

Recent work with insects (particularly mosquitoes), provides an important departure point for the composer who has spent some time now working with recordings of malaria-free *Anopheles gambiae* (*A. gambiae*). Studies of the insects has revealed that they respond to very specific changes in wingbeat frequencies during mating and other forms of insect taxis. In nature, this is referred to as phonotaxis.

*Anopheles* is a stand-alone composition that was requested as part of an inter- and intra-disciplinary research project. The principle premise was to exhibit extreme sound envelope transformations and ambisonic spatialisation of mosquito sounds using unique projection techniques. The result is a repeating 11 minute 13 second acousmatic work composed for thirty two channel system as it was requested to have a circular array of up to thirty two channels (minimum sixteen) for the sound installation. Due to some constraints, we ended up utilising the possibility of sixteen channels in physical projection with the control of the spatialisation done by software developed specifically for this work. The transformation and projection of the mosquito sounds presented unique compositional challenges that have resulted in informed practice for the principal contributor. This was particularly germane as far as physical channels were concerned. This required the audition of two independent mono channels at a time in planned sequences in the studio. This produced a sort-of round-robin style auditioning process that became essential in determining the sonic image of each independent channel in relationship to one another. Although lengthy, this process was entirely necessary and has helped to create a system of auditioning where composers could be requested to sequence large scale works for multiple channels.

The technicalities detailed here regarding the spatialisation of the composed acousmatic material are an important and intrinsic part of the work in that they purposefully moulded the poiesis and aesthetic complex the work finds itself in. An immersive sound system called ImmerGo was used to spatialise the thirty two tracks of mosquito samples. The samples were copied to tracks within a Digital Audio Workstation (DAW). ImmerGo and the DAW run on the same Apple Mac computer. The computer was connected via USB and Ethernet to a Presonus 32S rack mount mixer. The mixer was connected via audio cables to fourteen speakers and one sub-woofer.

The thirty two audio tracks were transmitted over the USB cable to the mixer, and then on to the speakers. Control messages were sent over the Ethernet cable to the mixer, and these messages determined the volume levels to be applied to each of the tracks when they were sent to the speakers. Within the mixer, the mixer inputs and the auxiliary buses form a matrix mixer. The control messages modify volume levels at the cross points of the matrix mixer.

ImmerGo presents a graphic representation of the venue with its speakers and also the track names and numbers. A circle in the room represents the position of the currently selected track, and this circle can be moved in three dimensions by the user. The movements can be recorded. The DAW can be started from ImmerGo, and each track can be soloed, causing only that track to be heard.

The spatialisation was done iteratively. A track was selected, the DAW started, recording requested, and the track moved via the track circle. The movements of recorded tracks can be displayed while a further track is spatialised. There were very explicit instructions from the composer as to how the tracks should move in space, which made the spatialisation task a lot easier (diagram of the composer's spatialisation included - see *anopheles* diffusion chart).

The result of the multi-track spatialisation is an XML file comprising a series of three-dimensional track coordinates and associated time stamps. ImmerGo uses these coordinates and the coordinate positions of the speakers in the room, to determine the volume levels at the matrix mixer cross points. The timing for the application of the spatialisations is provided by the DAW, which regularly sends timing messages to ImmerGo.

When listening to the render, it is recommended to use headphones as the binaural properties of the render are best suited to this mode of listening.