

Supplementary Material for ‘A Data-Driven Approach to Violin Making’

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ABSTRACT

This document contains equations referenced in the main text.

Parametric creation of a violin outline

Implementation of Stradivari's parametric outline. Equations defining the 17 points and 20 parameters used. p_i stands for x, y points whereas alphabetic letters are one dimensional parameters corresponding to radii and aperture angles. We start from the point p_0 and define iteratively points either on the circular arc (e.g. p_1 or p_2) or on the radii of an existing circumference (e.g. p_3 or p_4). Points p_{15} and p_{16} are found by imposing that they lay in the symmetry axis hence their formula is slightly different. To understand each parameter graphically please refer to Fig. 1

```
p0 = {-x0, 0};
p1 = p0 + aa {Cos[a], Sin[a]};
p2 = p0 + aa {Cos[b], Sin[b]};
p3 = p2 - c {Cos[b], Sin[b]};
p4 = p1 - cc {Cos[a], Sin[a]};
p5 = p4 + cc {Cos[d], Sin[d]};
p6 = p3 + c {Cos[e], Sin[e]};
p7 = p6 + f {Cos[g], Sin[g]};
p8 = p5 + h {Cos[d2], Sin[d2]};
p9 = p8 + h {Cos[l], Sin[l]};
p10 = p9 + k {Cos[l], Sin[l]};
p11 = p10 + k {Cos[\[Pi]/2 + hh], Sin[\[Pi]/2 + hh]};
p12 = p11 + k {Cos[hh], Sin[hh]};
p13 = p7 + f {Cos[gg], Sin[gg]};
p14 = p13 + ff {Cos[gg], Sin[gg]};
p15 = p14 + ff {Cos[-\[Pi]/2 - kk], Sin[-\[Pi]/2 - kk]};
p16 = {0, p15[[2]] + rr2 Cos[ArcSin[Sin[kk] ff/rr2 - p14[[1]]/rr2]]};
p17 = {0, p11[[2]] - rr Cos[ArcSin[Sin[hh] k/rr - p10[[1]]/rr]]};
```

This will be given as a Mathematica code the reader can run and create different violin plates.

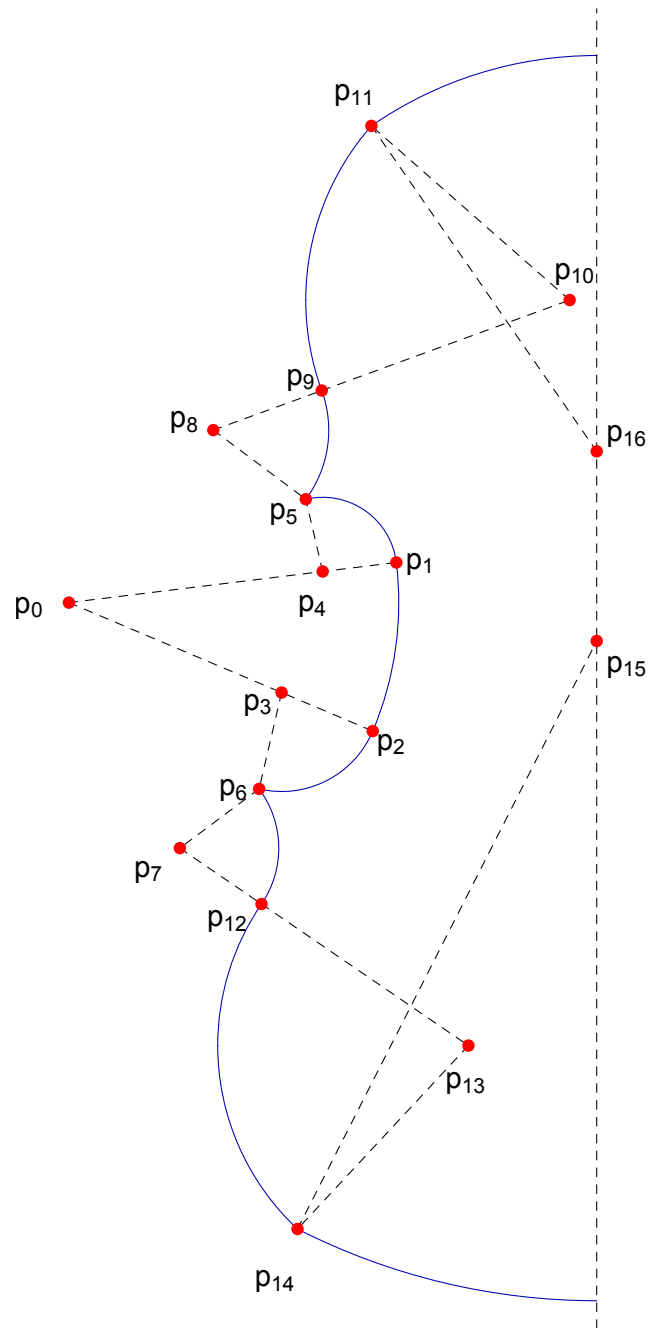


Figure 1. Diagram showing the construction method for the violin outline. We start by defining the p_0 , then p_1 and p_2 are defined as two points on the circle centred in p_0 of radius a and angles α and β respectively. Only half of the outline is shown since our model is symmetric