MusicBox: creating a musical space with mobile devices

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Angewandte Informatik

Introduction

- This paper describes the ongoing development of a system for the creation of a distributed musical space: the *MusicBox*.
- The *MusicBox* has been realized as an open access point for mobile devices.
- It provides a *musical web application* enabling the musician to distribute audio events onto the connected mobile devices and control synchronous playback of these events.
- In order to locate the mobile devices, a *microphone array* has been developed, allowing to automatically identify sound direction of the connected mobile devices.
- The system has been implemented on a *Raspberry Pi*, making it very cheap and robust.
- No network access is needed to run the MusicBox, turning it into a versatile tool to setup interactive distributed music installations.

MusicBox: creating an open musical space

- The underlying concept of MusicBox is based on a client/server approach, where standard mobile systems (aka smart phones) are used to perform the sound synthesis, or simply the playback of pre recorded sound files.
- The computing power of standard mobile devices has increased significantly during the last few years, making them feasible for sound reproduction.
- In order to perform the synchronized audio playback on the devices, web technologies are used.
- The musical web application was developed using *Node.js:*
  1. for the initial synchronization a web service has been implemented providing the current system time in ms
  2. a web socket based connection to the client is established for sending timing information and control data
  3. a visualization shows the attached clients and also displays status information of the clients
  4. transmission of audio data to the clients
  5. transmission of control data as part of the play back control.

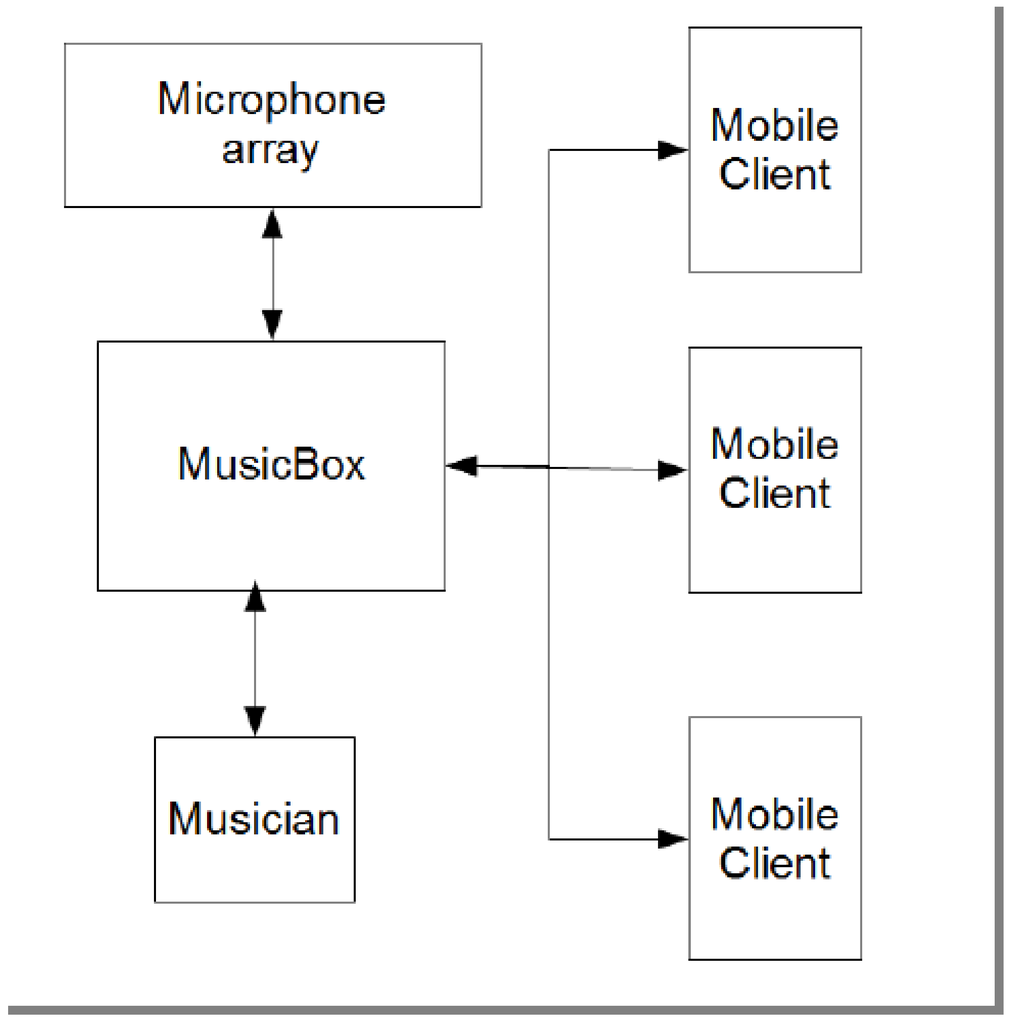

Fig1: The system architecture of the MusicBox. The web application is synchronizing the mobile devices. It provides a control interface to the musician, that allows to transmit audio data and control data.

Synchronizing devices

- The synchronization of the system times is a two step process:
  1. At first a simple AJAX request is executed upon loading the application onto the client, sending system time
  2. In a second step a WebSocket connection is established. This connection is used to further refine the adjustment of the time difference between server and client.
- In our experiments the first phase calculates a temporal difference in the timers of only *30 ms*. The faster second phase is able to decrease this difference to below *4 ms*.

Conclusions

- The MusicBox provides a simple, yet robust and flexible environment to easily create a distributed musical space using standard mobile devices.
- It synchronizes audio playback across the cluster and simplifies the spacial positioning of the connected audio clients.
- The current setup is a good basis for further investigations into the creation of musical spaces.

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