A Report on the Innovation of Reciprocal Panel System

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528cm in length, 24.8cm in width
Northern Song Dynasty (A.D. 960-1127)
Hongqiao
The Study Model

Horizontal member

Four members arch

Three members arch
Model of Hongiqiao
Application to Modern Structural Design

A cylindrical frame with Lap-Beams
Application to Modern Structural Design

Lap-Beam Dome (Zaru Dome)
From Basket Meshing to Space Frame
Versatility for Form Design

Plane frames
Versatility for Form Design
The key parts and basic units

(a) Key parts

(b) Lap-units

(c) Crossing-units
Inspiriting the Reciprocal Panel

Peishan Chen Dr.Eng., Hachinohe Tech.
Crossing-Panels
Reciprocal Panel in Cylindrical Form

Peishan Chen Dr.Eng., Hachinohe Tech.
Design from Hirosaki Kokin
Reciprocal panels emerged from traditional Chinese window grilles
On the stability
The Hongqiao was built in 1041-1048

Temple bridge proposed by Leonardo da Vinci: 1478-1518
Similar Ideas

http://www.spiro.arch.ethz.ch/de/research/reciprocal-frame/workshop.html
Conclusion

- Structural system of the Reciprocal Panel is inspired from the idea of 1.5-Layer space frame.

- The Reciprocal Panel System has versatility for form design.

- The techniques of interlocking and/or the connections at joints, mechanical characteristics and the ontology of the structural design are remained as subjects for further researches.
Let’s S-Art

Thank you!!