Advanced Radiative Boundary Conditions

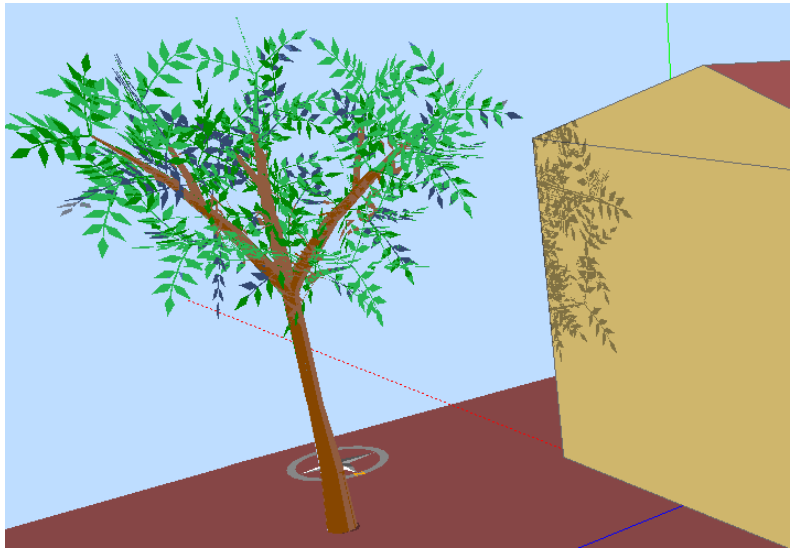
Rocha A.P., On the improvement of Building Energy Simulation by means of Pixel Counting.
PhD Thesis, PUCPR, Brazil, 2017.

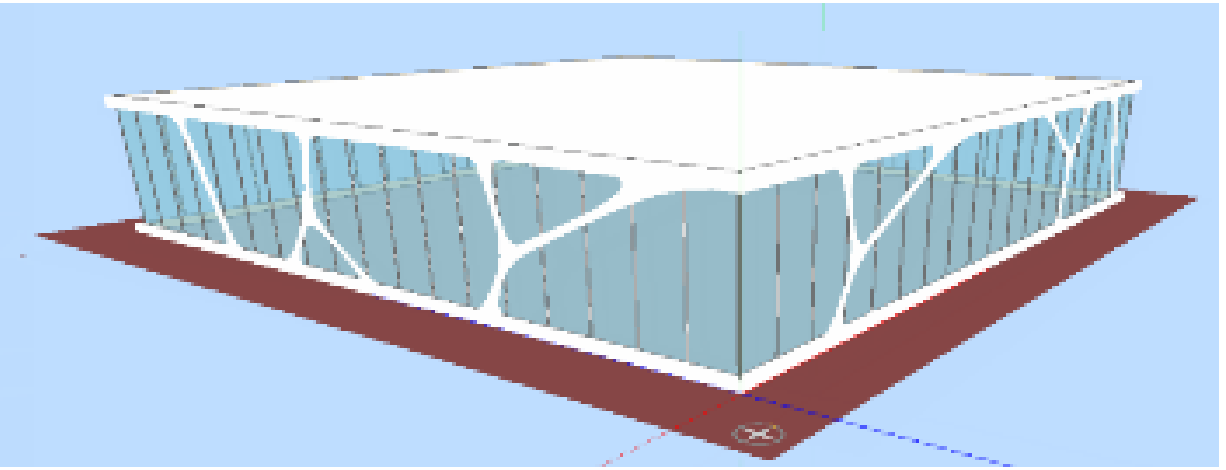
Advanced boundary conditions - Domus

Short-wave Radiation

Pixel Counting Technique

- Shading and sunlit
- External and Internal

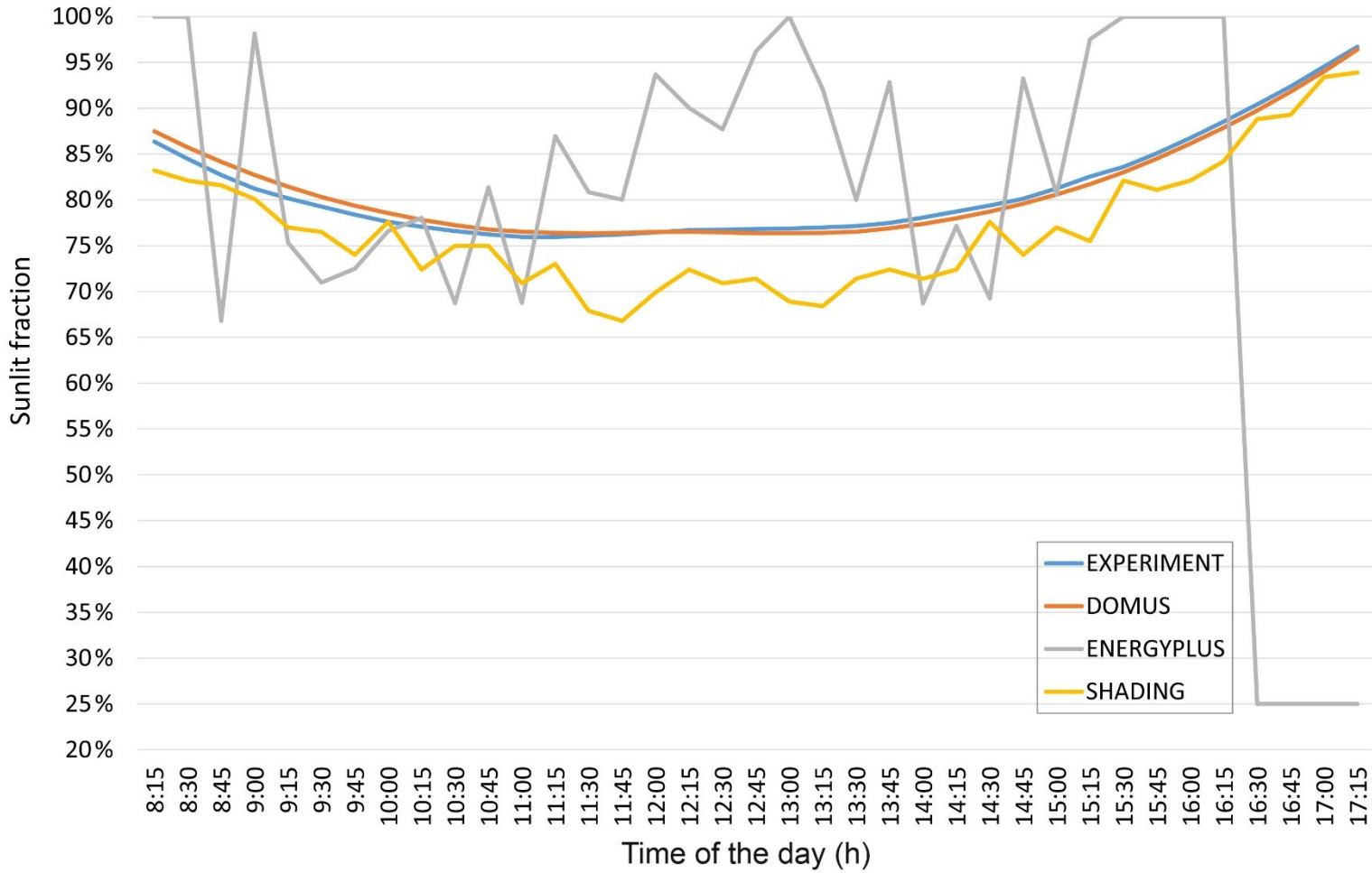


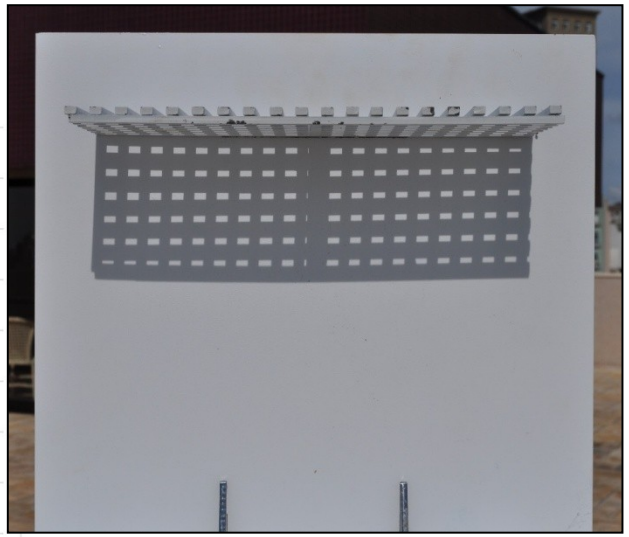


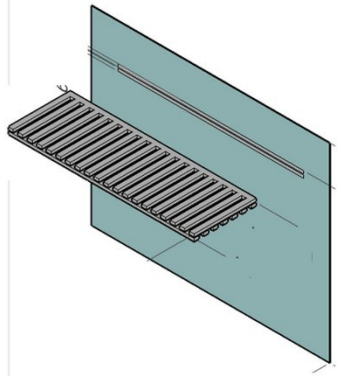
Source: Ana Paula Rocha Ph.D. Thesis

Advanced boundary conditions - Domus

Sunlit fraction

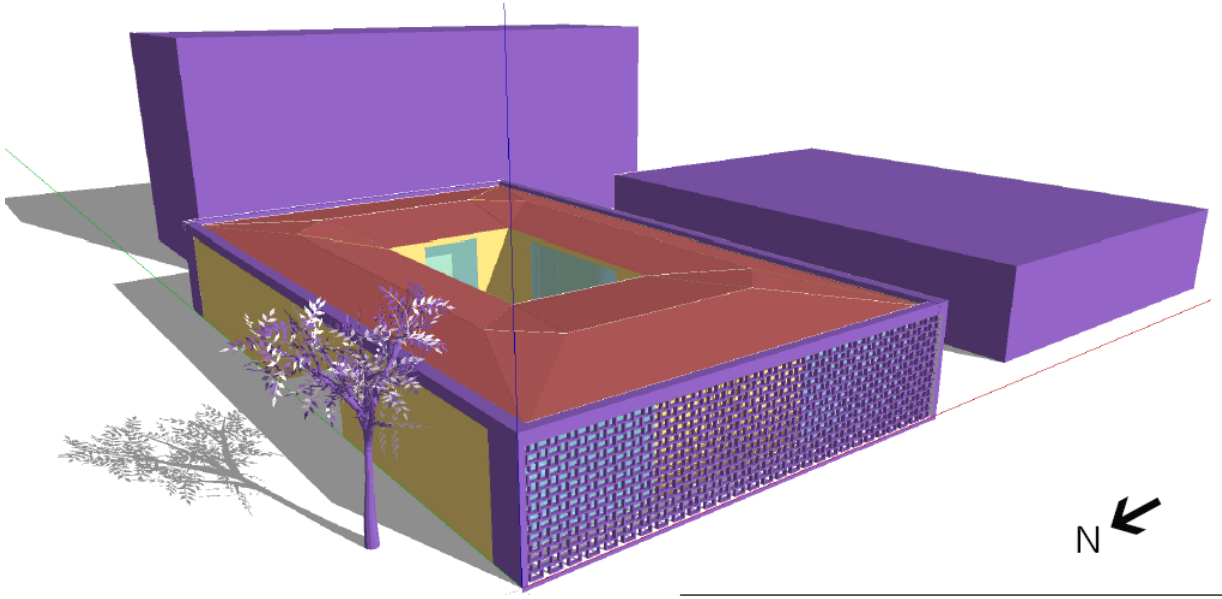






Source: Ana Paula Rocha Ph.D. Thesis

Study case || Sunlit Fraction Calculation

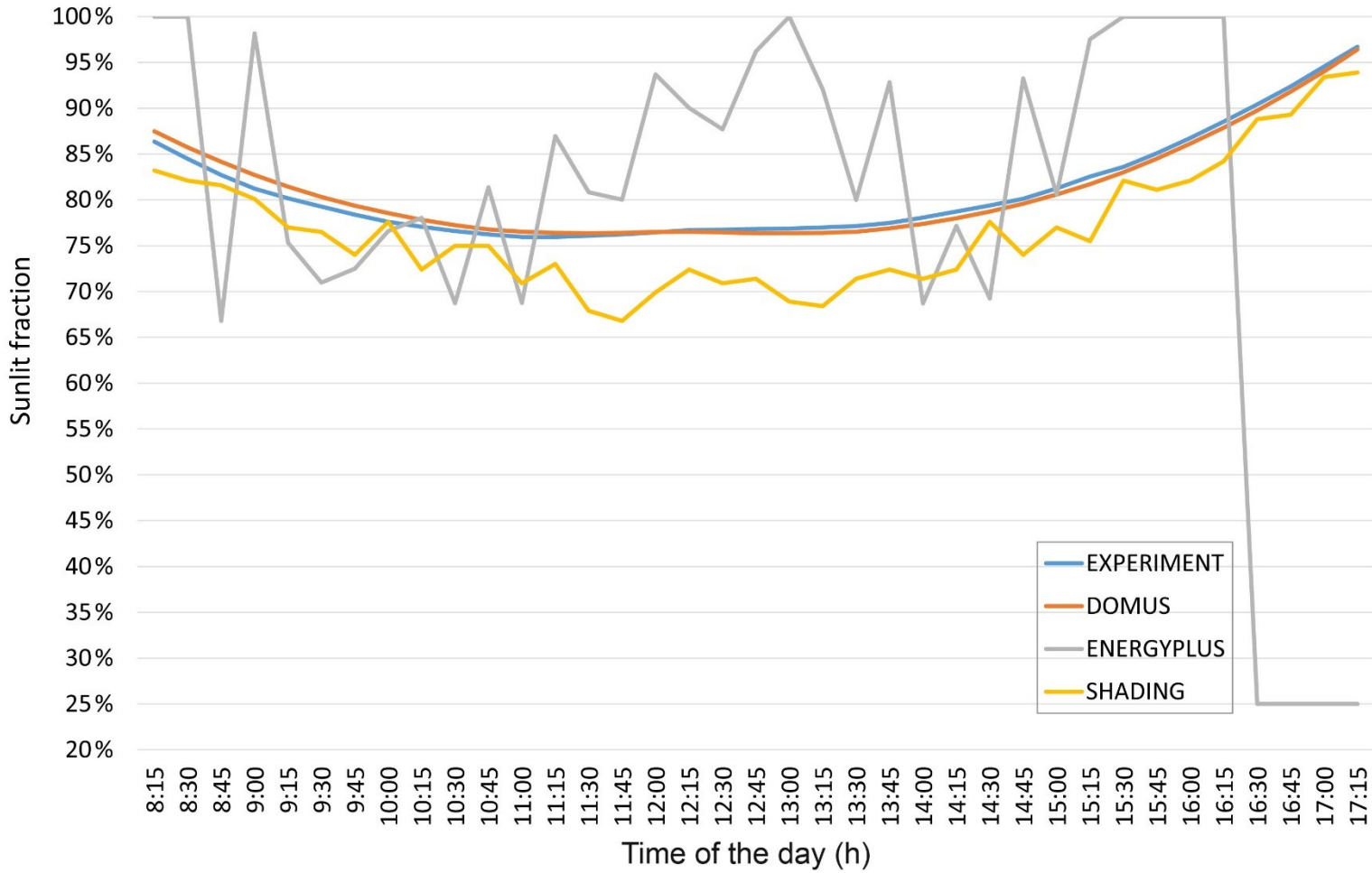


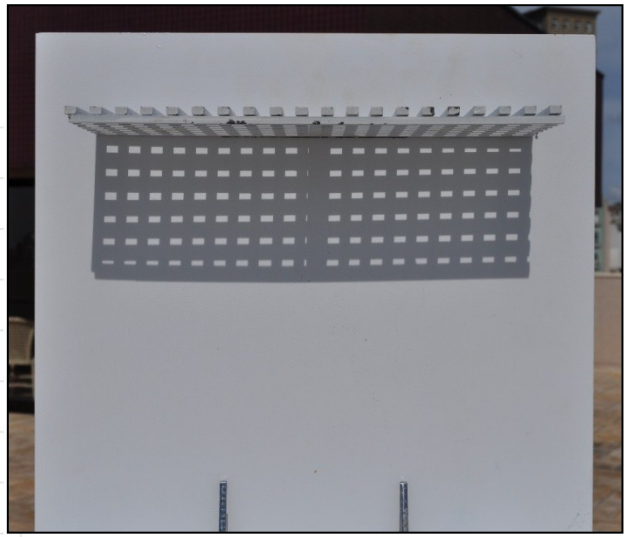
Computer run time (minutes)			
Softwares	Case 1	Case 2	Case 3
EnergyPlus	63	1062	no run*
Shading	146	146	217
Domus	43	41	59

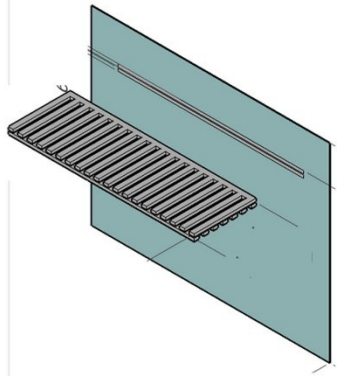
*It was not possible to complete the non-planar-tree case (case 3)

Advanced boundary conditions - Domus

Sunlit fraction







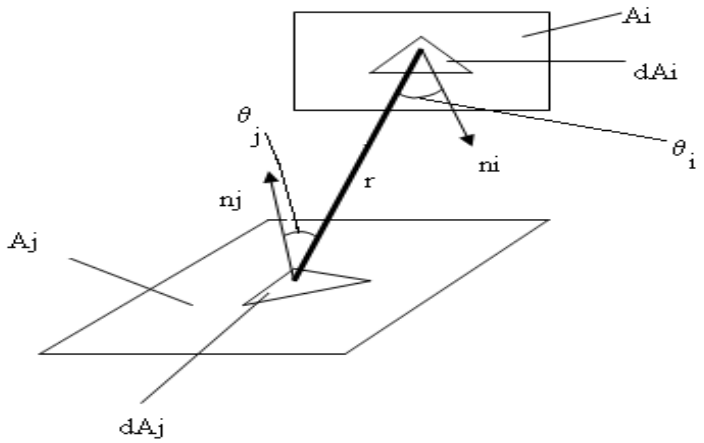
Source: Ana Paula Rocha Ph.D. Thesis

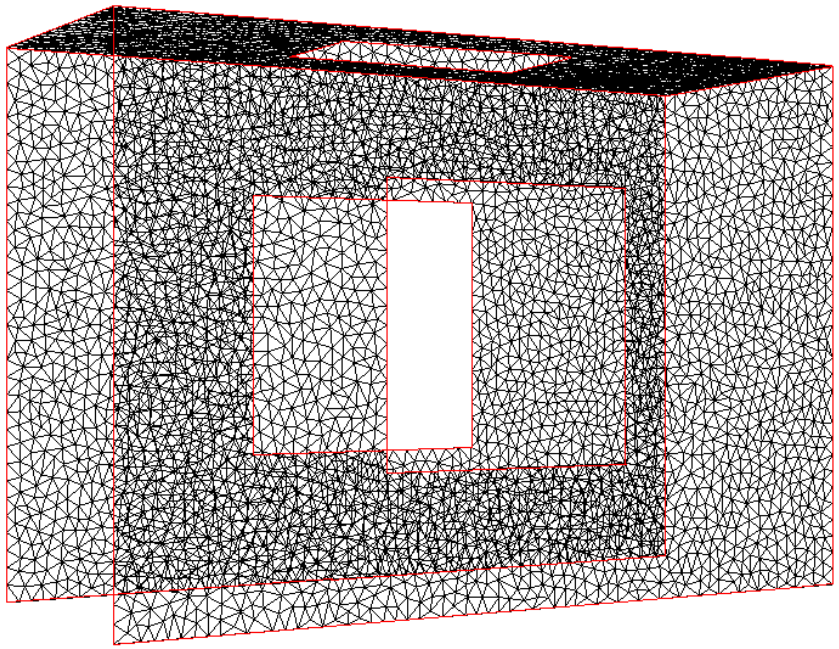
Advanced boundary conditions - Domus

Long-wave Radiation

Generic View Factor calculation

$$F_{ij} = \frac{1}{A_i} \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{\cos\theta_i \cdot \cos\theta_j}{\pi \cdot r^2} \, dA_i dA_j .$$





Source: Lilian Dobrowolski Master's degree