

Subaru Nursery School with the 3D curved roof structurally optimized by sensitivity analysis

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Abstract

Subaru Nursery School is built on a site in the suburb of Fukuoka -the biggest city in Kyushu Island, JAPAN-. This building has about 1,200 square meter total floor areas and has one story. Authors are structural engineer of this building. Architect of this building is Ryuji Fujimura / RFA and Shunji Hayashida / CFA. Ryuji Fujimura is one of the most famous promising young architect in JAPAN and his keyword for design is “architecture as a continuous body”.

The structural and architectural characteristic of this building is the shape of the roof. The greater part of this roof is made with general flat RC slab. The thickness of the slab is 180[mm] and it was led by the cantilever length of the eaves and the size of the classrooms. On the other hand, the maximum wide of the assembly hall is 15[m]. Of course, the flat slab with 180[mm] thickness can't cover the assembly hall. And then, we did the shape design by sensitivity analysis to minimize the structural strain energy. The shape of the roof changed to the 3D curved surface. In this analysis, we modify the shape (Z coordinate of the nodes) only above the assembly hall. As a result, we could design the lovely roof that is mainly flat and partially undulating with the same thickness RC continuous slab. The architecture merges into the surrounding landscape. We could create the continuous scenery.



Fig.1 bird view of the Subaru Nursery School (photo by CFA)

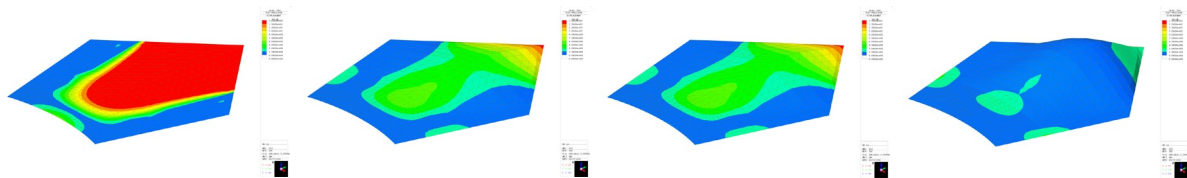


Fig.2 the sequence of the shape analysis (step 0, 10, 20, 30) and deformations by self-weight

References

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