

This document contains information about the Morning Line computer audio system.

TML speaker system

TML has 41 high-mid range loudspeakers plus 6 subs. These are arranged around a series of “rooms” or soundfields, as shown in Fig. 1 below.

Speaker Key Plan

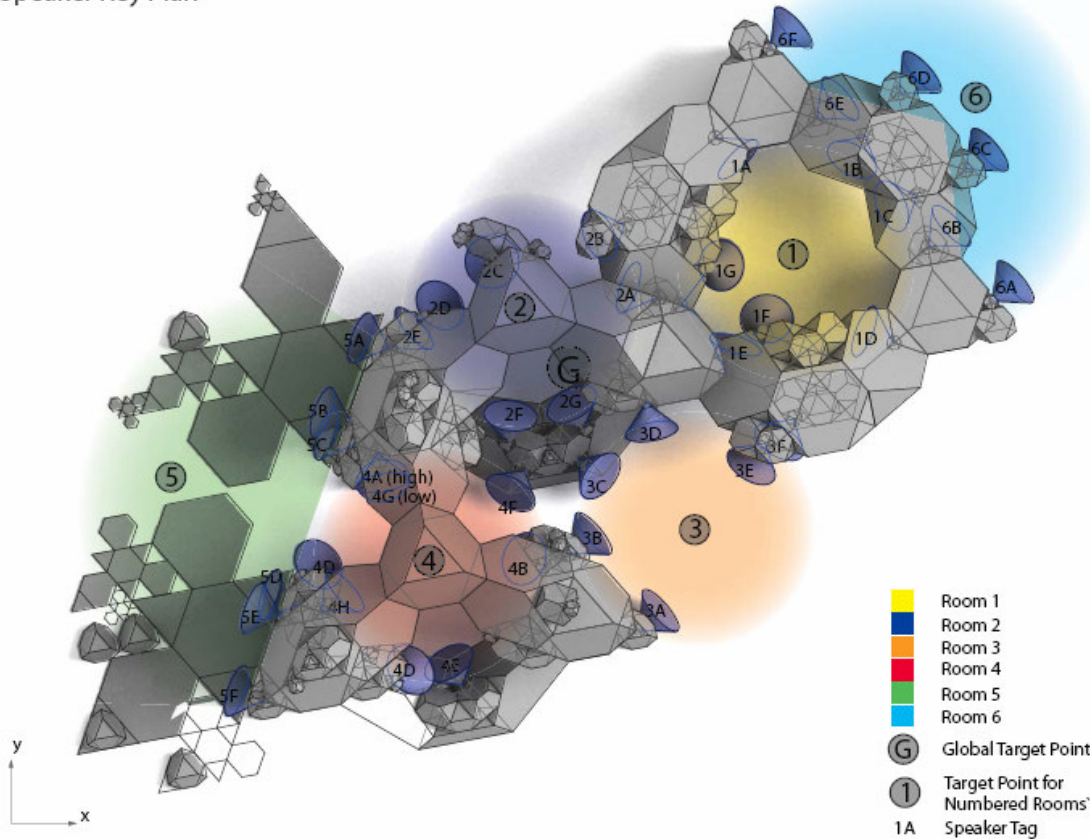


Fig. 1: Plan view of TML showing “rooms” and loudspeaker locations. (diagram: Aranda/Lasch)

The loudspeakers are arranged to form three types of soundfield:

- Planes of loudspeakers (Rooms 5,6)
- 3D surround sound soundfields (Rooms 1, 2, 3, 4)
- The entire sculpture

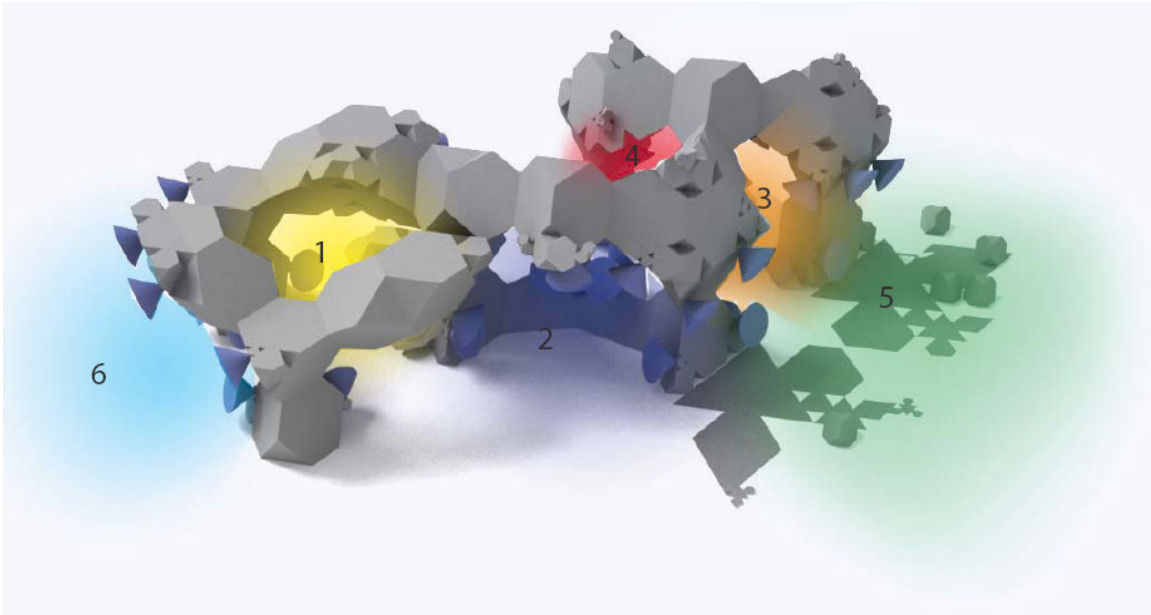


Fig 1a. Audio areas. (diagram:Aranda/Lasch)

Sounds can be directed to all of these areas simultaneously, or to any individual loudspeaker.

The distribution of sounds is realised by using interfaces that have been written for Max/MSP but can be run on any OSX or Win computers as standalone program, without the need to have Max/MSP installed.

TML audio control software provides real-time spatialisation of up to 10 simultaneous sound sources *per soundfield*. Individual sounds can be placed in a fixed position, spread over a number of loudspeakers or moved according to pre-defined or algorithmically controlled spatial trajectories.

Sounds can also be positioned or moved across the whole loudspeaker system that is between and across individual soundfields. Spatial trajectories can also be chosen from a palette of motion archetypes or drawn using a computer mouse within TML graphic interfaces, which direct or position sounds.

Concepts of soundfile spatialisation

TML Spatial Audio Objects

The movement and placement of sounds on TML is supported by the concept of Spatial Audio Objects (SAOs).

A SAO consists of a sound source plus a spatial trajectory or a spatial location that describes where a sound will appear or how it will move.

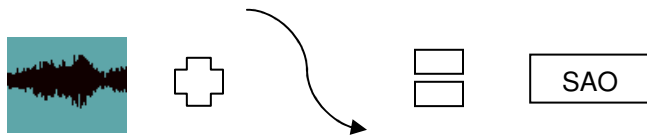


Fig 2. Soundfile and its trajectory or location are described by a Spatial Audio Object, SAO.

To create a SAO, sound sources are combined with spatial information using the TML SAO Editor interfaces.

SAO Editor

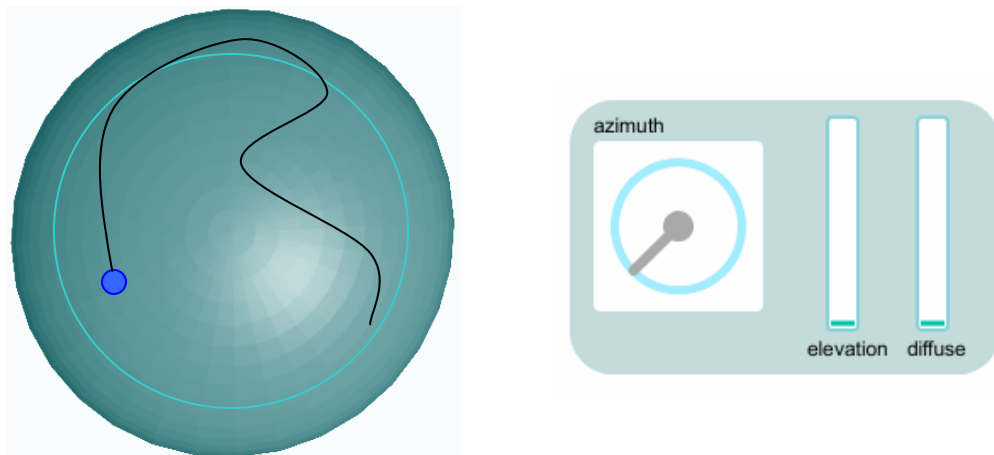


Fig 3. "Hemisphere" panner and azimuth, elevation and diffusion controls to support the creation of sound trajectories.

SAO Editors can operate for each type of soundfield. All have positional controls but the interface displays can vary according to the category of soundfield chosen (hemisphere, plane and a plan view of TML).

The hemisphere interface simulates looking down on a full surround soundfield, which can be envisaged as a sound sphere with the listener at the centre.

Drawing onto the display within the inner circle allows sounds to be located within the top hemisphere of the soundfield. Drawing outside the inner circle positions sound below the listener.

Drawing sound trajectories through the centre will make the sound travel above listeners. The elevation element of the data can be edited subsequently if necessary (see below).

When a soundfile is selected it is displayed in the interface.

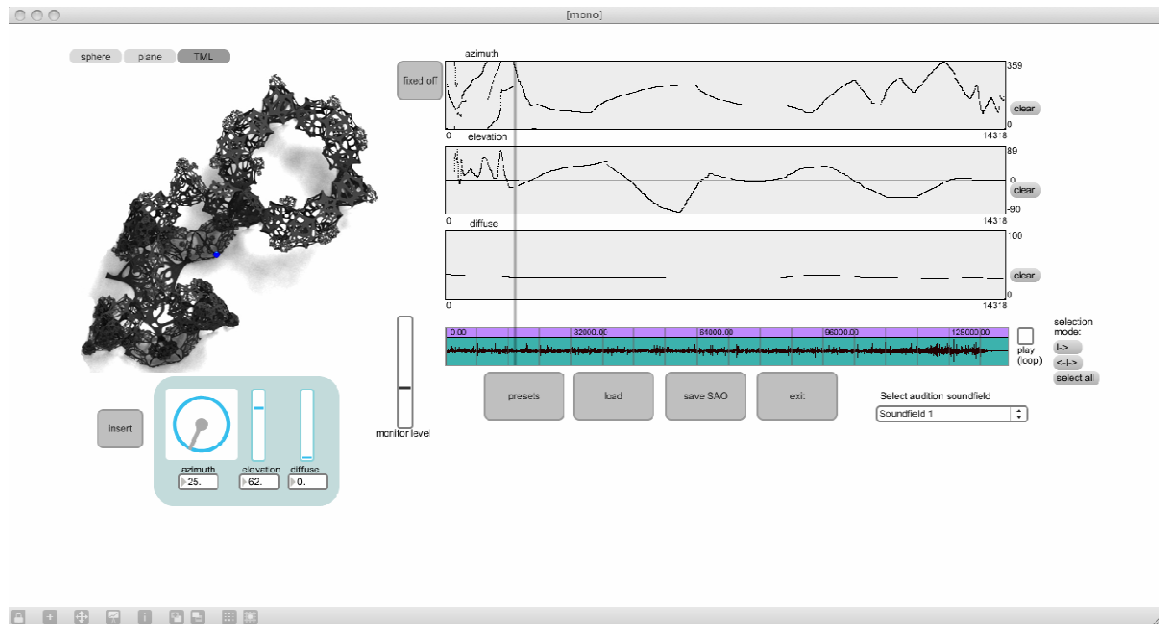


Fig 4. Trajectory data and soundfile display

Pressing “Play”, or pressing the space bar, begins playback and a cursor moves through the soundfile. As it does so, any drawing onto the graphic interface will move the sounds around the soundfield. The azimuth (rotation), elevation (height) or diffusion controls can also be modified.

Movements are recorded as they are made. The resulting spatial parameters will be displayed in the boxes above the soundfile display (shown in Fig. 4).

Additional mouse input can overwrite the stored data or data can be inserted into an existing trajectory.

When the sound playback is stopped, azimuth, elevation or diffusion data can be edited using the mouse to draw within any of tables containing spatial data.

The interface also provides a series of preset motion archetypes, such as random, rotate, scatter, fall etc. accessed by pressing a “Preset” button on the interface. This will display a window from which presets motions can be selected. Additional data can be input via this dialogue, such as the number of times a rotation might occur over the duration of a soundfile.

The SAO editor also contains a “Loop” button to loop the SAO when it is played back if required. Dragging over the audio waveform determines the loop length or portion of the soundfile to be played.

SAOs can be stored using a SAO name and recalled later for editing or entering into a TML score that will sequence the playback of multiple SAO files, for use in other live performance playback systems.

Algorithmic spatial trajectories

The spatial placement or movement of sounds is ultimately encoded as azimuth and elevation angles with respect to the centre of each soundfield (the “central” positions are indicated by the circled numbers in *Fig. 1*).

This can be done using the Max/MSP messages protocols described in the accompanying *TML_Max_Messages* document.

The azimuth and elevation information can be generated by any computer algorithm, Max patch, Open Sound Control data stream (etc.) as required, and then passed to the TML soundfield decoders.

This information can also be sent from external live controller devices to the TML computer via Ethernet, using the TML message system.

SAO scores

SAOs can be added to a score. This determines how and when SAOs are replayed. Scores for SAOs can be created in text files or created using the TML Sequencer interface. This interface can also be used while SAOs are being created, to audition and adjust sound positions or trajectories relative to those of other SAOs.

Scores are used for works which follow a time line.

The playlist contains a start time for each SAO, the SAO name, an audio amplitude control and the soundfield where the SAO is replayed (see document Max/MSP messages for full details).

SAOs can be reallocated to any TML soundfield. The system has also been designed to reproduce the same sound trajectories and positions, even if the locations of individual speakers change in future installations of TML.

Algorithmic compositions

The SAO trajectory editors attach spatial data to soundfiles, but they can also be used to define spatial trajectories alone.

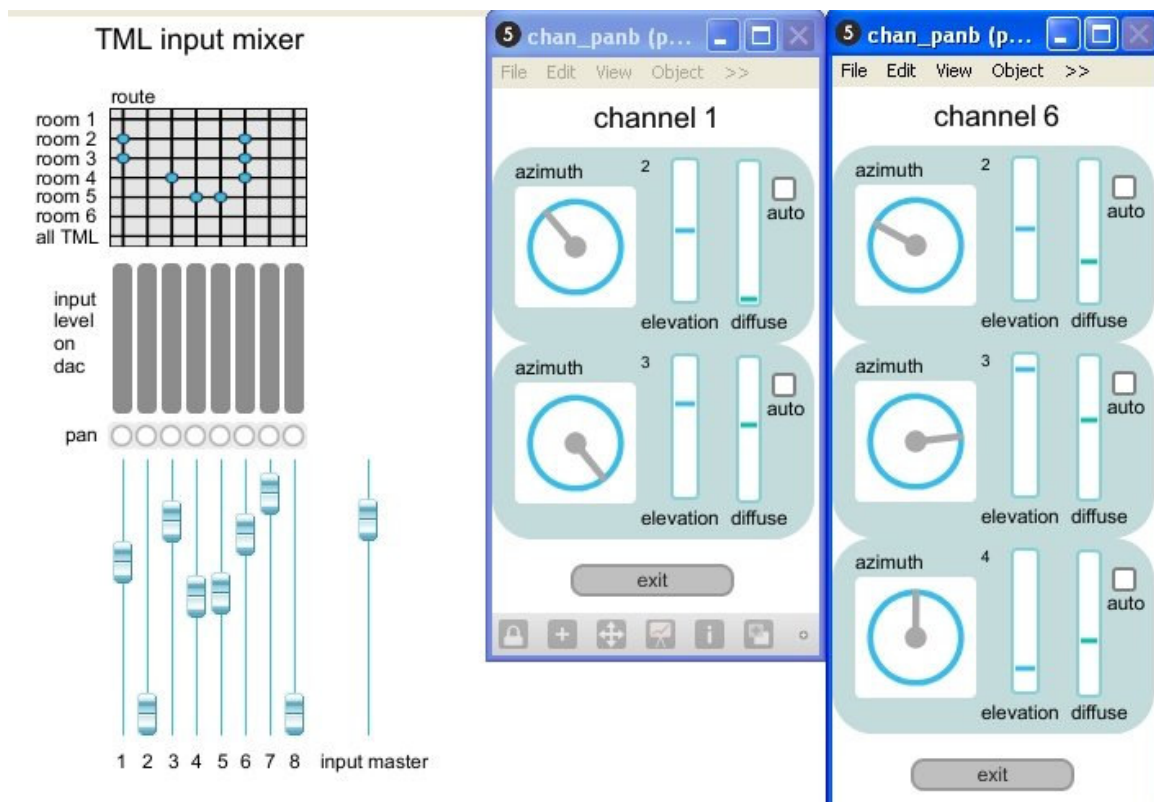
In circumstances where soundfiles are chosen by an algorithmic process, spatial trajectories can also be accessed algorithmically and allocated to sounds independently (see *TML Max/MSP Messages* document).

Audio input

The TML audio computer system can support 48 audio input channels, but is normally cabled for between four and eight audio inputs. Audio signals can be routed in Max/MSP to any TML spatial audio decode objects or to any individual loudspeaker.

The TML Live Mixer software interface controls the spatial distribution of live input signals with a series of panners which include LFO functions for auto panning.

Live input signals can be routed and positioned within any or all of the soundfields simultaneously.



Max/MSP

Any Max/MSP patch can be run alongside the TML software. Max/MSP patches can send audio, trajectory information and other control information to the TML software using the messages defined in the *Max/MSP messages* document.