What we lose sonically when we use multi-channels and panning in our DAWs
* Ensemble balance as intended by the conductor
* Solid imaging - perceived location of each instrument
* Depth - distance of instruments
* The room - spatial environment
* Timber of instruments as audience hears them

Imaging
Stereo does not mean two. It actually comes from a Greek word meaning *image*. Whether we have two speakers or five, it refers to the characteristic of the sound that makes it appear to come to the listener from one specific location in the sound field.

How to establish a solid directional image in a recording
Two things supply the direction information to our perception: ***relative level*** (ear to ear, therefore speaker to speaker or left to right) and ***delay or phase***. (arrival time difference between the sound from one speaker and the other speaker) We usually get only relative level in multi-tracking, unless we *record* in stereo.

How much arrival time difference?
3" further travel around head would be about .221 ms or .000221 sec.
or just under 10 samples!
1130 fps = 13,560 inches per sec
3" should take 1/4520 seconds

Note: For imaging purposes, 1.2 ms is considered the max delay that can be tolerated in a stereo mix. Of course we use much longer delays in our reverbs and echos.

Also, there are slightly less highs getting to the distant ear.

Assignment
Stereo Imaging/Localization DAW Exercise
Create a recording with great imaging.
For the purpose of this assignment, assume the spread between L and R channels is 120 degrees. Create a stereo wave file that uses four short voice recordings placed at about 20 degrees from left, 45 degrees from left, 75 degrees from left, and 100 degrees from left. The voice recordings should simply announce the image location, as "This sound is 20 degrees from left." Use relative levels and relative phase/delay to create the best location images possible.

This will require experimentation on your part. For a sound to appear 45 degrees from left, the difference in distance it would travel to each of your ears might be as little as 1" to 1.5". A sound delay representing 1" longer path would be only .000073 seconds. (7.3×10^{-5})

Stereo Imaging/Localization Strategies
1. Coincident Pairs
   1a. Basic coincident pair of cardioids
   1b. Stereo microphones
   1c. Blemlein double figure-8
   1d. MS Mid/Side
2. Spaced pair
3. Near-coincident pair
4. Baffled pair

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1. Coincident pair:
* Uses two directional mics angled apart with grilles touching. (almost)

* Level differences between channels produce the stereo effect.

* 120 - 135 degrees

* Images are sharp.

* Stereo spread ranges from narrow (narrower degrees) to accurate.

* Signals are mono compatible. Right for TV or radio.

Do not put too close to the source or two narrow a spread (90 degrees) or this may produce off-axis coloration.

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1b. Stereo Microphone (dual capsule)
* Good for complex ensembles.

* Captures spaciousness and tonalty of many acoustic instruments.

* Not so good for acoustic bass, horns, flutes, woodwinds.

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1c. Blumlein XY (two figure 8s)
* Good for very natural room recording

* Minimal off-axis coloration

* Excellent stereo spread

• Best for closer miking as they will loose bass at distance.

• Will pick up the audience though, and out of phase!

Setting them up

Must be matched carefully for recording volumes and tones. Mixer channel differences will interfere with imaging also.

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1d. Mid Side MS (Cardioid and figure 8)
* Great stereo image

* Great mono mix. Right for TV or radio

* Can dial in width and ambience as needed
How? By making 3 channels out of the two. Make a copy of side wave form and invert. Pan the sides hard R & L

Other How?* Making +/- Y cables.

* Avoid adding reverbs on the side channels. They will cancel!

• Less effective on larger groups, as it tends to favor the middle sources that the mics are closer to.

• Can be the best for room ambience miking

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How we can use MS in our digital mixes

Record the two tracks.

Put the cardioid in one track.

Put the figure 8 in two tracks, carefully aligned.

Invert one of the figure 8 tracks. In Tracktion, the EQ filter has a phase invert button.

Fade the figure 8 tracks in together to create stereo.

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2. Spaced pair:
* Uses two mics spaced a few feet apart, aiming straight ahead. Any pattern, often omnis.

* Time differences between channels produce the stereo effect.

Pros

* Provides a warm sense of ambience. Room reverb is incoherent, therefore diffuse or spacious. Not accurate but pleasing.

* Provides excellent low-frequency response if you use omni condensers.

Cons

* Tends not to sound good in mono, but not always objectionable. Putting the two channels together creates a comb effect.

• Center stage instruments tend to be a little too loud.

Cons:
• Low frequency comb filter effects.

* Off-center images are localized ok but a little diffuse, vague. Produces a blended stereo effect.

* Stereo spread tends to be exaggerated unless a third center mic is used, or unless spacing is less than 2 to 3 feet. (Music recital hall)

How far apart? Experimentation needed. Usually mono mics 3'. Sometimes wider, up to 10' used. 6' not uncommon.

Location. Height. Direction. All significant.
Too close?
All images in center.
Too far apart?
Hole in center appears.
(Except for actual center source)
Best image?
Probably fairly close or middle mic.

Note Omnis are usually a little directional in HF
Note Cardioids can have off-axis color.

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3. Near-coincident pair:

* Uses two directional mics angled apart and spaced a few inches (7-12") apart horizontally.

* 90- 110 degrees

* Level and time differences between channels produce the stereo effect.

Pros

* Images are sharp.

* Stereo spread tends to be accurate.

* The hall sounds more spacious than with coincident methods.

Cons

* Tends not to be mono compatible.

* Higher overtones tend to be out of phase.

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4. Baffled omni pair:

* Uses two omni mics, usually ear-spaced, with a baffle between them.

* Level, time, and spectral differences produce the stereo effect.

Pros

* Images are sharp.

* Good warmth and air.

* Stereo spread tends to be accurate.

* Excellent low-frequency response.

* Good imaging with headphones.

* The hall sounds more spacious than with coincident methods.

Cons

* Stereo spread is not adjustable except by panning the two channels toward the center.

* More conspicuous than other methods.

* Tends not to be mono compatible, but this might not be audible.

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5. Spot or Accent mics

* Not mixed up. Only the minimum to add definition. 6 dB max for automation.

* May need the HF dropped 2 dB to blend.

• Need a delay T=D/C

Time of delay = $\frac{\text{feet in front of main mics}}{1130 \text{ fps}}$

Example: 20' ahead = 17.7 ms

Mixing Spot Mics

Listen to the position in the stereo spread without the spot mic. Place the pan pot in about the right place. Bring up the level of the spot channel. If it pulls right or left, move the pan pot in the other direction. Less is more.

You can also use MS mics for spots. You can adjust the width and then pan the result into the main stereo spread. They tend to fit in perfectly.

Quality Mics

Need "low noise" mics.
Less than 20 dB equivalent SPL
A-Weighted (Filter for annoyance value)

For stereo, matched pairs are best
Cost more than 2 singles, though.

Sensitivity
How quiet can the sound be to still get a good recording without noise?
Voltage out measured at 94 dB SPL
Usually condensor best– Ribbon worst
Exception: Royer ribbons used a lot though

Omnis don't need bass EQ boost as much as directional mics.

Stands - like them up about 13'
So front row isn't louder than back
- 5-20' from the front row of musicians

Edgy sound or no ambience?
move mics further away
Too distant, muddy, reverberant? move in
Room live? closer
Room dead? further

Backup (for us at least)
Use multiple systems and compare afterwards.
1) Use two coincident pairs. 2nd 25-30' back
2) Coincident pair close. spaced stereo pair back.

Troubleshooting

A reversed mic cable will cause the two mics to be out of phase!
Some brands of mic might be out of phase with other brands. To be certain, test by putting them together and mixing and listening.

Quality Rooms

2 - 2.5 sec reverb time for orchestral recording
Less for other types of ensembles
No standing waves or nodes
No discrete echos

Placing Mics

GR General Rule – Don't use EQ to do what using the right mic would do in the first place.

Trust your ears. Move around while they sing/play and find the spot with the best version. It is often obvious – then mark the spot!

Rooms/Stages have standing wave nodes. Find them and avoid them.

Musicians use cues. Some that they are not conscious of! They may need to…
Hear each other clearly.
Watch each other's lips.
See a slight nod.
Hear a breath intake.
Be watchful. If your technology interferes with their communication, they will have trouble or be uncomfortable.

Remember
Get the program ahead of time to mark the spots on the recording.

Recording Pianos
General Characteristics of Piano Recordings

Notes need to be clearly articulated.
Don't want to hear the hammer sounds.
Needs mid and high reverberance, but not much low frequency reverberance.
Important when choosing a hall.
Intense reverb is ok, but not long intense reverb.

Mics inside?
brighter sound, emphasizes middle octaves
might start to hear pedals and hammers

Mics outside?
a balanced sound if the room is good
emphasizes the upper octaves

Fig 1: Coincident pair

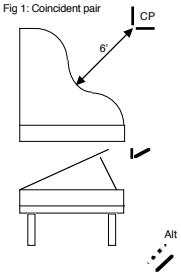
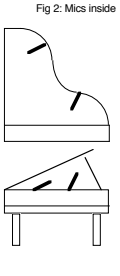


Fig 2: Mics inside



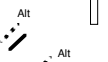


Fig 3: Stereo pair

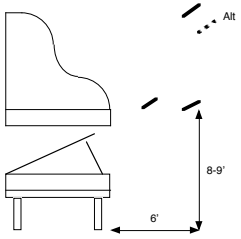
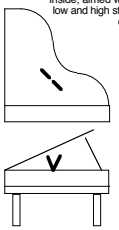


Fig 4: Coincident pair Inside, aimed where low and high strings cross



1. Coincident mics outside
Walk around the piano and listen with one ear.
Listen for balance direction and ambience distance.

2. Mics inside. One on bass strings. One treble.
Not the best for a real stereo image. Coincident might be better for stereo image.
Sometimes done with the lid lower and a blanket over the right side. (if too much bleed from other instruments.)

3. Stereo miking. Two or three mics.

4. Coincident mics inside aimed down.

Other Options
5. Two omnis inside and two outside for ambience. Watch out for phase cancellation.

6. Two mics just above the music stand.

Be certain to measure the distances so that we can adjust for phase cancellation later in the DAW.

Recording Brass
Widest dynamic range – need headroom
Many overtones from the side – exp if muted
Usually arranged
L R
Trumpet Trombone Euphonium Tuba

Often ribbon mics are used, exp if close-miked

Option 1
• 3-4 feet and omni
• Not on axis with the bell or spitty clicking sounds prevail
• Sometimes at the edge of the bell or even at the mouthpiece
However, more overtones on-axis

Option 2
Place players around a Blumhein pair
Keep them on the nodes

Tuba
Place mic 1' to 2' above the tuba
15 degrees off axis
Too blatty?
Further off axis

Brass too shrill?
Lower the mic
Put a sock in the horn (!)

Recording Accordion

Different timber in every direction
Each side creates it's own sound
Lead recordings sometimes utilize only one hand

Common Options
• 2' to 3' from bellows
• stereo/coincident pair 3'-4'
• large dia condensor 1'-1.5' from keyboard

Button accordion?
Use 57 underneath facing up
Performers mount them on bracket

Button air noise?
Use 57 instead of condensor