SPARG True Multi-channel Mixing Environment

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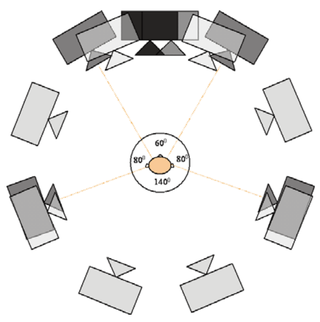
Project Outline

The Signal Processing Applications Research Group (http://sparg.derby.ac.uk) has carried out much research into the field of hierarchical multi-channel audio platforms and algorithms (e.g. see http://sparg.derby.ac.uk/SPARG/PDFs/BWPhDThesis.pdf). However, all current audio mixing and editing software is 'hard wired' to utilise only a fixed number of speakers and with internal workings predicated on stereo mixing paradigms making any true, flexible multi-channel sound mixing problematic at best. This project has carried out the implementation and documenting (using a Wiki) of a true hierarchical, flexible, mixing environment using the already established, permanent Multi-channel Sound Research Lab in MS216, Markeaton Street.



This project uses the Ambisonic surround sound system where the encoding and decoding of the audio is separated. That is, the piece is mixed once, and then decoded to what-ever speaker layout is needed – whether it's a standard stereo or surround sound arrangement, or a 32 speaker, with-height system. This makes for future-proof mixing – a feature that no other facility has.

The focus of this project, this year, has been the use of Technology Enhanced Learning via the use of Screencasts in order to create on-line, e-tutorial material that students can use and view in a time-flexible manner.

Project Plan

Screencasts have been created documenting:

- **Reaper** – a non-expiring shareware audio application that students can use at home.
- **Wigware Ambisonic Plug-ins** – a suite of software tools (the result of last years TIR project) that enable our students to create 'future-proof' surround sound mixes.

This work has been integrated into an assessment for the 2nd year undergraduate module Computer Music Production where students were given the opportunity to work in the University's Multi-Channel Surround Lab before the 3rd year, giving a taster of things to come (aiming to also aid retention).

An example of screencasts created for this project can be viewed at http://uod-true-multi-channel-mixing.wikispaces.com/Reaper+Tutorial+Videos

What is a screencast, and how can I make one?

A presentation documenting my work using screencasts can be viewed from my staff page (http://www.derby.ac.uk/staff-search/dr-bruce-wiggins), but basically, whereas a screenshot is a static picture of a users computer screen, a screencast is a video (potentially with commentary) of a computer screen in use. Uses for this technology include:

- The authoring of tutorial videos demonstrating how to use software tools on computers.
- Narrated presentations
- Reporting back of problems (by students) by linking self created screencasts from a blog or forum.

During this project, a number of screencast software packages have been used and evaluated. The best, so far, are:

Adobe Captivate (PC only)

Pros
- Excellent editing facilities
- Flexible in use (training, simulations, powerpoint importing)

Cons
- Audio routing options are far too basic (mic in or line in)
- Needs a powerful PC to work well (my 1GB memory 3GHz P4 PC often complained of a lack of virtual memory!)
- Quite unstable (version 2 used)
- Full motion capture can be jerky
- Only outputs to flash files (no AVI/video files)

BB Flashback (PC only)

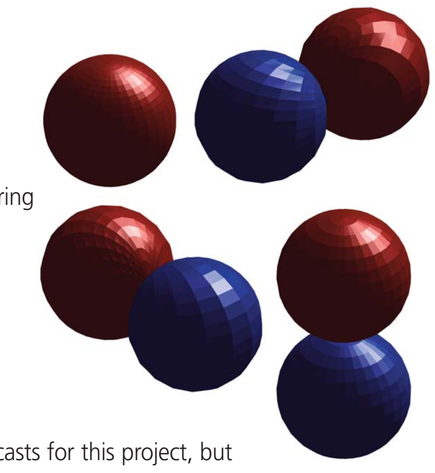
Pros
- Extremely straight-forward in use
- Efficient and responsive
- Audio routing/recording options are much better (all audio can be recorded with separate levels for each source)
- Exports to flash and AVI/video formats
- Exported flash files stream better than those from captivate.

Cons
- Free version has no editing facilities
- Full versions editing doesn't seem as intuitive as Captivate's.

Jing (Free for PC and Mac)

Pros
- It's FREE
- Runs on both Mac and PC
- Is combined with free, on-line space for uploading and sharing screencasts, which is very easy to do with the Jing software
- Extremely easy to use for both annotated screenshots and narrated screencasts.

Cons
- Limited to 5 minute screencasts.
- No editing facilities.



All three of the above packages have been used in the creation of screencasts for this project, but by far the easiest to use in terms of screencast creation and sharing is Jing (http://www.jingproject.com/), and I would recommend this as a good starting point if you want to try screencasting for yourself.

Ambisonics

This project hinges around the research of Dr. Bruce Wiggins in Ambisonic Surround Sound encoding and decoding technology.

Ambisonics works by recording, or synthesising signals relating to sound pressure and air particle velocity. These signals are collectively known as B-format, and it is these four signals that are created by the mixing/recording process for later processing.

Once the B-format has been created, linear combinations of these signals can be used to extract any 1st order virtual microphone pattern pointing in any direction.

Software has been created by Dr. Bruce Wiggins to automatically generate decoding coefficients for irregular speaker arrays, such as the standard 5.1 ITU standard found in the home, which can then be used in the custom written VST plug-ins along side a new Ambisonic Reverb plug-in developed here at the University.

These plug-ins can then be used with a flexible, multi-channel host, such as Reaper (http://www.cockos.com) and a USB midi controller, such as the Behringer BCF 2000 to create a true multi-channel mixing environment.

The Wiki Teaching and Learning Resource

The system has been documented using an on-line Wiki (http://uod-true-multi-channel-mixing.wikispaces.com/). This means that:

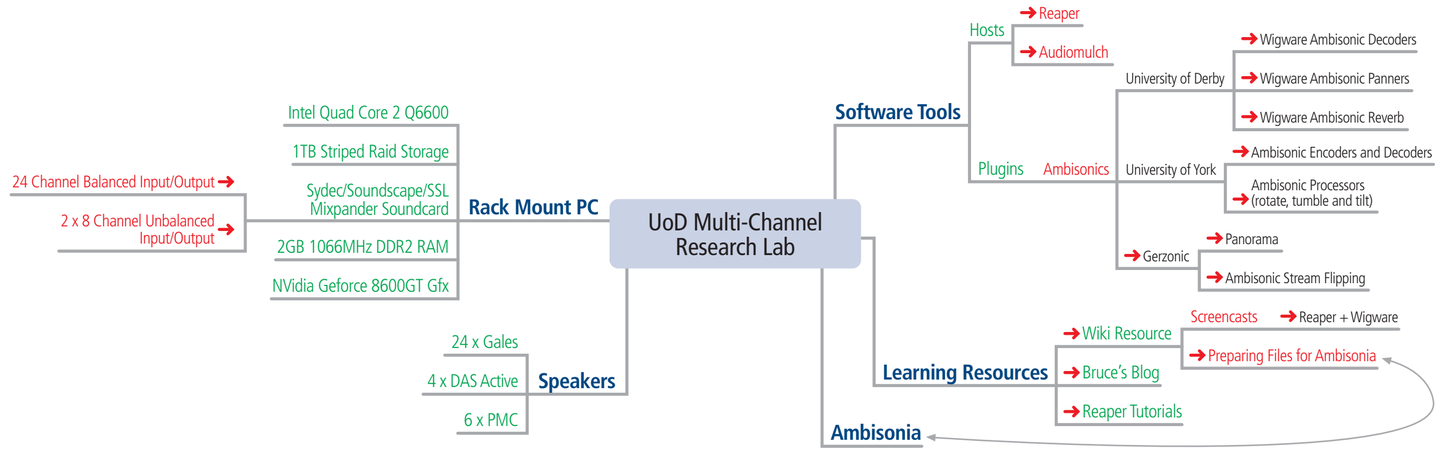
- Content can be easily updated and edited by staff.
- Students can contribute to the site adding explanations and getting involved in discussions about the system and its use.

Feedback and Outcomes of the Project

This project has resulted in the creation of state-of-the-art music mixing plug-ins along with on-line, e-tutorials documenting their use. As this is based on Wiki technology, the material is being constantly updated and improved, and is already proving invaluable in a number of 2nd and final year undergraduate modules, as a source of information and learning.

Feedback from staff and students (which is still being collated) has been extremely positive with students highlighting:

- The usefulness and accessibility of the screencasts, with the 'learning by example' style being very easy to understand and follow.
- The combination of Reaper and Wigware plug-ins allowing them to work away from the University just as easily as in our Multi-Channel Sound Research Lab.



Benefits for Students

Our students get access to a cutting edge mixing environment, coming out of current research in the area carried out at the University of Derby.

The plug-ins are made freely available to students, and the Reaper software is just £20 for a non-commercial license which, when combined with the on-line Wiki learning material with screencasts, allows students to work where and when they want.

Benefits for staff

Staff get to use and develop material for this state of the art platform, and also have the chance to improve their skills in e-learning and 'Web 2.0' technologies in the form of the Wiki. The material can be used in modules as diverse as Audio programming (as a case study in VST plug-in development) to popular music recording, and will help to aid coherence in our surround sound modules on both the technical and creative ends of our course provision.

Benefits for the University

Publicity has already been generated because of this project, with demonstrations having been given at the Sounds Expo Event in London and at the Sony Computer Entertainment Europe Technology Groups headquarters. News stories have also featured in the highly respected Music Technology publication Sound on Sound (http://www.soundonsound.com/) and a press release made on the University of Derby's website ('An End to Remixing') and lecturer Michael Brown demonstrated the Wigware Plug-ins at a performance of his piece V at the N.One6 concert at Leeds College of Music. This project is putting Derby in the spotlight, and continues to excite both staff and students with the possibilities that are now available in the area of surround sound recording and mixing.