Gibson, Ian

Collaborative music software for mobile phones

Original Citation

Gibson, Ian (2010) Collaborative music software for mobile phones. International Journal of Research and Reviews in Applied Sciences, 2 (2). pp. 104-107. ISSN 2076-7366

COLLABORATIVE MUSIC SOFTWARE FOR MOBILE PHONES

Ian Gibson

Department of Computing and Engineering, University of Huddersfield, UK.

ABSTRACT

The paper reports on the Cellmusic system: a real-time, wireless distributed composition and performance system designed for domestic mobile devices. During a performance, each mobile device communicates with others, and may create sonic events in a passive (non interactive) mode or may influence the output of other devices. Cellmusic distinguishes itself from other mobile phone performance environments in that it is intended for performance in ad hoc locations, with services and performances automatically and dynamically adapting to the number of devices within a given proximity. It is designed to run on a number of mobile phone platforms to allow as wider distribution as possible, again distinguishing itself from other mobile performance systems which primarily run on a single device. Rather than performances being orchestrated or managed, it is intended that users will access it and create a performance in the same manner that they use mobile phones for interacting socially at different times throughout the day. However, this does not preclude the system being used in a more traditional performance environment. This accessibility and portability make it an ideal platform for sonic artists who choose to explore a variety of physical environments (such as parks and other public spaces).

Keywords: *cellmusic, distributed computing, music technology, electro-acoustic*

1. INTRODUCTION

There are a number of artists and systems developers who have explored network-based music. Notably, the League of Automatic Composers wrote music for networks of microcomputers between 1977 and 1983 [1]. Software systems, such as MAX MSP [2] encourage users to compose using object-oriented methods. Currently ensembles such as the Princeton Laptop Orchestra [3] have allowed composers to use WiFi to synchronize events, facilitate communication between devices during a performance and exchange data which influences the output from each device. Web-based composition systems [4] have also emerged, allowing collaborative works to be developed over greater distance.

As mobile phones became more ubiquitous, they were used in performance. For example, the piece Dialtones by Golan Levin used software to dial mobile phones in the audience. Inevitably, as mobile phone computing power increased, composers started to explore these devices as composition tools in themselves. The Daisyphone system [5] allows users to compose using loop-based music. With this system, any device can contribute to the composition, with the same audio being played on each device. The Mobile Phone Orchestra (MoPho) [6] explores artistic expression of mobile phone from an ensemble/repertoire angle. The features of the phone (for example accelerometers, numeric keys, microphone inputs) present the performer with various methods of controlling the onboard sound generating algorithms. Many pieces are conducted while some are free-form.

The Cellmusic system has been developed to enable interactive performance with a number of players using domestic mobile devices (such as mobile phones). This system is designed for spontaneous performance (for example when two or more people find themselves near to each other in a park or outside space). It is intended that users dip in and out of a performance in the same way that they might use social networking software on a day-to-day basis. This, however, does not preclude the system from being used in a more formal performance environment. It is intended that the final system will record and store found sounds, allow transformations between 2 or more sound sources, allow the user to specify algorithms for manipulating sound data.

Each node consists of a mobile device running the Cellmusic software. There are a number of developments which arise from such an environment. Different methods of composition evolve, due to the distributed nature of the nodes. New software instruments and new methods of performing might arise. New working practices and methods of group interaction might also be produced.

This paper will describe the design considerations which led to the development of the software, the motivation for producing the system, a description of the technology and device network.

2. THE SOFTWARE

The system has been developed using NetBeans. The software runs on a mobile phone or device compatible with Java. The function of the device is to collect sonic data, process it, and perform with it. Devices might synchronize and communicate with each other using the Bluetooth communication protocol.

Bluetooth is designed to run at distances of up to 10 metres, however high powered devices will function up to 100 metres. A Bluetooth device can be discoverable. It may respond to an enquiry from another device with the following information:

- Device name
- Device class
- List of services
- Technical information (relating to the device features, manufacturer, Bluetooth specification implemented etc)

Some devices are limited to the number of simultaneous connections they can achieve (typically 3). In some cases, one device may be required to pair with another in order to access its services. A device may have to break a pairing in order to make itself discoverable to others. Every device has a 48-bit address which is unique. Generally these are hidden, with user-defined names appearing in response to scans.

During a performance, a message may be sent from one phone to another requesting that it plays a sequence at a certain time (determined by the phone's internal clock or timer). This is quite a crude mechanism for synchronization and further testing is required to determine latency times in performance.

3. COMPOSITION HIERARCHY

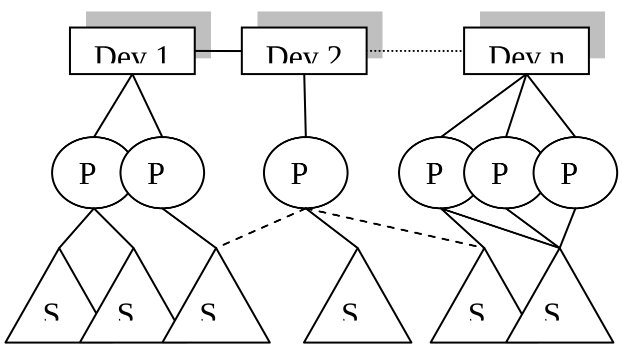

Figure 1. An overview of Cellmusic showing the devices, processes (p1 to p6) and sound objects (s1 to s6).

The Cellmusic system consists of a several devices with each device programmed with a number of processes (See figure 1). A process might be, for example, to play a sequence of notes or trigger the playback of an individual sound.

Processes on one device may refer to sound objects stored on the same client or a different one. A sound object might be a sound produced using MIDI using the phone's internal sound synthesis system or a sound sample (e.g. mp3 file).

Software and initial performance data are programmed using the handset. In some cases, devices are passive and will perform according to the pre-programmed performance data (e.g. a sequence). In other cases, devices will enable performers to interact with, guide and direct the piece by influencing events on other devices.

A piece is organised and scheduled according to a composition hierarchy. At the lowest level, sonic data may be collected using the device's own recording features. Each recording is tagged with a unique ID. This ID can be used by one device to trigger a sound in another device. For example, device 1 may instruct device 3 to play the third sound in its bank.

Messages passing between devices may fall into the following categories:

- Initiation of a sonic event (e.g. play a note, play a sequence of notes)
- Transformation of a sonic event already in progress (e.g. stop playback of a sequence)

- Selection of the sonic event being played (e.g. change the sound or MIDI instrument)
- Cueing of another device to start playing

The performer is presented with the following options displayed on the mobile device:

- Change the current sonic event
- Enter a sequence of events (which may either be initiated on the current device or another device)
- Rest (or pause)
- Play a sonic event (either immediately or after receiving a cue message from another device)

4. RESULTS

There have been several non-public performances of Cellmusic. This has enabled the system to be tested before being used in public performance.

4.1 The Rolling Wave

The rolling wave uses one sonic event and sequence event to trigger a rippling cascade of sound. Performers stand in a straight line. Sequential commands are loaded into each device to trigger the sound of the next device in the chain. The last device in the chain sends a command to the first device, which causes the triggering of 2 sounds in sequence with a slight delay between them. In the next round, 3 sounds are triggered from each device, and so on. This creates a rippling effect of ever-evolving densities. After a pre-determined number of rounds, sounds are dropped from the sequences 1 by 1 at the end of each round, until there is silence.

4.2 City Living

This piece is meant to evoke the fast pace of city living. The performers represent the path of a train. At the start of the piece, the train emulates the sound which might be heard near any point beside the rail track. As the piece progresses, the listener is taken to a sonic abstraction of a city dweller's state of mind as his life becomes more stressful and how the day-to-day routine of a 9 to 5 job becomes unbearable.

4.3 Cell-o-phane

In this piece, performers stand in a circle with one node in the middle. Small, sonic events are used to surround the middle point, which, at the start of the piece emits a strong audio signal. The piece progresses, with granular textures surrounding the middle node. Eventually, the identity of the middle node is wrapped (and eventually smothered) under waves of sound.

5. Emerging Compositional Processes

The most inspiring use of Cellmusic comes from its potential for accessibility and portability to many different environments, including public spaces. Acting without a server, users can simply transmit the software to each other, set up their respective performance data, and initiate a performance. The potential of this will be explored further, but in the trials so far, it has become apparent that freedom from fixed performance environments and ease of use are appealing to composers and performers alike. The trials have shown that pre-loading performance data to a performer's phone inspires the new performer to investigate tweaking the options while gaining confidence in taking more control of the piece.

The preliminary private performances and tests of the system have allowed composers and performers to gather sonic material which might be used immediately and spontaneously in performance. Sonic material must be selected carefully, since audio reproduction is mainly dependent on devices' built-in speakers. The sound quality of internal speakers is somewhat limited, as is the sound output level. Performers must work within these limitations in order to perform in a variety of environments and spaces.

One behavioural element which emerges with the system is the concept of performers performing 'subversive' acts whereby they attempt to take control of a performance or to swamp the network with their events and performance data.

6. CONCLUSIONS AND FURTHER DEVELOPMENT

The digital domain of sound generation offers the performer a practically unlimited palette of sounds. Often, however, interesting pieces arise from the limitations which the composer might impose upon him or herself. For example, the range of sound sources might be limited according to a geographical location, or to a particular time or theme. This will be explored with the system.

The use of a server may be investigated to provide further structure to a performance. The server might schedule key events in a piece (For example, for all devices to play the same sound at a particular time). However, in the event of a server being used (for example, hidden from sight in a café or railway station) careful consideration of the 'ad hoc' nature of performances will be given in order to make participants feel that they are not being too directed.

Other devices could be incorporated into the network, for example, wireless speakers. Also, devices for lighting control could be explored. An installation might allow users to wander into a space, download the software to their mobile device, and interact with an immersive environment.

The current user interface uses text and 2 dimensional representations of sound data and transformations. There are a host of 3 dimensional display features accessible through Java which could be utilized. A version for Cellmusic is not yet available for iPhone, and this would be an ideal platform to explore given the speed of the processor and the touch screen interface. Indeed, the software might incorporate calls to any hardware device to establish the availability of features and services which it might want to use.

Creatively, Cellmusic relies upon composers and performers gathering sonic data. This concept could be expanded to allow manipulation of video data from phones. Either individual users might view their own video performance, or a server might process incoming video messages to produce a shared visual experience.

Development of mechanisms to limit user participation might also be considered. Currently, a composer of a piece may wish individual performers to control only certain elements at certain moments.

Importantly, the development of a website will allow users to share experiences, interact, share pieces through downloadable data and provide useful suggestions and information for future versions of Cellmusic.

7. REFERENCES:

[1] Brown, C. and Bischoff, J. "Computer Network Music Bands: A History of the League of Automatic Music Composers and The Hub" in Precursors to Art and Activism on the Internet. Cambridge, MA: MIT Press, 2005: pp 372-390.

[2] Puckette, M. "Combining Event and Signal Processing in the MAX Graphical Programming Environment" Computer Music Journal, Vol 15, No. 3, 1991.

[3] Trueman, D., Cook, P and Smallwood S. "PLOrk: The Princeton Laptop Orchestra, Year 1", in *Proceedings of the International Computer Music Conference*, 2006. New Orleans.

[4] GIBSON I.S., DOVEY M. A web-based system for collaborative electro-acoustic composition. International Journal of Advanced Manufacturing Technology. 2006. London, UK: Springer.

[5] Bryan-Kinns, N., & Healey, P. G. T. "Daisyphone: Support for Remote Music Collaboration.", in Proceedings of NIME 2004, Hamamatsu, Japan, pp. 27-30

[6] Wang, G., Essl, G. and Penttinen H. "Do Mobile Phones Dream of Electric Orchestras?", in Proceedings of the International Computer Music Conference, 2008.

BIOGRAPHY: DR IAN GIBSON

Dr Ian Gibson has an MSc and PhD in Music Technology awarded at the University of York, United Kingdom. He is a senior lecturer in Music Technology at the University of Huddersfield. His interests are in composition, speech analysis and synthesis and collaborative music synthesis environments.