*Projects and Stuff*

Accel

Project Log

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# 2012/10/03

This evening I created the initial git repository, and began sketching out initial plans.

I’ll be using Google Sketchup to build most components in this project.

Initial notes:

Ring Radius: 500 mm

Ring Diameter: 1000 mm

(Ring dimensions are drawn to the center of the tube)

Ring Segment central angle: 18 degrees

Total Segments: 20

Ring Segment Arc Length (at center of tube): ~157.0796326794897 mm

Ring Total Circumference: ~3141.592653589793 mm

Tube diameter: 27.4 mm

Tube Thickness: 5.0 mm

Remember to include on each segment:

- Wire guides

- Sensor mountings (LED/magnetic/etc)

- Assembly (3-4 screw posts/holes at each tube end)

- Stand mounts for securing to a surface (closer to surface = better)

Also consider foam dampers at mount points, and a heavy base is best

Consider placing a cheap ADC or Schmitt Trigger along with each sensor to get quick, accurate results back to the main board quickly.

Alternately, use a (Optical - Photo Detectors - Logic Output) as a simple and possibly cheaper solution.

The following math isn't 100% accurate, because I'm calculating it for the center of the tube, but it's near enough not to matter:

My magnet will be 1 inch in diameter, and 1 inch in length. 1 inch is equal to 25.4 mm

With a ring radius of 500 mm, a central angle of 2.91 degrees gives an arc length of 25.4 mm. Expanding with some basic trig, the segment height - essentially the additional tolerance needed in the tube radius to allow the magnet to pass smoothly - is 0.16 mm. For the sake of simplicity, and to provide just a bit of additional tolerance in case of manufacturing imperfections, I'll use an inner diameter of 27.4 mm, well beyond what should be required if everything were ideal. We'll use a wall thickness of 5 mm.

# 2012/12/16

The past couple months have been pretty busy, so while I haven’t made many updates here, I’ve been working furiously on this and other projects. I’ll attempt to catch up here.

In order to reduce costs, I’ve made a design decision to reduce the diameter from 1 meter to 50cm. This also means that the projectile will now be half the original size (~12.7mm), and so the inner tube will also be smaller (~15mm)

I’m going to post the initial Sketchup model for the first coil section prototype and push to GitHub. Then I’ll continue updates here.

I printed the uploaded model on a 3D Touch 3D printer, using natural PLA plastic. I then used 22 AWG wire and coiled 3 layers of wire. I secured it in place with some enamel and tape, and performed some very basic tests between 10 and 24 volts.

The circumference of the entire circle (from the center of the tube) is 1570.79 mm. We’ll round to 1570 mm. I decided 24 segments of 15 degrees each makes more sense. 157/24 = ~65.42 mm. For simplicity we’ll approximate to 65.5 mm. This makes the final circumference (from tube center) 1572 mm, which is ~1.2 mm off from the ideal. This will work just fine.

The length of the segment will be as follows:

End 6 mm

Spacer 4 mm

Coil 25.5 mm

Sensor/Gap 20 mm

Spacer 4 mm

End 6 mm

# 2013/01/01

Uploaded the progress from the past week. I created a new prototype 15-degree segment, including the bend. I’m quickly improving in my abilities to effectively use SketchUp, and am implementing better processes as I learn.

The most recent prototype didn’t print out as nicely as the previous one, and some changes are still required, including larger holes in the bottom.

Here are the latest notes and measurements for the segments:

24 segments of 15 degrees each

65.5 mm Length (through center tube)

1572 mm Total Length (through center hole)

Lengthwise Measurements:

End 07.50 mm

Spacing 03.00 mm

Ring 03.00 mm

Coil 26.50 mm

Ring 03.00 mm

Sensor/Gap 15.00 mm

End 07.50 mm

Other Measurements:

Inner Tube Radius 07.50 mm

Outer Tube Radius 10.00 mm

Ring Radius 14.50 mm

End Inradius 16.00 mm

End Top Bevel 05.00 mm

Bottom Screws XX.XX mm

End Screws XX.XX mm

End Apothem 31.00 mm

Arc Height 02.14 mm

I still need to determine a number of things to proceed:

* What size screws to use on to hold the ends together, and to secure them to a base?
* How to secure the sensors (and related boards) to the segments?
* Should the tube thickness be increased further in order to facilitate better sensor placement?
* Should I use two curves in SketchUp, rather than a circle, when creating the inner tube? This might prevent the stretching I’ve seen in the latest prototype.