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An Introduction to The Randome

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The design of the randome provides a spherical or near-spherical structure that is made of elements that are simple and inexpensive to manufacture and to assemble. Unlike previous geodesic dome designs, which required exacting measurements and were generally limited to spherical forms, the randome is a structure that is versatile in form and not restricted to the form of an icosahedron. The randome can be easily assembled without requiring complex mathematical calculations and without having to arrange the elements in a pattern along predetermined great circle gridlines. As the name implies, the randome design functions not so much as a design template, but as a modular construction system with a high degree of flexibility.

The flexibility of the randome is achieved by providing a geodesic structure made of convex-concave elements that are arranged in an approximate manner, either with the aid of a simple spiral pattern, or more or less randomly. By "approximate" is meant that the elements are assembled one next to the other according to some principle such as overlapping or tangentially touching adjacent elements, yet randomly in the sense that particular exemplars of the elements do not necessarily have to be placed or fastened along predetermined great circle gridlines, nor do they have to be placed in a particular sequence or at a particular location. The example of a dome for human shelter will be used to describe the basic geodesic structure according to the invention, although it should be understood that a complete geodesic sphere, a semisphere, or an irregularly curved structure can also be constructed in a similar manner, and that geodesic structures constructed according to the invention are not restricted to a certain size or to certain applications, such as shelter for humans.

Identical, shallow, cone-shaped "hub elements," are used as the convex-concave elements and are assembled in an overlapping configuration, typically from the top of the structure downward, although a structure could just as well be assembled from the bottom up.

The randome is self-adjusting because the hub elements are not necessarily precisely spaced from each other, but are, rather, assembled in an approximate manner arranged according to some general principle with virtual struts automatically forming along the single-axis curvature that extends from vertex to vertex. The geodesic dome thus constructed will have an overall shape with a curvature that corresponds to an average curvature of all the hub elements. Furthennore, the randome is self -triangulated. If lines are drawn from each vertex to adjacent vertexes, one can see that the entire structure is divided into triangles, albeit triangles of varying dimensions, including scalene triangles in which each leg of the triangle is a different length.

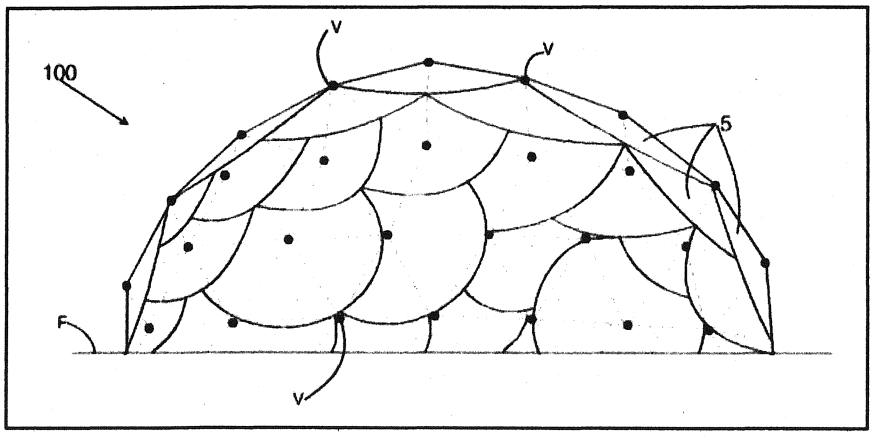
Cones were used as the hub elements in the randome because cones are easier to work with and less costly than continuously curved elements. Cones can be easily fabricated from a flat circular sheet material by eliminating a section of material from the center to the outer edge of the hub, thereby forming what is hereinafter referred to as an angular deficit in the sheet. This angular deficit determines the curvature of the hub element. The cone shape also imparts improved strength and rigidity to the material. Thus, materials that are relatively thin and/or inexpensive can be used to create large spacious enclosures.

The elements can be made of a variety of stiffly flexible materials such as paperboard, plywood, oriented-strandboard, cardboard, sheet metal, and sheet plastic or fiberglass material.

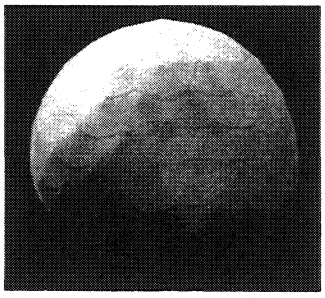
It is possible, however, to use several different sizes or shapes of hub elements and arrange them in an evenly alternating pattern to form the structure. For example, hub elements of two shapes, i.e., having the same diameter at the outer perimeter, but having different angular deficits, can be assembled in an alternating pattern for an aesthetic effect.

A typical assembly sequence for the randome is to arrange a first row of elements around a first single element, such that the first single element overlaps with a portion of each element in the first row of elements so as to not leave a gap between elements. In each subsequent row, additional elements are attached to elements in the preceding row, with the new elements overlapping with a portion of two adjacent elements in a preceding row. Assembly continues in this fashion, row-by-row, to construct a semispherical enclosure. The bottom-row elements are trimmed to form an edge that conforms to the contour of the foundation of the structure. The structure is self -adjusting in the sense that it is sufficient if the elements are placed approximately evenly according to plan. The strut lengths of the virtual struts extending from vertex to vertex of the uniformly-sized hub elements will automatically adapt to the variations in placement of the hub elements. The resulting structure will be a spherical structure with an overall dome curvature that corresponds to the curvature of the individual hub elements.

The use of uniformly-sized cone-shaped elements makes it a simple matter to calculate in advance how many elements are required to build a geodesic structure having a certain dome curvature and a certain diameter. The frequency of a construction, as the term was used in the past in connection with conventional geodesic domes, is not applicable for calculating the elements or size of the structure according to the invention. Rather, calculations are based on simple trigonometric functions, whereby either the number of available hub elements is known, or the internal angle of the hub elements, and the strut length or the radius of the finished dome structure.



(a)



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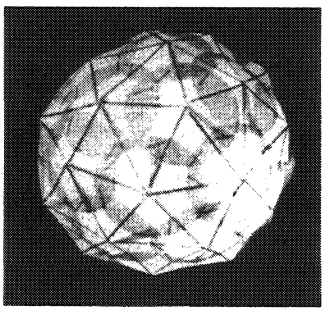

(c)

Figure 1: (a) *The randome, showing random distribution of conical hub elements,* (b) *A paper model showing a six-spiral assembly,* (c) *A randome model with vertexes drawn on.*