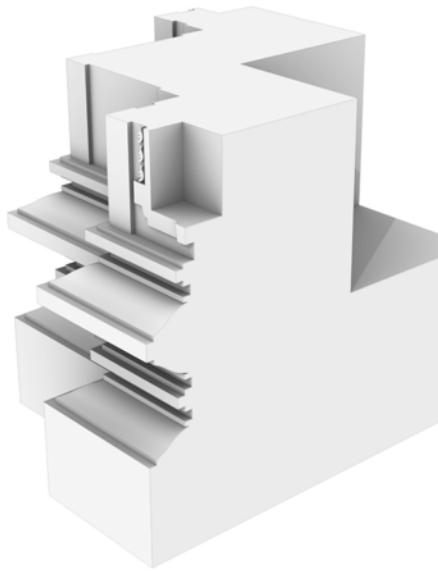
34 temple datasets

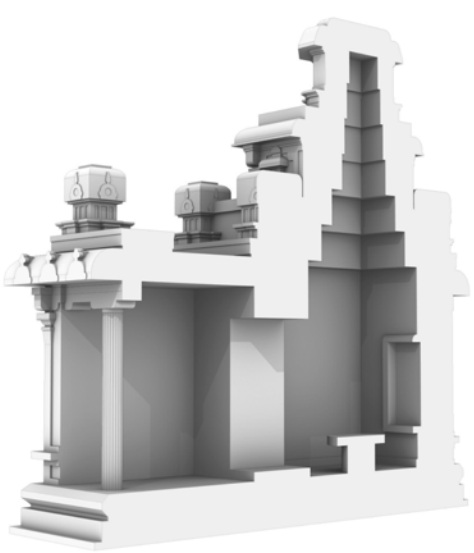
Digital Curation
the selection, preservation, maintenance, collection and archiving of digital assets.

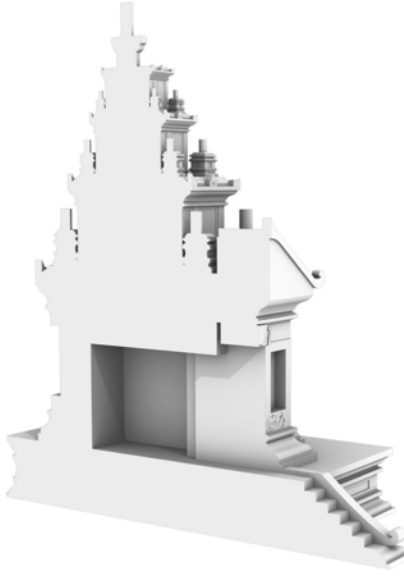
Temple Comparisons



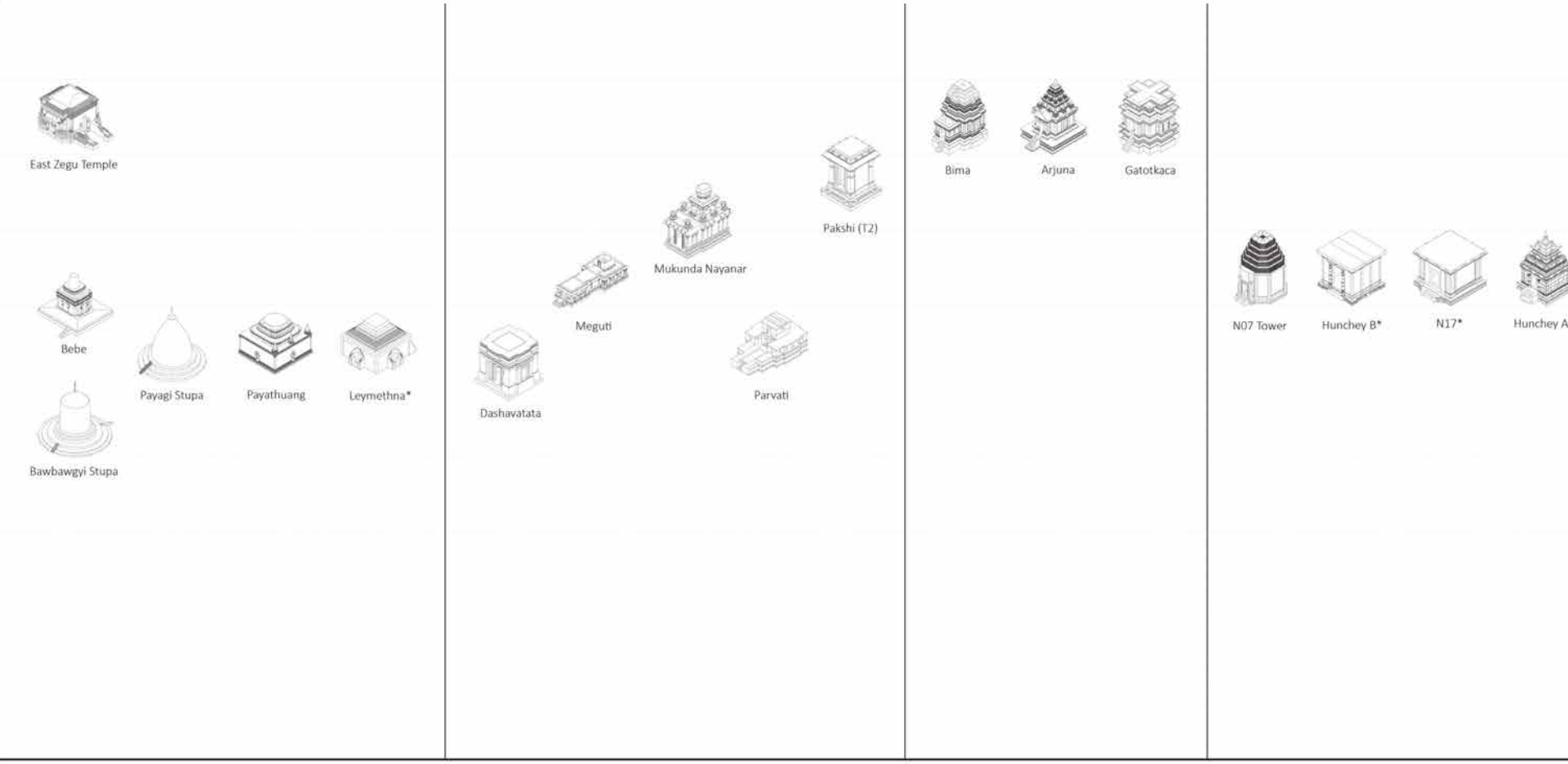








Temples in Visualisation:



Sri Ksetra	Gupta	Aihole	Chingleput	Nachna	Roda	Dieng Plateau	Sambor Prei Kuk
Myanmar	India					Indonesia (Central Java)	Cambodia

Location

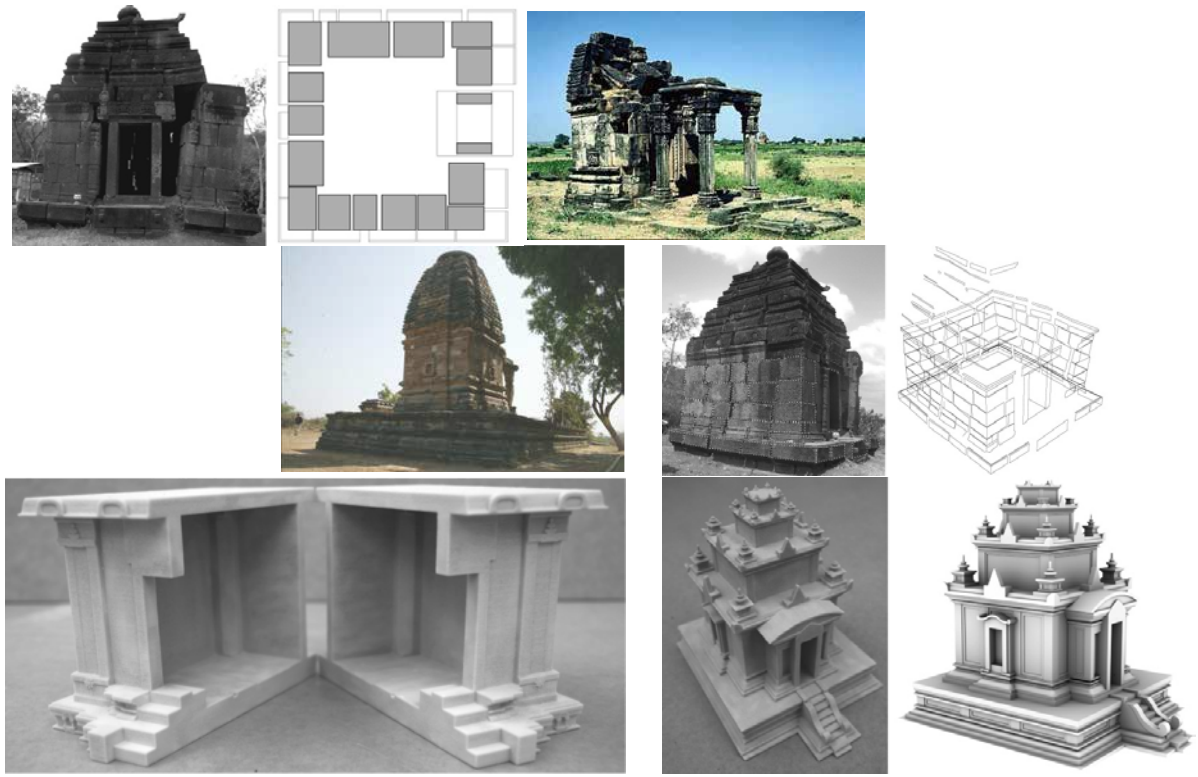
Notes:
? Age unconfirmed
* Temples shown are not to scale

Further Work

- **Rescuing** the knowledge about the unique character of Temple Architecture (mathematics, geometry, construction)
- **Recording and archiving** the role of temple architecture in the cultural and urban heritage of Asia
- **Unveiling** the structure of early connections by **analysing** with digital architectural preservation techniques
- **Capacity building** in South and Southeast on architecture and urban conservation and **technology transfer** from research institutes and bodies to local experts; and
- **Raising awareness** of cultural, social, spatial and urban heritage in the current context of urban development in SE Asia

11 December, 2019

NDLI-UNSESCO International Symposium on Knowledge Engineering for Digital Library Design, IIT Delhi



Curtin University