THE SOUND MACHINE:
A STUDY IN STORYTELLING THROUGH SOUND DESIGN

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ABSTRACT
The term audio film refers to a novel format of sonic art that explores the possibilities of telling a story solely through sound, sound processing and spatialisation, without the need for visual elements or a narrator. The term audio film was coined by the authors as part of the research project entitled ‘The Design of an Audio Film for the Visually Impaired’. The term was chosen for two main reasons: firstly, because the final work is to be experienced in a cinema environment, and secondly, because certain elements of the filmmaking process might be adapted for the conveyance of a story through sound, creating an experience equivalent to the cinematic experience. The present paper explores the possibility of minimising or eliminating speech in audio films. In particular it focuses on the comparison of two versions of an extract from The Sound Machine by Roald Dahl (1949). The first version portrays the story through the use of sound effects, internal sounds and music, while the second, is identical to the first but with the addition of speech.

Categories and Subject Descriptors
H.5.5 [Information Interfaces and Presentation]: Sound and Music Computing - methodologies and techniques, modeling, signal analysis, synthesis, and processing

General Terms
Design, Experimentation

Keywords
Audio film, sound design, storytelling, spatialisation

1. INTRODUCTION
In our everyday lives we use sound as a source of information about our environment in a very natural and intrinsic way. However, our understanding of how sound portrays information is still very limited. In recent years different methods and techniques have been developed to convey information solely through sound. In the field of Auditory Displays (AD), research has been carried out to explore how information, such as data and messages, can be presented through non-speech audio [1]. Moreover, the research field of Sonic Interaction Design (SID) concentrates on how sound can be designed to portray interactions between humans and/or objects in an informative way [2, 3]. Despite the fact that applications of these research areas are often technical and scientific, it has been suggested [4, 5] that strategies and techniques for effective sound design can be acquired from more creative fields such as film, theatre, radio and games, areas in which sound design is an established form of communication and has demonstrated to be successful in conveying information. Whereas film and theatre sound portrays story information together with images, in radio dramas and audio films sound is the only medium used for storytelling and therefore projects in these areas are of particular interest to AD and SID. This paper looks at some examples on how non-speech sound has been used in radio drama to convey storytelling, and uses these observations in the creation of a new audio film. The process of creating the audio film is described and the success of the sound design is evaluated through a listening test. The results are interesting for both creative and scientific/technical applications.

Audio films differ from other formats because they do not depend on either visual elements or a narrator to successfully convey a story. Instead they rely solely on sound, audio processing and spatialisation. The viability of this format was first explored by the authors in 2008, [6, 7] through the design of an example based on Roald Dahl’s Lamb to the Slaughter (1954). In this example, sound effects were used to both represent actions and, in the form of soundmarks, help listeners identify the different spaces included in the piece. Also, artificial reverberation was employed to suggest the layout of the spaces as well as to indicate the movement of the characters. Non-diegetic music was used in the same way as in films to indicate the characters’ feelings, enhance tension and as a leitmotif to clarify the plot.
The present paper focuses on the design of an audio film based on an extract from Roald Dahl’s *The Sound Machine*. This story was chosen because it features unrealistic objects and events, which make the sound design task highly challenging. Dahl’s story was first published in *The New Yorker* on September 17, 1949 and it tells the story of Klausner, a man passionate about sound, who invents a machine capable of detecting frequencies beyond the reach of human hearing and converting them into audible sounds. In the selected extract Klausner decides to test his machine, which is described as ‘a black box about three feet long, the shape of a child’s coffin’ [8, p. 298]. He takes it to the garden and places it on a wooden table to test whether it works. He is excited about his invention and notices his neighbour, Mrs Saunders, cutting roses in her garden. He switches on the machine, tunes it and waits anxiously. Suddenly he hears ‘a frightful piercing shriek’ [8, p. 303] through his headphones, he does not know where the sound is coming from, the only one nearby is Mrs Saunders, and he is sure it is not her. He hears the sound again which is described as ‘a throatless, inhuman shriek, sharp and short, very clear and cold. The note itself possessed a minor, metallic quality that he had never heard before.’ [8, p. 303]. Eventually he realises that this is the sound of the flowers screaming as they are being cut. In order to analyse the effectiveness of non-speech sound in audio films, two versions of this story were designed employing a 5.1 surround sound setup. The first version, which will be referred to as Version A, employs sound effects, music and internal sound, i.e. the sound that ‘corresponds to the physical and mental interior of a character’ [9, p. 76], in this case breathing and panting, to tell the story. Sound processing and spatialisation are also used as tools to convey the story. The second version, Version B, is identical to the first, but with the addition of speech in the form of Klausner’s thoughts. The present paper describes the design method utilised for these versions as well as the differences in an audience’s understanding and interpretation of each of the versions, looking into the possibility of minimising or eliminating speech in audio films, and providing an insight into the effects of the presence of speech on perception in audio-only works.

2. RELATED AREAS

2.1 Radio Drama

The concept of audio film bears some resemblance to radio drama, the main differences being that an audio film does not use narration and employs surround sound to convey information. William Ash defines a radio play as ‘a story told in dramatic form by means of sound alone.’ [10, p.1]

Rattigan asserts that radio drama is a format in itself that does not need visual elements, it is ‘not handicapped by the absence of any visual output, on the contrary, its “sightlessness” is the basis of its unique appeal, which promotes an imaginative visualization on the part of its listeners’ [11, p.1].

An audio film is also a format in itself that does not need images. On the contrary, it is designed with a purely aural approach, which stimulates the listener’s imagination. An audio film also includes the same elements present in the radio drama: silence, pauses, voice, sound effects, utterances and music [11].

As regards sound effects, Rattigan argues that they need a verbal contextualisation to acquire meaning for the listener regarding their intention and their consequence. At the same time he warns that the intentions stated should not be naïve or overstated [11, p.154]. Crisell also suggests this need of contextualisation by stating that ‘it seems doubtful whether any radio sound is ultimately meaningful without the help of speech’ [12, p.141].

Although it could be agreed that sound effects, which are not contextualised, might disorient the audience, speech contextualisation might not be the only alternative. Music could be used to denote certain meanings in those cases in which verbal statements would destroy the mood of a scene of a radio drama or an audio film. Furthermore, it seems that by considering that sound effects must be contextualised through speech, a great stress is being placed on the voice while denying the possibility of communicating full meaning through non-speech sounds. These opinions seem to underestimate the ability of the listeners to put together different sound effects in their minds to reconstruct meanings or to use other clues other than speech to interpret those sounds. It also seems to be suggested that sounds need to be clarified immediately when it may transpire that meanings become clearer as the story evolves in time and in the listeners’ minds.

2.1.1 “The Revenge” a radio play without words

In 1978 BBC Radio 3 aired The Revenge, a radio play without words, written and performed by Andrew Sachs. This play, which is about a man who escapes from prison and then drowns a man in a bathtub, was innovative because it told a story entirely through ambience tracks (e.g. birdsong in the countryside, people at a pub), sound effects that represent objects and actions (e.g. doors, telephone, motorbike, footsteps), and internal sounds (e.g. panting), but did not include any recognisable words. Andrew Sachs first came up with this idea around 1963 as a result of thinking that

‘people talked too much on radio drama, they never stopped talking and that radio is not just a medium of words but a medium of sound, so surely it might be possible to write something where actual sounds take a greater part in the proceedings.’ [13]

The sounds were recorded on location using a binaural system in order to place the listener in the position of the main character. Significantly, the play was preceded by an introduction as well as a short interview with Ronald Mason (head of drama radio) and Andrew Sachs (writer and performer). In this introduction, various statements reveal how much the authors fear that this experiment is too unconventional and almost shocking for the audience. The introduction gave the title of the play as well as suggestions on listening through stereo headphones or through ‘well-balanced speakers’, and at ‘the correct level’. During the introductory interview Ronald Mason clarified that this was just a one-time experiment, which was not meant to form part of a series of plays with no dialogue. He explained that ‘Radio is a medium where the word is all important, the word has so much power.’ [14] The interview in question also included further suggestions on how to listen and enjoy the play:

‘I think the listener should listen in as quiet a room as possible, preferably the windows closed and if they can arrange so they are not distracted during the twenty odd minutes that the play runs, and there are as few extraneous sounds as possible. I think
this will help them to enjoy *The Revenge* as a play, which is what it is after all.’[14]

These suggestions seem to imply that listening to just sounds is almost unnatural and requires a specific attitude that is unnecessary when speech is present.

Interestingly, parts of the plot are revealed in the interview. For instance, Ronald Mason stated: ‘What I think is absolutely important when you are listening to this play is to remember that implicit in the title is the theme.’ [14] Also, while discussing sound effects in the play, they say that in the play someone dials 999, thus revealing its ending.

It is possible to argue that by including these clarifications in the introduction, and even by the inclusion of an introduction, the interviewees are revealing their lack of belief in radio plays without words, and at the same time they are questioning the ability of the audience to follow the piece without being given any clues. This is also emphasised by the fact, mentioned above, that the creators did not see this attempt as something that could be improved and that had potential. On the contrary, they viewed it more as something of a curiosity. This position is also expressed by Andrew Sachs in the interview by Peter Reed on BBC Radio 7 in 2010. Andrew Sachs said that *The Revenge* was an experiment without much scope: ‘you can’t do half hour plays on them and you wouldn’t want to, the actors are necessary’ [13]

*The Revenge* encountered harsh criticism by writer Jonathan Raban, who described it as a ‘wordless sequence of noises’ and ‘a well-puffed curiosity’ [15, p. 53]. He considered the play to be confusing as well as ambiguous.

Martin Shingler and Cindy Wieringa also question *The Revenge*:

‘As it stands, *The Revenge* demonstrates that audiences can recognise certain actions solely through their sound: e.g., the man being pursued across the countryside, his success in eluding the police, stealing a motorbike, breaking into a house, stealing up on and drowning another man in his bathtub. But what is also demonstrated is the limitation of non-verbal sound to evoke drama: that whilst sound effects and acoustics can successfully convey something of the what, the where and the how, they are incapable of dealing with the why. By the end of the play, we know what has happened and where it happened but have no sense of who the characters are, what their relationship is (or was) to each other nor what motivated this act of revenge. In other words, we have only half of a story.’ [16, p. 52-53]

Shingler and Wieringa’s argument can be deemed merely speculative due to the fact that no research seems to have been conducted to observe how much information was successfully transmitted to the audience. For this reason, it seems difficult to claim that the elements and actions from the story were all correctly recognised by the audience. Furthermore, it might be contended that the indication of the relationship between characters and the motivation for certain actions is not the most important part of some stories, or that this could be conveyed through alternative sound elements such as music, which is not present in *The Revenge*. Music itself can be used to convey information about a character’s emotional state, create a general atmosphere or a specific mood, and as a means of narration [17].

Electroacoustic composer Trevor Wishart [18] does not consider implausible the idea of conveying storyline solely through sound, but he considers that, with this purpose, it is necessary to develop a new form of sonic art. Wishart says referring to *The Revenge*:

‘Although the play demonstrated the inherent power of sound-effects techniques, it appeared, however, as a poor substitute for a real text-based narrative rather than the development of an entirely new art-form based on the subtle composition of aural landscape.’ [18, p. 138]

*The Sound Machine* differs from Sach’s experiment because, adhering to Wishart’s statement, it is part of the design and exploration of a new format of sonic art, which follows design criteria that are specific to it, and that has been tested and is being tested with the objective of improving the format. It is not meant to be an isolated example; it is part of a series of *audio films* that aim to study the potential of the format as well as the challenges faced by the sound designer.

### 2.2 Vococentrism

This project compares the differences between two versions of the same piece. As mentioned above, Version A includes sound effects, internal sounds and music, while Version B, adds speech. Michel Chion [19] explored the concept of *vococentrism* in reference to the predominance of the voice over other sounds in everyday listening. If a human voice is present the ear will focus on it granting it more importance than to any other sound and organising the entire aural perception around it. Referring to the voice, Chion not only considers words but also includes internal sounds

Vococentrism also applies to cinema, and it is possible that it will apply to *audio films*. Chion explains that

‘In actual movies, for real spectators, there are not all the sounds including the human voice. There are voices, and then everything else. In other words, in every audio mix, the presence of a human voice instantly sets up a hierarchy of perception.’ [20, p. 5]

The concept of *vococentrism* will be considered when analysing the way in which the perception of sound effects in Version B differs from the perception of the same effects in Version A. Also, it will help in the understanding of the amount of information that can be transmitted through internal sounds.

### 3. THE DESIGN OF THE SOUND MACHINE

#### 3.1 The adaptation

In this section the differences between Dahl’s story and the *audio film* will be described. The first change included in the *audio film* concerns the fact that in Dahl’s story Klausner stores his sound machine in a garden shed, and it is from this shed that he carries the machine out to the garden. In the *audio film* Klausner is portrayed as leaving his house. This detail was not considered of great importance as emphasis is placed on the listeners recognising the fact that Klausner leaves an enclosed place and goes out to the garden carrying his machine, rather than the type of building he is leaving.

A significant difference with Dahl’s story is that he describes the ambience as follows: ‘The sun had gone down. There was no wind, no sound at all.’ [8, p. 302]. The *audio film* portrays the
opposite environment through the addition of sounds that characterise the garden including, bird song, distant traffic, a lawn mower and the sound of a rake. This change was necessary because the sound elements are the only clue the listener has to position Klausner in that particular space.

It was also essential to make the presence of Mrs Saunders as evident as possible. Consequently, she is depicted as humming a song (In an English Country Garden). In this way the listener can identify the presence of a female character and, if the song is recognised, link her to gardening tasks. Moreover, the sound of a watering can was included in order to establish the presence of the flowers.

Finally, in the short story Klausner approaches Mrs Saunders after hearing the screaming flowers and asks his neighbour to cut another flower so that he can test his theory. In the audio film, since only an extract of the story was designed, Klausner returns quickly to his house after hearing the scream of the flowers. In this way, the extract is given a clear beginning, middle and end.

3.2 Soundmarks and other Sound Elements

In the design process of The Sound Machine different soundmarks were utilised to make the audience aware of the space in which the scene takes place. Schafer defines a soundmark as a type of sound that, similarly to a landmark, characterises a place for a group of people [20]. The soundmarks employed were the singing of birds, distant traffic, a lawn mower, and the sound of a rake, and they were included to convey the idea of a garden in a residential area.

Sound elements have also been used with the following functions:

1. to indicate the presence of the characters;
2. to define the feelings of the characters;
3. to portray actions;
4. to create associations.

An example of the first is the inclusion of footsteps as well as breathing sounds, in the case of Klausner, and singing, in the case of his neighbour. Klausner’s breathing sounds also relate to the second function, since his heavy breathing is intended to portray his initial anxiety as he-tests the sound machine, while his panting sound expresses his perturbation as he hears the flower shrieking. The third category consists of sounds such as the sound of the flower stems being broken, the sound of Mrs Saunders watering the plants, and the sounds of the switches from the sound machine as Klausner operates it, among others. Finally, it was necessary to incorporate additional sounds that would help set the scene for the listener due to their association with other elements. For example, the sound of the bee was included to make the presence of the flowers more explicit. Sounds within the same frequency range were separated in time and differentiated through changes in spatialisation as much as possible to avoid confusing the listener.

A timeline that details the sound elements used throughout the audio film in order of appearance is presented in Table 1:

| Table 1. Timeline of the sound elements present in The Sound Machine |
|--------------------------|--------------------------|--------------------------|
| **SOUND ELEMENTS**       | **TIME**                 |                          |
| Birdsong                 | 0.01                     | 0.02                     |
| Traffic                  |                          | 0.03                     |
| Lawn mower               |                          | 0.04                     |
| Raking leaves            |                          | 0.05                     |
| Bee                       |                          | 0.06                     |
| Door Klausner            |                          | 0.07                     |
| Internal sounds          |                          | 0.08                     |
| Klausner’s footsteps     |                          | 0.09                     |
| Machine on the table     |                          | 0.10                     |
| Door Mrs Saunders        |                          | 0.11                     |
| Female footsteps         |                          | 0.12                     |
| Flower stems              |                          | 0.13                     |
| Flower shriek            |                          | 0.14                     |
| Watering can             |                          | 0.15                     |
| Music                     |                          | 0.16                     |
| Whisper                  |                          | 0.17                     |

3.3 Sound Layering

The sound that was used to represent the ‘sound machine’ itself was required to be at the same time original, as it represents a machine that does not exists in reality, and recognisable as a sound that can be related to audio engineering equipment. To express these characteristics, it was decided to layer three different sound samples. The first consisted of ‘Radio static with reverb’.[1] This sound sample was chosen to help the listener associate the sound with the idea of a machine used to pick up sound. Filtering was applied to this sample thus creating a sweeping effect through different frequencies in order to indicate that Klausner is tuning the machine.

The second sound sample was a synthesised sound created in Pure Data [21] using Frequency Modulation [22, p. 132]. This indicates that the machine is related to audio.[2] Finally, a ‘whispering’[3] track was used to convey the idea of a machine that captures eerie sounds.

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1 This sound effect, called Radio Static with Reverb was sourced from the Hollywood Edge Sound Designer Tool Kit - Disc 3 - Whooshes, Animals and Ambiences.
2 Special thanks to Chris Robins for having designed the Pure Data patch used.
3 This sound effect, called Weird Male and Female Mixed Eerie Whispering, was sourced from Hollywood Edge Sound Designer Tool Kit Disc 3 Whooshes, Animals and Ambiences.
The most challenging aspect of this project proved to be the sound design of the shrieking flowers. In order to create this sound, four different elements were layered. The first is the call of a hawk\(^4\), which was chosen due to the fact that it is a high-pitched sound and that it is related to nature. The second was the sound of a celery stick being broken. This sound was a processed version of the sample used to indicate that the flowers’ stems were being cut. It was included in the layering process to allow the listener to associate the flower cutting sound to the shrieking sound. The third sound included was a sample of a woman screaming\(^5\), and its inclusion had the aim of increasing the intensity of the shriek. Finally, the sound of vibrating metal\(^6\) was incorporated in order to add an otherworldly characteristic to the shriek.

### 3.4 Hearing Through Klausner’s Headphones

The *audio film* begins with the listener placed in the centre of the scene, listening to the sounds from a position that is not associated with any character. However, Dahl’s story describes Klausner testing his machine through headphones. In the *audio film* the moment Klausner puts his headphones on and switches the machine on, the listener shifts position and begins listening from Klausner’s aural perspective, i.e. through his headphones. In order to achieve this effect, the samples that portrayed external sounds, such as ambience tracks and Mrs Saunders singing, were low-pass filtered and the levels were reduced; while the sounds of the ‘sound machine’ and the sounds of the flowers, were given higher levels in comparison, and were equally panned to all the channels.

### 3.5 Spatialisation

The *Sound Machine* was designed using a 5.1 surround sound setup, which was used to indicate the position of characters in space, their movements, as well as to convey the idea of sounds being heard through headphones.

Figure 1 indicates the position of the main sound elements in the 5.1 surround sound setup.

As mentioned in the previous section, the *audio film* starts by positioning the listener in the centre of the space. Consequently, the ambience tracks (bird song and traffic) were panned equally to all the speakers, in order to emphasise the idea of being immersed in the setting.

During the process of spatialisation special attention was paid to making the elements seem as clear and different from each other as possible, in order to aid the listener in their understanding of the plot. This was of great significance, for instance, in the positions chosen for the two doors. The original position of Mrs Saunders’ door in the right channel led to confusion and her entrance through this door was wrongly interpreted as Klausner exiting the scene. Consequently, Mrs Saunders’ door was panned to the left.

![Figure 1. Spatialisation in *The Sound Machine*](image)

The panning of footsteps and internal sounds follow the characters movements. In Klausner’s case he is panned from the left surround to the right surround channel, and then back as he returns to the house. Mrs Saunders is panned from the left to the centre channel to indicate her movement as she exits the house, goes out to the garden and approaches the flowers.

Non-diegetic music was panned equally to all the channels in order to create a sense of envelopment.

### 3.6 Music

The musical piece entitled ‘Klausner’s discovery’ was composed by Chris Robins and features piano and strings and presents an ominous tone. It begins as Klausner hears the first shriek and is used to make explicit Klausner’s anxiety towards the scream. This usage corresponds to one of the uses of music in films: ‘to reveal, confirm, or make precise a character’s feelings toward something or other in the story.’ [18, p. 511]

### 3.7 Version B: The Addition of Speech

Version B includes the thoughts of the main character through internal monologue. The phrases included are purposefully short and do not offer excessive information. The purpose of their addition was to allow the analysis of how perception changes when audio-only pieces include speech and whether they are necessary to clarify certain elements of the storyline. The phrases in question are:

‘OK I’ll try again, maybe out here in the garden the reception will be better’

‘Hmm something strange there, what was it?’

‘Oh my God, is it possible? How could it be?’

The first phrase was included to emphasise the fact that Klausner is going out to the garden and to clarify that he is using a machine that relates to sound. The second phrase aims to emphasise his

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\(^4\) This sound effect, called Eerie Hawk Call, was sourced from Hollywood Edge Sound Designer Tool Kit - Disc 3 - Whooshes, Animals and Ambiences.

\(^5\) This sound effect, called Woman Screams Piercing, was sourced from Hollywood Edge The Premiere Edition Human Sounds 1 CD PE 13.

\(^6\) This sound effect, called Vibrating Metal, was sourced from Hollywood Edge Sound Designer Tool Kit - Disc 3 - Whooshes, Animals and Ambiences.
surprise. Finally, the last phrase highlights the fact that he has heard something ‘unnatural’ and that he is troubled.

These lines were processed by adding reverb using the Space Designer plug-in in Logic Pro 9, and employing a modified version of the preset: 1.8s Midnight Hall. The addition of an unnatural reverb effect to the lines delivered indicates that they are not part of a spoken monologue but rather part of Klausner’s thoughts. This effect was emphasised by panning the speech to the left-surround and right-surround channels to avoid being associated with Klausner’s physical position (right-surround).

4. LISTENING TEST

A listening test was created to evaluate how an audience would perceive the pieces. The people tested were asked to summarise the plot, to list the recognised characters, the sounds and their location, and to add general comments.

In order to test the pieces, two groups of 15 people were formed. Group 1 listened to Version A, while Group 2 listened to Version B. The test subjects comprised 20 males and 10 females. The average age of the subjects was 27. Out of the 30 volunteers, 20 were native English speakers and the other 10 were people for whom English was a second language. The pieces were heard in a recording studio control room well isolated from noise. Each test was carried out individually with the listener positioned at the centre of a 5.1 speaker setup (defined by ITU-R BS 775-1). The subjects were asked to hear the piece twice and then answer a questionnaire. No information about the piece or the questions was given to the subjects before the test. None of the subjects had any previous knowledge of the story.

4.1 Recognition of characters and sounds

All subjects recognised the presence of a male character and 29 out of 30 subjects identified the presence of a female character. The internal sounds of the male character and the humming of a song by the female character were enough to make the presence of these two characters clear to the audience.

In both versions at least 67% of the subjects recognised the birdsong ambient sound, indicating an outside setting, Mr Klausner’s footsteps, and the humming of a song by Mrs Saunders. Furthermore, around 33% of the subjects recognised the bee sound and the machine sound. None of the subjects noted the presence of ambient traffic sounds, the rake, or the man connecting headphones to the machine.

Some sounds were recognised better in one version of the piece than the other. Mrs Saunders’ footsteps, for example, were not well recognised in Version B. The reason for this might be that they overlap with the first phrase delivered by Klausner, the presence of speech causing the listeners to focus their attention on what is being said and not on other sounds. The internal sounds of Klausner were also mentioned by fewer listeners of Version B. This might be because in Version B the presence of Klausner is mainly connected to the presence of his speech, while in Version A the internal sounds are the main sounds (together with footsteps and other movements) that allow the audience to recognise Klausner’s presence; these sounds also allow the listener to assess his feelings and his personality. Again, the presence of speech seems to divert attention away from other auditory cues, which contain important information about the story.

The door of Mrs Saunders’ house was also significantly less recognised or remembered in Version B. Although this sound did not overlap with speech, it did come just before Klausner’s first phrase. Consequently, the listener might have forgotten about it because it was considered less important than speech and therefore not ‘worth’ remembering in relation to the words that came afterwards.

More listeners of Version A mentioned the presence of non-diegetic music in comparison to the listeners of Version B. This does not mean that the listeners of Version B were not aware of it. However, it might indicate that, since Version A did not include speech, the listeners felt they had to make the most of every element in the piece to interpret the story. Conversely, listeners of Version B placed the emphasis on the speech when interpreting the story and paid less attention to other sound elements.

Some important elements of the story such as the flowers’ shriek and the cutting of the flowers were heard by most people, but they were wrongly interpreted leading to an incorrect understanding of the plot. The sound of breaking celery was used to portray the action of cutting the flowers. This sound was perceived as a crunching sound or the sound of opening a pea pod, among others. The shriek produced by the flowers and amplified by the sound machine was heard by the subjects but attributed to a bird or an alien creature. Most people heard the presence of a machine, but nobody clearly understood what the function of the machine was. The closest people came to the concept of a ‘sound machine’ was in instances where it was interpreted as a radio-like machine.

In the audio film, sounds are filtered when Klausner is hearing the surroundings through headphones connected to the machine. None of the subjects picked up on this sound-processing element, which was intended to give another clue that the machine is used to hear sounds.

Other sounds, less important to the plot, were wrongly interpreted. For instance, the sound of the lawn mower was considered by some to be the sound of a projector or generator, and the sound of water was not associated with the action of watering plants and flowers.

With regard to the localisation of sounds, the best localised sounds were the voices of Klausner and Mrs Saunders, indicating that subjects attributed more importance to the main characters and remembered their locations more easily. Other sounds relating to the main character, such as the door opening and the sounds of the dials and switches, were located correctly by about 50% of listeners. In general there was no difference in the ability to locate sounds between Version A and B.

For both versions of the piece about 80% of the people thought some sounds were difficult to recognise.

4.2 The plot

In both versions over 70% of the people understood some very general elements of the story: that the scene is taking place outside (a garden or forest were mentioned), that there is a man and a woman, and that towards the end of the scene something scary happens and the man runs away disconcerted. About 50% of the subjects mentioned that the man seemed to be working on a machine, but nobody thought that the man was scared by something heard through the machine. About 50% of the people mentioned the scream/shriek sound in the plot summary, however they attribute it to a bird, an eagle or an alien character. The reason why the scream is attributed to a bird or eagle is probably because the sample chosen includes the sound of the call of a hawk mixed with other sounds.
It is obviously a very difficult task for a sound designer to create a sound that does not exist in reality (the flowers’ cry) and manage to generate an association in the listeners’ minds to an object that does not emit sound (flowers), especially when no images are being employed.

In this case the sound designer attempted to suggest the presence of flowers by using the sound of watering plants, the sound of a bee and the sound of breaking celery for the cutting of the flowers. In addition, the song hummed by Mrs Saunders In an English Country Garden, was intended to suggest the presence of flowers. These clues were not enough to make their presence clear.

The piece In an English Country Garden was successful in portraying the presence of Mrs Saunders, but failed to connect the piece to nature and, in particular, flowers, in the listener’s mind. The success of the association is dependent on the listener’s previous knowledge of the title and lyrics. In a new version of the audio film this musical piece could be replaced by an instrumental piece to test whether it would be more effective in conveying the necessary information. However, in order to select a suitable piece listening tests would need to be conducted to determine possible associations between instrumental pieces and nature.

A surprising difference between the plot summaries for Version A and B is the fact that some subjects listening to Version B thought Klausner was using a mobile phone. This seems to be due to the presence in the speech of the word ‘reception’ which, for the subjects, appears to be inextricably linked to a mobile phone, despite the fact that there were no mobile phone sounds in either version and the presence of a mobile phone did not make any element of the story clearer or more plausible. This is a clear cultural effect that has a consequence on the understanding of the story and highlights how carefully sounds and words need to be chosen if storytelling is to be clear.

From the above, we can say that some very general elements of the story were understood by the majority of the audience in both Versions A and B. However, conveying a more detailed understanding of the plot proved to be very difficult. We divided the story in 10 main plot steps and calculated how many people correctly reported those steps in their plot descriptions.

The plot elements were:

1. Klausner leaves the house
2. Walks across the garden.
3. He is carrying the (sound) machine.
4. Klausner turns on the machine and adjusts it (related to sound)
5. Lady leaves house.
6. She goes to the garden.
7. She does the gardening – cuts flowers and waters the plants
8. Klausner picks up a strange sound with his machine
9. He hears the sound a second time and recognizes it is the flower screaming.
10. Klausner returns home feeling perturbed.

Speech in Version B, even though it is kept to a minimum, seems to help clarify some elements of the plot; particularly, that the man is going into the garden, that he is looking for better reception, that he hears something strange and that he is surprised. However we also notice that the inclusion of speech can create confusion (e.g. the interpretation of the word ‘reception’) and can direct listeners to incorrect assumptions.

It is interesting that element number 3 (Klausner carrying the machine) was more easily recognised by the listeners of Version A. An explanation for this might be that the only clue that the listener has of the fact that Klausner is carrying a heavy object is the internal sounds added to depict his efforts in carrying the machine and positioning it on the table. In Version B, these internal sounds are also present, but just after them, the phrase ‘Maybe out here in the garden the reception will be better’ is included. Once more the presence of speech might have been deemed more important than the internal sounds, and therefore the memory of the lines delivered “drowned” the interpretation of the internal sounds. Furthermore, as it was noticed in the summaries, the word ‘reception’ was, in several cases, considered as referring to a mobile phone. This association may have caused the listeners to disregard the idea of something heavy being carried, since they might have thought that the object of relevance in the scene was a mobile phone.

### 4.3 General comments
Several subjects noted that they were aware that they had heard more sounds than those they had listed, but that they could not remember them.

Also, the majority of subjects expressed a lack of confidence in their answers, even when these were correct. They seem to have felt that it was their own auditory perception that was being tested rather than the piece itself.

### 5. CONCLUSIONS
This paper explored, through the making of an audio film, how non-speech spatialised sound can be used to portray storytelling information effectively. In this project, parts of a story were conveyed effectively solely through sound and with minimal or no inclusion of speech. However, other aspects of the story, in particular the unrealistic ones, were not conveyed successfully.

![Figure 2: Recognition of Plot Elements](image)
The most evident case is that of the flowers shrieking as they are being cut. The subjects tried to associate the sound with something ‘known’, and for this reason they isolated the most recognisable of the sound samples used for the creation of the flowers’ shriek, the call of the hawk, and associated it to a bird or something scary like an alien creature. The attempt made by the designer to portray something silent like flowers by introducing sounds that can be associated with their presence (watering, bee, etc.), was not successful and this made it even more difficult for the audience to make an unrealistic association between the shriek and the flowers.

Further work needs to be done in order to deepen the analysis of the way in which the ‘unrealistic’ in The Sound Machine could be better conveyed.

Regarding the differences in perception between Version A and B, it was shown that the phrases added helped the listeners to define some elements of the plot more accurately, for instance that Klausner goes to the garden. However, it was also noticed that speech distracted the listener from other auditory cues present in the piece, so much so that the subjects often failed to make the most of the other sounds. Furthermore, words were deemed so important that in some cases the listeners based their interpretation of the story on the presence of some words (e.g. ‘reception’), even when the other auditory cues were contradicting their interpretation.

Further work is needed to establish whether speech is in fact necessary to portray certain elements of storytelling and what should be the balance between non-speech and speech sound so that all the cues present are used in the process of understanding the story.

As the audio film format is in its early stages its grammar and language is gradually being developed through the design and testing of different examples. As more work is done on exploring different ways of storytelling through sound, and the format is experienced by a larger amount of people, audiences will become more acquainted with the conventions used in audio films, allowing the employment of more effective and complex techniques.

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7. REFERENCES


