THE 'PERFECT' GUARD POSITION in Fiore's system of fencing

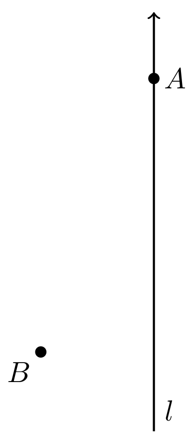
suggested by the geometry of Volta Stabile

Ville Tilvis, 2015

Fiore dei Liberi does not give precise definitions for his guards and steps in his book Fior di Bataglia. The Getty manuscript simply tells that the turn *volta stabile* lets you play forward or backward on one side without moving your feet.[1] This leaves much to be interpreted. The current understanding of the matter in Guy Windsor's School of European Swordmanship is as follows.

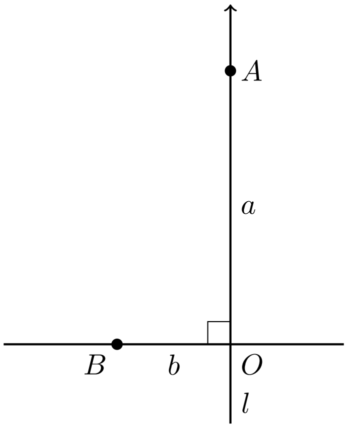
- In the guard position most of the weight is on the front foot
- Volta stabile means pushing your weight to the back foot while turning on the balls of your feet, thus aligning yourself into a new line
- The angle of rotation is $\frac{3}{4}$ of a semi-circle, that is $135°$
- If you face in the new direction, your guard position should be indentical to the original one, but with the other leg forward and rotated $135°$

The point of this little mathematical article is to note that this set of ideas actually restricts the guard position quite a bit. If the balls of the feet don't move, and the guard position must be identical in two different lines, then the ratio between the length and the width of the stance is fixed. To see this let's mark A and B as the points in the front and the rear foot that do not move in a volta stabile. Let l be the line in which the fencer is facing.

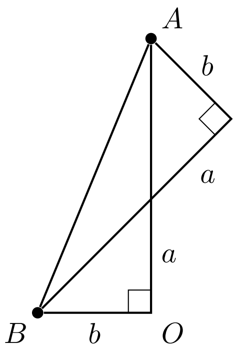


Drawing a perpendicular of l through B gives the intersection O. Now we can define the length of the stance to be OA and the width to be OB. Let's mark these with a and b.

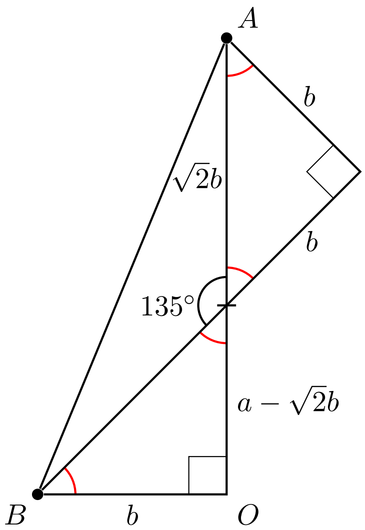
[1] Fior di Bataglia, Getty manuscript, at the beginning of the section Sword in Two Hands.



The right-angled triangle with sides a and b is all we need from now on. After the volta stabile point B becomes the front foot, and if the guard position is unchanged, a congruent triangle with side lengths a and b must be formed.



From this the ratio $\frac{a}{b}$ can be determined. First we note that if the turn is $135°$, all the angles marked red in the figure below will be $45°$. Therefore the little right triangles are isosceles with legs b and hypothenuse $\sqrt{2}b$ (by the Pyhtagorean theorem). Thus the segment AO is split into segments of length $\sqrt{2}b$ and $a - \sqrt{2}b$.



But the lower small right angle is also isosceles, so we must have $b = a - \sqrt{2}b$. From this the ratio can be calculated:

$$
\begin{aligned}
b &= a - \sqrt{2}b \\
b + \sqrt{2}b &= a \\
b(1+\sqrt{2}) &= a \\
\frac{a}{b} &= 1 + \sqrt{2} \approx 2.4142\ldots
\end{aligned}
$$

The concluson is that the 'perfect' guard position should have a length-to-width ratio of $1+\sqrt{2}$, or about 2.4 (measured from the center points of the balls of the feet).

There is naturally no need for this geometrical result to be the anatomically optimal guard position. If the two are not the same, there is little reason to deviate from the anatomical optimum to achieve a perfect volta stabile. Given that different tactical situations require small changes to the guard position anyway, the hunt for one perfect postition is doomed.

...and just in case anyone wondered: if the angle of rotation in a volta stabile was α instead of $135°$, by similar reasoning the ratio $\frac{a}{b}$ would become

$$
\frac{a}{b} = \frac{1 + \cos(180° - \alpha)}{\sin(180° - \alpha)}.
$$