# *Larry Sue's Rehearsal Notes*

## Timbre Notations

Pianists are often recognized or commended on the basis of their "touch". This elusive performance quality is a subjective measure of how they extract their very own sound out of the instrument. Different performers clearly get different results; the difference is due to how they work with the mechanical aspects of the piano.

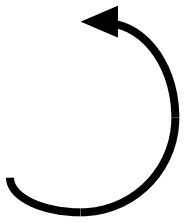
The same is true of handbells. If you take it back to the absolute essentials, it's all about the following (if you'd rather just get to the applicational ideas here, skip to the bottom and return to the technical specifics later):

- The speed at which the clapper and casting come together. Sharper strikes tend to excite more of the higher harmonics of the bells; gentler strikes less of them. To the listener, the sharper strikes usually sound a bit harsher.

- The length of time for which the clapper is in contact with the casting. Because the clapper head (and to a much lesser extent, the casting) is inelastic, the strike is not a perfect bounce. The hardness of the rubber/felt, plus the velocity **and** acceleration of the strike, affect this. For instance, if the clapper is accelerating into the casting, the length of contact will usually be shorter than if it's decelerating - that's because the impact will be softer and the bounce-back therefore isn't as strong.

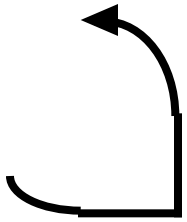
- The speed and size of the "circle stroke" that follows the strike. This is manifested mainly in the Doppler-effect broadening of the frequencies in the bell's sound.

I'm going to assume a ringing motion that's based on the normal "circle stroke". This stroke will be the basis for what follows. Here's a profile of the prototypical circle stroke:



However, I also am going to modify it by adding a "corner" at the bottom; just make the usual kind of circular motion, but at the lowest point of the stroke make an upward angle rather than a

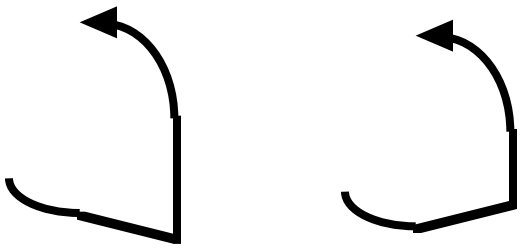
smooth curve. To execute the strike that creates the bell's sound, lift the casting into the clapper at this point. Here's a circle stroke with a corner:



We can vary this modified circle stroke in three fundamental ways:

- **By changing the speed at which the "corner" is approached.** The faster the movement, the stronger the strike, and the greater the volume.

- **By changing the angle of the "corner".** This is a remarkably simple way to alter the resulting sound because it changes the acceleration imparted to the clapper at the instant of impact. In general, a sharper angle decreases the contact time between clapper and casting and excites more of the higher-frequency overtones, creating a brighter, more incisive sound. A larger angle results in greater contact time and slightly damps the higher-frequency overtones, creating a mellower, gentler tone. It's perfectly analogous to how pianists alter finger action to change the tone of their instrument. Here are two modified circle strokes, one with a sharper angle and one with a larger angle. Note that in each case, lifting the casting into the clapper is done vertically; this ensures more consistent control.



- **By changing the size and speed of the motion that follows the strike.** This affects the Doppler-based fullness (or if you like, the "splattering") of the sound. Some of us have also referred to this by using terms such as "circle stroke size" and "robot ring".

In 2009, I performed some simple experiments to determine the effect of these factors on the sound of handbells and handchimes. While I don't have any quantitative data or a scientifically formalized conclusion to provide, I can say that there are significant differences that warrant a means of notating how to apply all of this to playing handbells and handchimes.

The system is very simple:

Initial speed - the part of the stroke before the "corner", is determined by the score's dynamic indications.

Corner angle is indicated by one of three symbols:

| | |
|---|---|
| < | Make the corner angle sharper than 90 degrees, that is, acute. |
| ⊥ | Make the corner angle 90 degrees. |
| > | Make the corner angle larger than 90 degrees, that is, obtuse. |

Post-strike motion is indicated by a number:

| | |
|---|---|
| 0 | No motion (also known as "robot ring") |
| 1 | Small motion |
| 2 | Medium-sized motion |
| 3 | Large motion |

I prefer to work from "=2" as my baseline - that is, ringing at the indicated dynamic level with a 90-degree corner and medium-sized circle stroke is a good place from which to standardize. Once that's established, the other notations are executed relative to it.

Here some real-life examples of how this works:

- Sometimes we're directed to "robot ring", which in the above system would have a zero as the second character. This also implies that we can modify our robot ring sound by specifying what corner angle should be used for the passage in question: ⊥0, ⊥1, ⊥2, and ⊥3 would all mean different sounds!

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- Tim Waugh uses the method of "ringing higher [above the table]" to create a gentler sound. This happens to be exactly equivalent to using a larger angle! This would be indicated by >0, >1, >2, or >3 depending on how full you want the sound to be.

- Try ⊥0, ⊥1, ⊥2, and ⊥3 with thumb damps. You'll find that you get a different timbral qualities even though you're using a stopped sound. If you do this in a more "live" room (i.e. with more "echoiness"), the differences will be even more apparent.

- When I need a gentler tone my bells, I generally find myself enlarging my corner angles (e.g. >2; when I really want them to sing, my corner angle can become nearly zero degrees (e.g. <2 ... or if you want to be mathematically extreme, <<2).

I encourage you to try this in your ringing!