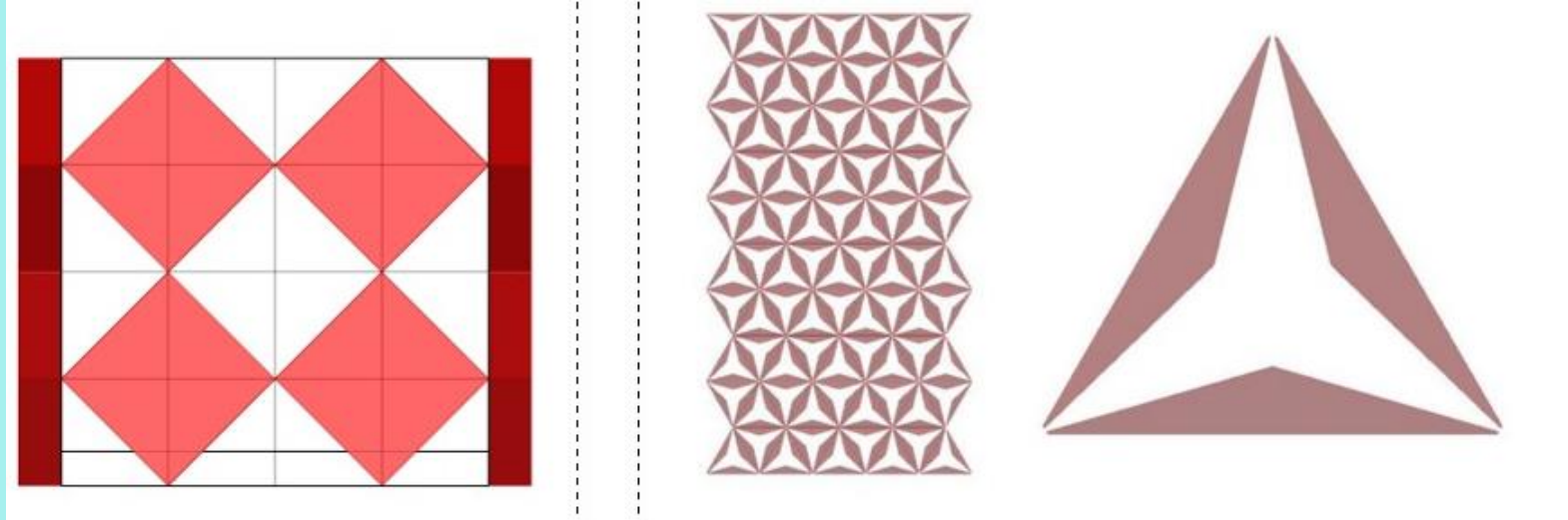




Bandung
Institute of
Technology



Comparing the Effectiveness of Dynamic Facades for Natural Daylight and Energy Usage in Buildings

N H N Budhiman
M D Koerniawan



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on Sustainable Buildings, Cities, and Communities
"Building Low Carbon Future: Decarbonizing with Impact"





Introduction

- Background

Explore the integration of dynamic facades

- Objectives

Introduce two distinct dynamic facade designs: 1. A triangular shape, 2. Origami folds.

Compare the effectiveness in optimizing: 1. Natural daylight, 2. Energy uses

- Research Hypotheses

There is a difference in effectiveness between the two dynamic facade designs

Method

- Procedures
 - Design and development
 - Data collection using computational simulations with Python and Rhino 7.
 - Evaluation of natural daylight metrics; sDA300,50 and ASE1000,250.
 - Manual calculation of energy required for dynamic movement
 - Comparative analysis of facade performance

- Tools

Rhino 7, Grasshopper, Ms. Excel, Python

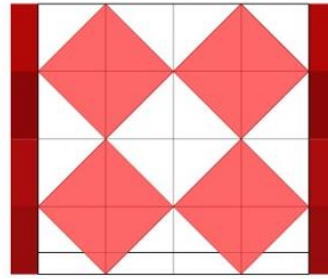


Figure 1. Façade model that inspired by origami.

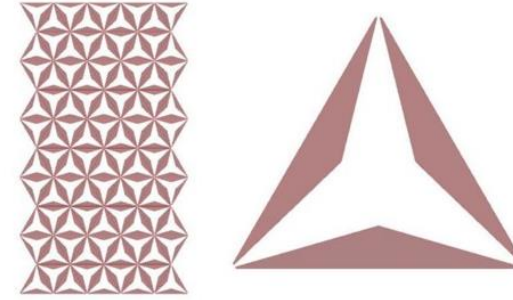
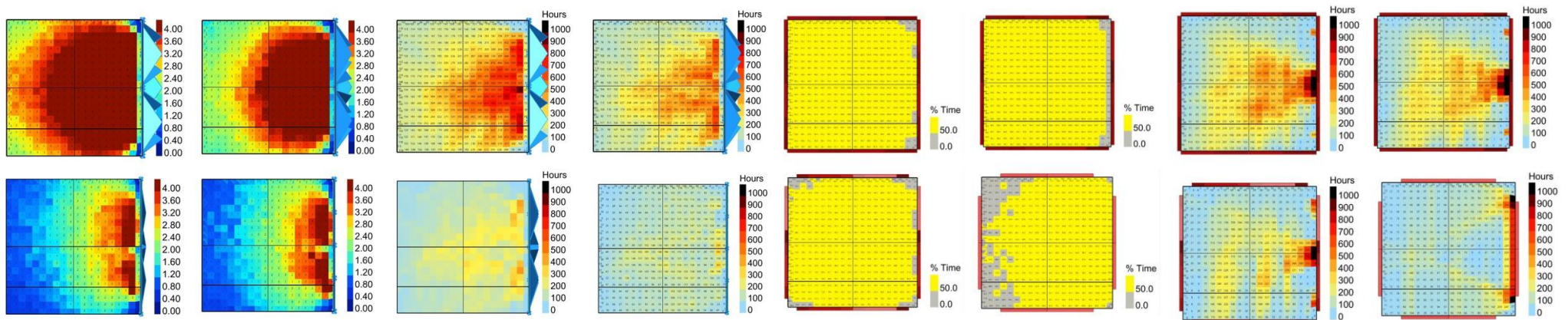


Figure 7. The triangular façade.

Result and Discussion

- Natural Daylight Performance

	Triangular Facade	Origami-Inspired Facade
$sDA(300,50)$	94.8	90.15
$ASE(1000,250)$	18.94	15.9
DF	2.78	2.14





Result and Discussion

- Energy Usage Analysis

With the assumption that each piece of façade both the triangular and origami-inspired equals 3kg

	Triangular Facade	Origami-Inspired Facade
Work	73,5 Joule	103,96 Joule

- Overall Performance
 - Both façade designs meet the standards
 - The triangular facade requires less energy for dynamic movement compared to the origami-inspired facade



Conclusion

- The overall performance evaluation indicates that both facade designs meet the standards for natural daylighting metrics. However, the triangular facade demonstrates slightly higher energy efficiency in terms of dynamic movement.
- Overall, the study underscores the significance of innovative facade designs in advancing sustainable building practices and underscores the need for continued interdisciplinary collaboration to address the complex challenges facing the built environment.