

# Application: How to surround



**Surround sound vastly increases the spectrum of creative mix-down options. The extra channels can also be put to very different uses, some of which highlight limitations of the mixing technology that severely hinder efforts to create a high-quality listening experience. I will demonstrate a promising creative approach by examining the physical prerequisites and giving illustrative examples of practical surround mix-downs.**

## Surround today

There are two approaches to using the additional surround channels:

- a) Sound source imaging to the rear and sides. This may be considered an effect, to be creatively deployed by the recording engineer.
- b) Creation of the impression of a genuine acoustic event, with the so-called “envelopment” to give the listener a heightened sense of involvement. Besides others, the recording engineer faces the creative challenge of establishing a realistic-sounding envelopment.

This is achieved by feeding the surround loudspeakers with signals corresponding to what would be heard from a given direction: this includes crucial side reflections generated within the perceived space. The most natural way to create an envelopment is to use an array of 5 microphones positioned similarly to 5 loudspeakers, and route their playback signals directly to the corresponding speaker channels. The rear microphone pair picks up the surround portion, while the front pair picks up mainly frontal sound. This technique has proved successful for classical music recording in rooms with extremely clear and transparent acoustics. In most cases, though, the recording engineer wants – or is compelled – to create an artificial mix incorporating sonic corrections or even to overemphasize certain aspects. The extreme would be to generate a surround image from a multitrack recording of pure mono sources, whereby the challenge is to create the envelopment as un-artificial sounding as possible, and establish a genuine surround impression.

## What do we hear?

Let us take a closer look at the sounds reaching our ears. In order of arrival, these may be classified into:

- 1) Direct sound
- 2) Early reflections
- 3) Late reflections (reverberation)

(1) and (2) are most affected when a sound source changes its location relative to a fixed listening position. (3) remains virtually unchanged, since late reflections are already highly diffuse within the acoustic space. Generating all three components as faithfully as possible for each of the loudspeakers requires knowledge of the sound source position for (1) and (2). Looked at another way, realistically integrating a monophonic sound source (e.g. a single spot microphone or one track of a multitrack recording) in a surround image with envelopment requires generating (1) and (2) dependent on the panner position. The simplest place to achieve this is in the panner itself. Reverberation (3) may be generated using an external surround reverb unit. Integrating the reverb unit with the mixing desk brings increased operational and automation convenience.

## Contemporary surround mixing techniques

Surround mixes may be roughly classified as follows:

- The surround channels are used simply as effects. Although arbitrary and flexible, this technique is unlikely to deliver long-term listening satisfaction.
- Impressive surround effects may be generated using a battery of delay lines, reverbs and other effects units, with their outputs routed to the

various playback channels. Mixing is very time-consuming.

- Surround music mixes are preferably made from material that already contains dedicated surround signals. In pop music, these are frequently derived from ambience microphones positioned close to the live audience. Classical or jazz recordings frequently use main microphones with rear-oriented capsules to acquire signals for the surround loudspeakers. At the start of the mix it is clear what signals are to be routed to the rear loudspeakers. The problem, having established a rough mix, is surround fall-off as more monophonic signals are added. This is caused by a lack of envelopment which matches these signals, particularly the type created by early reflections with correct directional and timing characteristics. Simply expressed, the fewer mono signals a surround mix contains, the better the surround image. This means compromising between acoustic balance and the overall surround impression.

### Practical experiences

“The Proms”, Royal Albert Hall, November 1999 – mixing live classical recordings:

- 40 tracks
- Main microphones arranged as “Decca Tree”
- Additional ambience microphones
- Numerous spot microphones

The sound engineers began by establishing an enveloping surround image derived from the main and ambience microphones. Surround was perfect, but the balance and tone of individual instruments were unsatisfactory. Spot microphones were then added to the mix, mostly panned into the soundstage between the left and right loudspeakers. Balance and tone were now right, but the good initial surround was swamped by the 2-channel mix between the front loudspeakers. The logical corrective step was to increase the level of the surround channels, and add a touch of ambience from the side between the front and rear channels. The surround loudspeakers were audible again, but in place of seamless surround were two separate sound images emanating from the front and rear speakers. Even with additional reverb

treatment, the new surround image was significantly inferior to the original.

Starting from the previous mix, Virtual Surround Panning (VSP, see box) was activated in the spot microphone channels. First, the simulated room model was tuned to match the Royal Albert Hall as closely as possible (early reflections). Then, these reflections were subtly added to the respective pre-panned microphones. Despite the spot mics, the surround effect returned; the concert hall became apparent, suddenly we were back in the performance, totally involved and enveloped! Furthermore, it was no longer necessary to compromise between the front soundstage and the surround effect. Subtle early reflections brought another bonus: the spot microphones could be inserted at the correct distance impression in the sound image. It also eliminated the need to use a few external effects units, making the mix even more clear and transparent. The recording engineers compared this result with the previous, traditional mix. Opinion was unanimously in favour of the Studer VSP.

“Grand Mothers Funk” – mix-down of a live concert recording:

- 40-track live recording
- No main microphones
- 4 ambience microphones
- 36 monophonic sources

A sound engineer performed the mix-down twice, with and without VSP. The startling difference



between these mixes lay not so much in the individual instruments, but the envelopment generated from the separate mono sources. VSP engaged the listener, putting him in the thick of the musical action and emphasising the groove. Although only light VSP processing was applied to individual tracks, the result was a convincing surround experience.

### **Conclusion**

Spatial perception hinges on positional reflections; nothing new there. Using surround to create a better image of the acoustic space clearly means paying more attention to these reflections. For the mixing desk panner to function as an effective positioning tool, it must also take account of position-dependent reflections. Virtual Surround Panning (VSP), as found exclusively in the Studer D950S, does precisely this and addresses many of the recent problems associated with surround mixing. Recording engineers can begin assembling a mix using a conventional stereo approach. Thereafter, the watchwords are development and experimentation! Practical experience clearly indicates that VSP boosts mix-down efficiency in various surround formats, and delivers convincing results. VSP offers new creative freedom. ■

### **Virtual Surround Panning VSP explained**

Virtual Surround Panning (VSP) is a parameterised audio positioning tool for realistically imaging a mono source using a 2 to 8 channel playback system. It offers the following independent advantages over conventional panners:

- 1) Generating early reflections within a simulated acoustic space, depending on the pan position. These reflections are reproduced from the correct direction, at the correct time.
- 2) Better directional imaging (left-right panning), by adding phase and frequency spectrum information to the customary amplitude difference between left and right loudspeakers.

The newest VSP version also provides for late reflections (reverb). These are delivered in de-correlated form, independent of the pan position, to two (2-channel stereo) or four (surround) loudspeakers. VSP in conjunction with reverb is a complete room simulation tool built into the Studer D950S.