

Kinetic geiger dome with photovoltaic panels structural membranes 2013

Citation for published version (APA):

Pronk, A. D. C., Dominicus, M. M. T., & da Conceicao van Nieuwenhuizen, J. (2013). Kinetic geiger dome with photovoltaic panels structural membranes 2013. In K. U. Bletzinger, B. Kroplin, & E. Onate (Eds.), *VI International Conference on Textile Composites and Inflatable Structures STRUCTURAL MEMBRANES 2013, October 9-11, 2013, Munich, Germany* (pp. 461-472). International Center for Numerical Methods in Engineering (CIMNE).

Document status and date:

Published: 07/10/2013

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

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Kinetic Geiger dome with photovoltaic panels

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ABSTRACT

Photovoltaic panels can be placed on a tracker to minimize the angle of incidence between the incoming light and a photovoltaic panel. It can increase the amount of energy produced compared to fixed panels with 30% for single axis trackers and 36% for dual axis trackers. Dual axis tracking systems are relatively expensive and complicated compared to single axis tracking systems, with only 6% extra benefit [1]. The integration of dual axis tracking systems in building concepts is rare.

Leonardo da vinci made the first connection between polyhedral structures in architecture.[7] Snelson, Buckminster fuller and emmerich studies the form of tensegrity structures in the past. Emmerich reported that the first proto-tensegrity system, called “gleichgewichtkonstruktion”, was created by Karl Iogason. [1][2]. The word tensegrity is combination of tensional and integrity, and was postulated by Buckminster fuller. Buckminster fuller patent called: “ tensile integrity” [6]. Snelson invented the a polyhedral structure with a continuous tension and discontinuous compression [4]. Emmerich has a patent called “construction de reseaux autodendants” and “structures lineaires autodendants”. Buckminster fuller was the first one who created a complete sphere, the Fuller-dome. A similar dome structure is the Geiger dome, both are tensegrity or tensegrity like structures. [6] Geiger improved the tensegrity dome by changing the triangular grid into a rectangular grid with radial ring cables and tension hoops. Both dome principle are useful for large span structures, with a minimum of weight.[6] [7]

The Original Geiger dome principle was a static structure, and we transform this structure into a dynamical one, combined with photovoltaic panels on the top of it. A double layered dome is constructed, based on experimental double layered grid of Motro. The dome is constructed with variable string lengths in combination with flexible and rigid element rods. On top of the dome structure several photovoltaic panels are fixed to gain optimal sunlight radiation (see fig. 1). The rigid elements were made by using a combination of wood and steel. The next part of the research will be the structural optimization of the rigid elements to reduce weight.

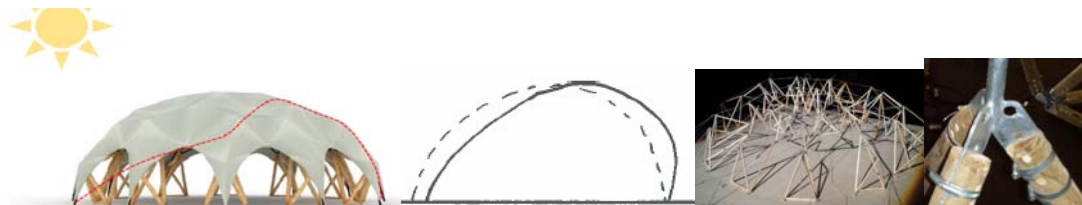


Fig 1. Power dome construction

Acknowledgements,

We thank Moveyou located in Den Haag, Plavercon metaalwerken b.v. located in Maarheeze and the Master students Building Technology autumn 2012 of the Eindhoven University of Technology for their input and collaboration in realizing this project. Special thanks to R.Motro for providing an insight in his experiments as mentioned.

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