Tensegrity Tower

Lucy Khoang

Concept

Tensegrity or tensional integrity is a structural concept used in space structures, whereby the members are either always in tension or always in compression.

Compression members are remote and do not touch other compression members; tension members, usually prestressed cables or wires, form a continuous network with compression members between. There are no bending moments in the resulting structure and compression members are not subject to usual larger buckling loads; some external forces can be distributed through the structure via the tension members and return to the original shape when removed therefore giving remarkably rigid and resilient but slender structures.

These properties are attractive since the cost of buildings and bridges can be lowered by minimising the amount of (costly) compression members. Also, the resilience that this type of structure provides could potentially resist earthquake forces.

Examples

(1) A balloon - the rubber is in tension (continuous skin) and the air inside is in compression (remote gas particles);
(2) Needle Tower Sculpture by Kenneth Snelson – uses this particular pattern of physical forces in space to create unique artwork, the compression members seem to be floating in mid-air since there is no contact between them.

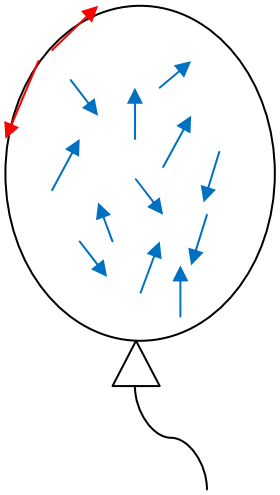
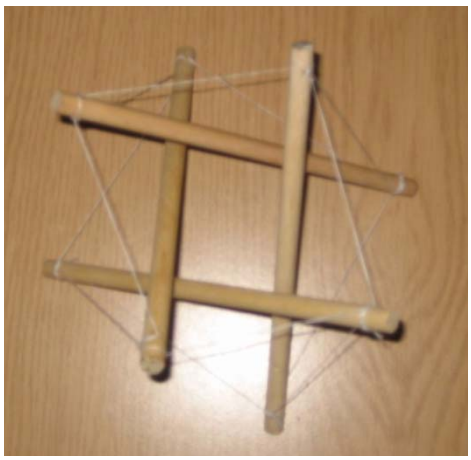


Figure (1): Balloon

Figure (2): Needle Tower

Model

Below I created a simple cube model from dowel and cotton string to further illustrate this concept and the separate forces of tension and compression.



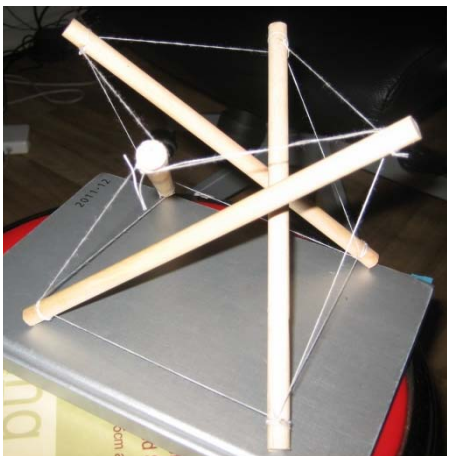


Figure (4): Elevation View Cube Model

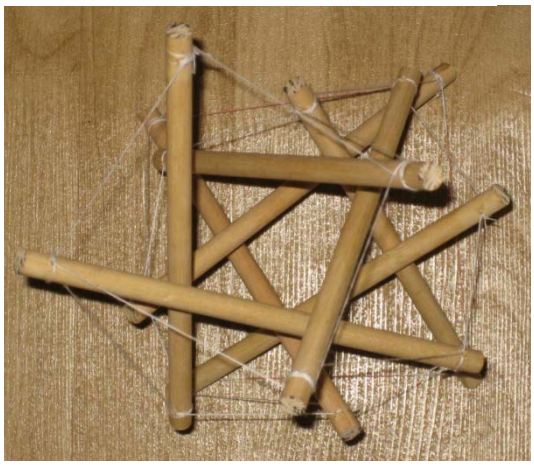
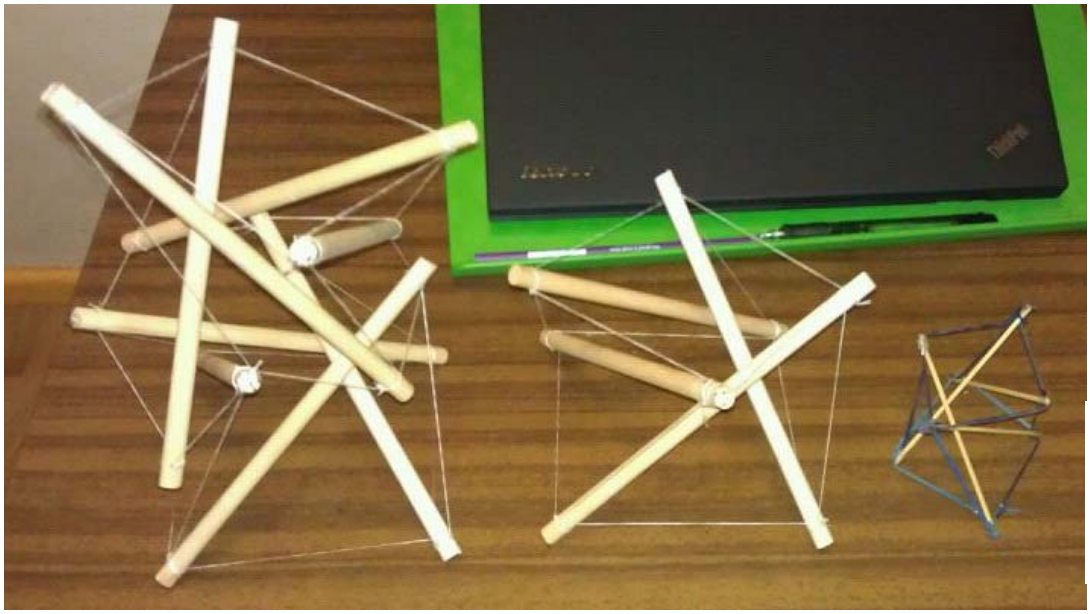


Figure (6): Elevation View Two Level Cube Model



References:

Bing, W. B., 2004. *Free-standing Tension Structures: From tensegrity systems to cable-strut systems*. USA & Canada: Spon Press
Burkhardt, Jr., R. W., 2008. *APractical Guide to Tensegrity Design.*
Klimke, H., Stephan, S. *The Making of a Tensegrity Tower.*
Pugh, A. 1976. *An Introduction to Tensegrity*. University of California Press.

List of Figures:

Figure (1) Balloon
Figure (2) Needle Tower by K. Snelson Ref: [http://kennethsnelson.net/sculpture/outdoor/images/needle_tower2.jpg]
Figure (3) Plan View Cube Model
Figure (4) Elevation Cube Model
Figure (5) Plan View Two Level Cube Model
Figure (6) Elevation Two Levels Cube Model
Figure (7) Summary Two Levels, Cube and Elastic Model.