

Instructions for making a bamboo geodesic dome

Written by

Sunday, 29 August 2004 02:45

While exploring the [Geodesics, Bamboo and Tensegrity](#) I realized that the [Bamboo Dome](#) instructions, reputedly done by Buckminster Fuller, could be adapted for continuous poles. Attached are detailed instructions for anyone who wants to give it a go, I'm sure there are probably easier ways to do this, and comments are welcome!

Required

Tools

- Gloves (or bandaids)
- Drill
- Loppers or saw
- Tape measure
- Knife (for marking)

Materials

- Cable ties, variety of sizes
- 5 Bamboo poles, 11'
- 5 Bamboo poles 13'
- 1 Bamboo pole 20'
- (or two * 12')
- 1 rope 22'
- 20 eyelets (see directions)
- 5 velcro tidies (optional)
- Tent pegs (optional)
- more twine

Planning

First, decide on the size of your dome, I picked one that would be about 6 meters circumference, which works out about 1.2m high. Divide the circumference by 20 to get the unit used for measurement. This comes to 30cm, (or 1 foot (1')). All measurements below are in terms of this unit, I think the instructions would scale to a larger or smaller dome, though I haven't tried it. The Buckminster Fuller instructions use adequate measurements, but I found that rough measurements worked fine with this medium.

Safety precautions: Bamboo is sharp, especially when cut, wear gardening gloves or you'll need the band-aids. Also, watch out for eyes, and use common sense!

Cut the poles

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First, I cut the bamboo poles from a thicket, I picked young shoots, the ones which still had smooth sides, and hadn't put out any branches, the ones I used were about 1cm across. I used big loppers which is MUCH easier than using a trimming saw. The easiest way is to cut a few, select the longer ones for the 13' and shorter ones for 12' and 11'. If possible, cut them about 1-2' above the ground, as the bottom part doesn't seem to be very flexible. You'll end up with poles which vary from two stiff at one end, to two flimsy at the other.

It works best if the thin end is cut about 1cm past one of the bamboo nodes, otherwise it has a tendency to split.

Initial layout and preparation

Cut a 1-unit, in my case 1' measuring stick. This makes life much easier than using a tape-measure for every measurement. Use the knife to mark each pole in 1' lengths from the wide end.

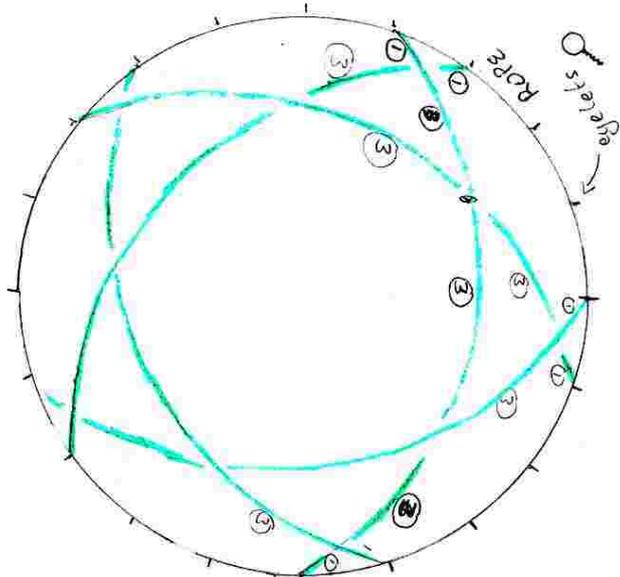
Use the drill to open up any holes which are not hollow

Thread the eyelets onto the rope and tie them in at 1' intervals. Tie the rope into a 20' loop, if you have tent-pegs then peg it out roughly.

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Stage 1: short poles

Stage 1: Shorter poles

Starting with the small poles fit the thicker end into an eyelet, then fit the narrow end 9' further around the rope clockwise. Go one eyelet counter-clockwise, fit another thick end, and again the narrow end goes 9' further clockwise. For each pole ensure that the thick end goes Outside the poles it costs and the thin end goes inside. Repeat until you've got all 5 short poles installed.

This step is fiddly, and works better with two people, although I managed it on my own. Expect some of the sticks to come out and need putting back, also expect some of the thin ends to split. In this case, I found I could just tie it into the rope.

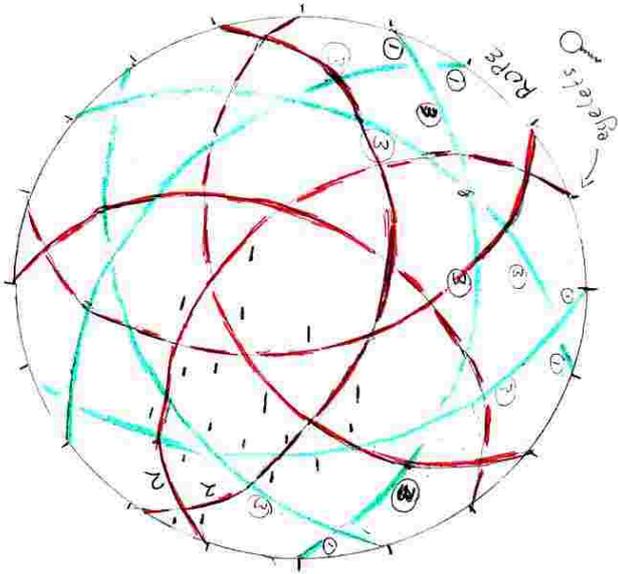
At this point, if you have a helper, then have that person hold the mesh of poles up into the lower part of a dome. If you are on your own, then you can use a 15' loop of twine with Velcro cable-tidys every 3' to hold them in position.

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Fasten cable ties at each of the joints, start with the places where two poles close to each other cross over 1' above the rim, then where the poles meet 3' another pole 3' up from that point. At this point you can remove the cable-ties or your helper and it should stand by itself.



Stage 2: long poles **Stage 2: Longer polls**

Start fixing the long poles, note how each pole starts with the thick-end goes clockwise around the circle, going up outside the other polls, and coming back down with the thinner half inside the other polls to end up 7' anti-clockwise from where it started.

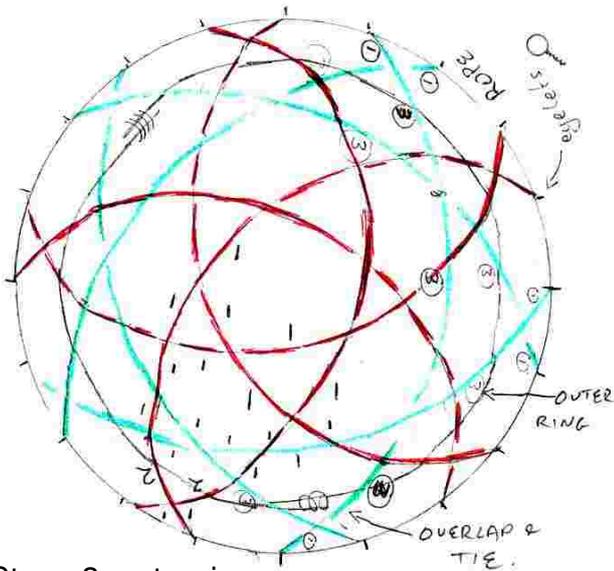
Add all 5 polls, and expect that it will be almost impossible to keep them all in their joints, that is OK at this stage.

Start fixing them, starting off with a 1' pentagon at the top, and then working down, each joint should be obvious, though the bamboo will probably need persuading to join at the right mark. Note that all the lengths are 1' except the next before the last which is 2'.

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Stage 3: outer ring **Stage 3: Base circle**

Thread the remaining 20' pole (or two * 11' poles) around the circle, joining half way across the 2' lengths.

If everything is correct now, you should have 6 pentagons, and 10 hexagons

Next steps and variations.

I'm thinking of building a bigger one, approximately 4 times this size, i.e. about 4.5 meters high, for this I'll use poles around twice the length, from a larger species of bamboo, and then overlap and join pairs of poles at the middle (i.e. in the center pole).

Another variation is to start at the first horizontal ring, to make what is called a 3/8th dome. This means starting with poles 4' shorter. This could be easier when scaling up, as the poles don't have to be as flexible, but the disadvantage is that the dome is not as high for its width.

I'm wondering about distortions, and whether on a larger dome, the poles can be pushed apart in places to create a bigger entrance, and whether this will compromise the strength

I'm planning on using the first test-dome as a trellis for beans, peas and tomatoes

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And finally a few photos of the dome, after it had sat for a while in my vegie patch. Click for a full-scale file (1mb each)



Comments before ported to Joomla

I make some model of the bamboo dome by using the chord factor of A. Pugh : $S=25$, $M=31$, $L=32$,
and the chord factors of Fuller ; 26, 31, 32.

But I seem that the sphere is never perfect , and swells in the pentagonal area. Please have you some suggestions ?

Do you use chord factors in your method ?

Thank you, biagio di carlo

<http://www.biagiodicarlo.com>

Posted by bdc⁹
at June 28, 2005 5:09 AM

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I don't know about A.Pugh, my intuition - which turned out to be ok - was that the chord factors were close enough to 1:1:1 that for a woven dome I could build it and the stresses would ensure that the bamboo found a reasonable shape. You'll notice if you click on the photos that the joints are just cable-ties, so the bamboo can adjust itself. The result of course is a imperfect dome, which is usually fine for the kind of applications I see this dome being used for.

The only instructions I found using chord factors for bamboo domes involved LOTS of joining and fiddling, and seemed to take away the best thing about bamboo which is its strength over long distances, and its flexibility. If you know of some good instructions please post the URL in a comment.

- Mitra

Posted by: Mitra²
at June 28, 2005 9:07 AM

I did my bamboodome and was astonished as I was able to climb on it even after having left it under sun and rain for two years! Bamboo is a wonderful material!

I used the instructions from the desertydome page. I had no problems with chord factors. See the building phases on www.blog1.de/bamboodome

Posted by: FOO²
at December 21, 2007 7:46 PM

What country did you do this in?

I'm glad someone tried the Domebook instructions. I looked at both domebook 2 and <http://www.desertydomes.com/bamboo.html>

before I came up with my idea, it seemed a crazy idea to take something naturally long and flexible, and treat it like something short and rigid! Which is why I came up with the bending idea. I ran into the author of domebook2 recently but I forgot to ask him if he'd ever tried this

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technique!

The other bamboo domes I like are Marti's <http://www.wizdomes.ws/> he uses plastic pipes to join the ends, its a simple and obvious idea, but there are a lot of challenges to it that Marti has worked out. We constructed one at a festival, about 10 or 12m diameter and covered with the skin of a retired hot-air-balloon.

Posted by: Mitra²
at December 28, 2007 11:24 AM