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A NEW METHODOLOGY, EXTENDING THE INVERSED CATENARY FORM FINDING METHOD OF ANTONIO GAUDI TO GENERATIVE SPACE SHELLS

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Abstract. *This work aims to constitute an algorithmic framework for the automatic creation of compression only forms of generative space shells. In particular the case of concrete dams is investigated, where the loading is non-uniform –of typical dome shells-, but triangular. The hanging models have been used by several research works [1] as a conceptual approach to the structural optimization of space structures [2]. In the current study, the conceptual form of the shell is derived from the parametric components of the surface, while the design variables are the curvature at each control point and a subset of the boundary curves, not including the constrained ones. The final designs accomplished are compared with the corresponding hyperbolic surfaces of the inversed problem: the form finding of the consistent membrane structure. The automatic creation of a membrane form receiving pure tension, is characterized by simplicity in comparison with the structural optimization of the topology of a dome in compression. In conclusion, the resulting designs of the two approaches are analyzed and discussed.*

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