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# M.M.M.M. – A SOUND AND VISUAL INSTALLATION

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*M.M.M.M.* is a generative sound and visual installation developed as a temporary exhibit for the Puppet Museum of Porto. It leans on the history of the museum and of the company that created it, the Puppet Theater of Porto, and develops a distributed sound composition with generative characteristics, built from sound recordings created through the manipulation of puppets and scenic objects from the archives of the company.

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## 1 . CONTEXT

The Puppet Theater of Porto (PTP) was founded in 1988 by João Paulo Seara Cardoso and has since premiered dozens of plays, from performances inspired by the Portuguese puppet tradition, to street theater and stage plays created for both adult and younger audiences.

The Puppet Museum of Porto (PMP) was inaugurated in February 2012, featuring a series of exhibits from the collection of the Puppet Theater of Porto as well as a room for temporary exhibitions.

Miguel Carvalhais and Pedro Tudela first collaborated with the PTP in late 2011 while composing a soundtrack for the play *OVO*. In 2013 they were invited to develop an installation for the temporary exhibitions room of the museum. This piece, titled *M.M.M.M.*, was developed from August 2013 to January 2014 and presented from February to July 2014.

## 2. "OVO", "AB OVO" AND "M.M.M.M."

For the soundtrack of the play *OVO*, Carvalhais and Tudela composed 19 pieces to be played back on cue and mixed live with the voices of the actors. As a subsequent effort, the materials collected and developed during the composition process were used in the creation of a further set of 6 pieces, released in January 2014 as the CD *Ab OVO*.

Fig.1 Scene from *OVO*. Photo © Tuna TNSJ.



Working closely with the puppets, designers and puppeteers during the development of these two works, the authors became aware of a rich sound potential to be

explored. Furthermore, during the conceptual stage of the installation, they also discovered that whilst the museum was populated by dozens of puppets on display, with the exception of somewhat rare video presentations, all of these were static, being neither manipulated by puppeteers nor visitors. They were presented as motionless objects and not as the dynamic actors that they were created to be and that they only became in the hands of puppeteers. Even when smaller stages or elaborate scenic arrangements are presented at the museum, they are nevertheless displayed without life or action, almost as if they are permanently waiting for puppeteers and audiences to enter at any given time and for a performance to start.

The conceptual starting point for *M.M.M.M.* was therefore found at the intersection of these two realizations and in the wish to bring the sounds and actions of the plays, the dynamism and the life of the puppets, actors and stages back to the space of the museum. As the puppets physical presence is felt everywhere else in the museum, the authors opted to develop the installation focusing on the puppets' sounds, on the audible layer of their manipulation.

### 3. SOUND SOURCES

The raw material for the installation was assembled through the manipulation of puppets. Besides those on display at the museum, the authors were also granted access to the archives of the PTP, filling three floors of a building in Porto's old town and storing a large number of puppets, sets and stage mechanisms used by the company. The same building also houses the company's workshop, where new puppets are developed and where restoration work for the museum takes place.

During a series of recording sessions organized at the archive, several puppets, sets, mechanisms and accessories were manipulated, exploring their mechanical structures, their articulations, joints and materials, to capture the sounds produced during their operation (including those of the puppeteer's motion, breathing, etc.). These puppets were in varying states of preservation, from well preserved or restored and fully operational, to severely damaged, either due to accidents or decay or simply because they were discarded experiences or prototypes.



Figs. 2 & 3 Recording with puppets.

The recordings were made as 2-channel files. From the several hours of material collected, the authors prepared a selection of over 500 edits, ranging in duration from just under one second to one and a half minutes. Besides minimal equalization or denoising, no further post-production was carried out.

From the same set of recordings, the authors also produced a smaller set of two-dozen sounds with durations varying from just over thirty seconds to almost forty minutes and edited to loop seamlessly. These were more abstract and tended to be continuous or to slowly modulate, they were meant to create an ambient framework for the remaining sound events and to help marking stronger contrasts in the global sonority of the work.

#### 4. PHYSICAL SETUP

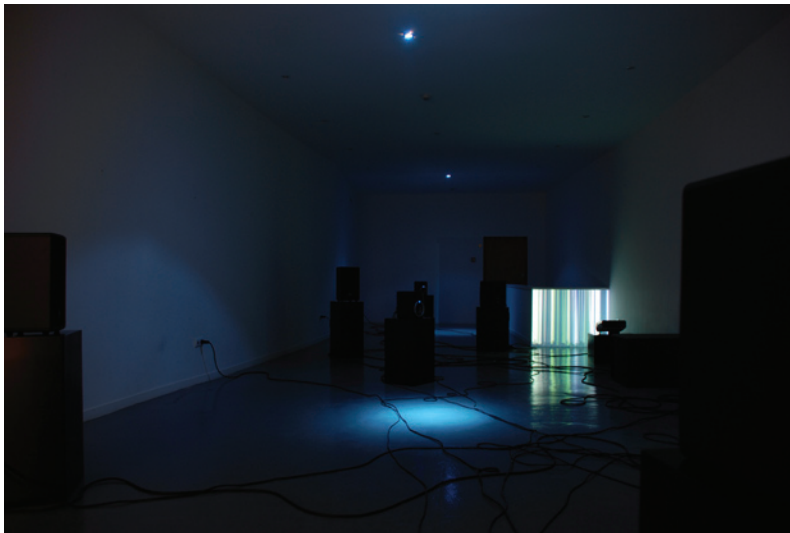
The temporary exhibitions room of the Puppet Museum of Porto is a 15.5 x 5 m room without windows, two doors on opposite sides and a small stairwell to access a currently unused underground room.

Six full-range active loudspeakers were mounted on black parallelepipedic stands, not totally dissimilar to those used elsewhere in the museum to display puppets and objects. Although the speakers were kept in plain sight, no effort was made to lighten them or to somehow attract the visitor's visual attention to them. Rather, they were spread over the room, allowing space for circulation and directing the sound projection roughly towards the center of the space. Although it would be possible to hide the speakers, the authors found that a casual setup

on stands would be in line with what can often be experienced in puppet theater, where structures for the support and manipulation of puppets, as well as the puppeteers themselves are not necessarily hidden from view, rather assumed to be an integral part of the performance, although not its visual focus.

The computer running the installation and the audio interface were stored away from view, with all the cables casually arranged on the floor of the room, contributing to an overall look of the installation as a *work in progress*. The lights were dimmed to a minimum, with the stronger light source being a visual projection directed to a small wall, illuminating the room with a soft flicker.

Fig. 4 View of the installation



## 5. THE COMPOSITION

The main software for the sonic component of the installation was developed in Max 6. The patch includes 4 main sound modules – 3 Sample Players and a Loop Player –, a Reverb module and a Master Control module.

The Master Control (MC) module is responsible for marking the structural sections of the composition and for determining volume balancing and the global density of the composition, delegating most of the remaining choices to the other modules.

The 3 Sample Players (SP) share a similar base-structure with a 2-channel sound player that is randomly loaded with one of the edits. All of the edits were named with a serial number and two attributes that determined their probability to be repeated after play and a maximum pause to be respected between plays (in ms).

For convenience, these attributes were included in the file name – e.g. *MMM089-repeat85-pause2000.aif* or *MMM090-repeat20-pause1000.aif* – and are retrieved upon load of each file using a parser of regular expressions. Upon playback of each file, the SP determines whether the file will be replayed or if a new file will be loaded. In either case, before starting a new play, a variable pause is respected (randomized from zero to the value in the pause attribute multiplied by the global density).

At the start of each new play, each SP directs its output to two of the six speakers. This change takes place immediately, in an attempt to maximize the spatial dynamics of the composition. Each of the three SP runs autonomously in regards to timing and sources. All three SP share the same set of files and are not programmed to filter repetitions or to avoid files that may have already been loaded by other modules.

The MC module counts the number of plays from the SP modules and when it reaches a preset threshold, it marks the start of a new section of the composition. At these times, the control of the overall density of the composition is achieved through two systems: by deciding which of the three SP will be active in the new section and by varying the multiplier for the maximum duration of the pauses between plays in the SP. These decisions are probabilistic, the first with a pseudo-random function, the second selecting from a predetermined set of multipliers (0.5, 0.75, 1, 5, 10, 20). Although the number of files to be played in each section is constant, the final duration of each section is determined by the sounds played and by all the pauses, thus varying considerably.

The Loop Player (LP) contains a 2-channel sound player that is randomly loaded with one of the files available in the set of loops. At the start of each section it determines whether to persist playing the same sound or to change and, whenever a new loop is selected, the module cross-fades the currently playing sound with the new one over a period of as much as ten seconds.

The LP also uses two of the six speakers, but the channels are not chosen when a new sound is selected but rather when this happens in the first SP (henceforth SP1). Each new spatial position is cross-faded over the course of five seconds, allowing the looping sound to be continuously moving across spatial positions. The LP is permanently playing; its volume is controlled by the MC and gradually changed to a new value at the start of every section.

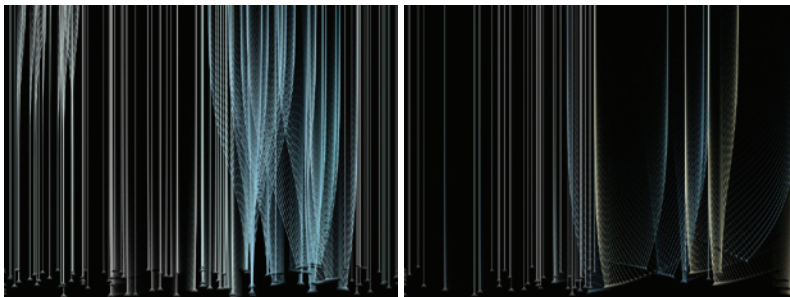
Finally, a Reverb module is connected to the other sound modules, dynamically processing their outputs, with its timing controlled by SP1. Whenever SP1 finishes playing a sound, it instructs the Reverb module to change its parameters, randomly defining new parameters, output volume and destination to its outputs, using a process similar to that of SP. It will also, and perhaps most importantly, select which of the other modules to take as input. Although not producing new sounds per se, because its outputs may be routed to speakers that are otherwise not engaged by any of the remaining modules, the Reverb module is experienced as a de facto fifth sound module.

## 6. VISUAL PROJECTION

The visual projection was developed with the double intent of providing visual cues of the installation's operations and of conceptually reinforcing it. It is directed at a 1.2 x 0.8 m wall close to the floor.

Over a black background a series of white vertical lines are drawn, hanging from the top of the projection and terminating in a triangular form at a small distance from the bottom of the projection. Although this may at first seem rather abstract, as soon as the projection animates, it becomes clear that through structure and physical dimensions, it intends to develop an analogy with string puppets on what can be read as a stage.

Figs. 5 & 6 Aspect of the visual projection.



The visuals are generated in real time and are synchronized with the audio layer of the installation. Whenever the SP modules play, their outputs are analyzed and, if they exceed a threshold, the value of the maximum amplitude is used to stimulate the strings in the projection. The higher the amplitude, the bigger the number of strings to be stimulated and the stimulus given to each of them. In moments with fewer events and lower overall

amplitude the strings remain almost static whereas in moments with a higher activity, the strings tend to jiggle vigorously and sometimes to be violently rearranged. All lines start in white and their colors are gradually changing according to the amount of stimuli received, with the MC module controlling the hue, slowly circling during a period of around 180 minutes.

The system for the visual projection was prototyped in Processing and implemented in openFrameworks, communicating with the Max patch through Open Sound Control.

Fig. 7 View of the installation.



## 7. CONCLUSION

*M.M.M.M.* is a generative sound installation with a visual component. It is a site-specific work leaning on the history of its location and on the context it sets for its experience by visitors.

*M.M.M.M.* develops a distributed sound composition that has characteristics of a generative system. Although the sound sources are prerecorded, their articulations during the presentation are highly variable and there is no score or centralized control of its development over time. After the initial setup, the only control that one can



have over its deployment is at the level of the overall volume balance, by adjusting the global output gain. Every other aspect of the runtime articulation of the system, of its performance, was programmed to be autonomous.

*M.M.M.M.* was created to be shown for six months, therefore needing to balance two characteristics: to be able to showcase its gamut of outputs during relatively short contacts with the visitors, and to develop the composition over a long span of time in a sustainable manner, avoiding excessive repetitions or monotony.

The authors were aware that the average duration of any single visit to the installation would most likely be rather short, perhaps in the vicinity of five minutes. Some visitors would hopefully linger over for a more prolonged time or make repeated visits, and to these, the system should be able to demonstrate a capacity for reinvention or surprise. Although there are no hard-coded time-related variations in the system – e.g. variations mapped to the time of day or day of the week – it was discovered that the autonomous operation of the modules conduced to significant variations of the system's outputs during the performance.

The authors' goal was to build a permanently shifting composition with a sufficiently large variability (so it would seem potentially endless), an open composition that would develop a marked structure, with a clear distinction between sections but that would nevertheless keep its identity in spite of the continuous variations.

#### **ACKNOWLEDGEMENTS**

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