Play the Un-playable: Tinfoil Recording Recovered by the Sound Archive Project

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Since December 2003, the British Library Sound Archive has been a partner in the Surface Scanning of Archived Sound Recordings research project at the University of Southampton. The project's manager is Professor John McBride.

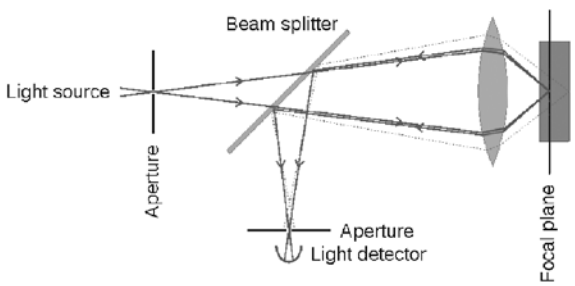
The aim of the project is to investigate methods for the non-contact scanning of mechanical (i.e. grooved) sound recordings so that the recorded sound can be preserved as a digital format with the ability to reproduce the recording. Because the scanning process uses a non-contact methodology rather than a traditional stylus-in-a-groove approach sound recordings on artefacts that are too fragile, unstable or otherwise unplayable by conventional means can be recovered. To date, the project has focused on the very earliest recordings (wax cylinders and coarsegroove discs) and has concentrated on three areas of research:

- Non-Contact Surface Measurement. The development of metrology systems for mapping the surface topology of cylinders and flat discs.
- Sensor Development. The design of optical sensors with improved angular tolerance and sensing speed.
- Audio Signal Recovery. Methods of accurate sound reproduction from discrete surface maps of cylinders and discs.

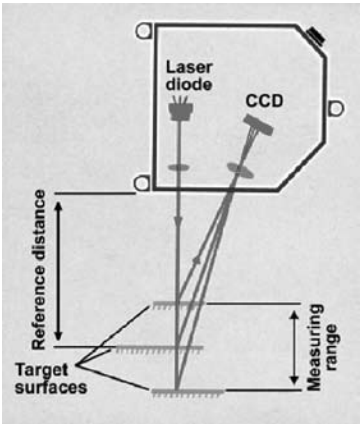
In the initial stages of the project, three non-contact sensing technologies were considered and a benchmarking study of the three competing systems was carried out to determine the best sensor technology for the project. The three systems considered were: a confocal laser, laser triangulation and a white light sensor.

With confocal laser scanning, the laser beam is oscillated through a collimator lens to vary its focal point to produce an in-focus image of the target (the groove). Laser triangulation detects the deflection of reflected light and so the position of the target. With a white light sensor the light beam is broken down into constituent red, green and blue which are focussed at different parts of the target.

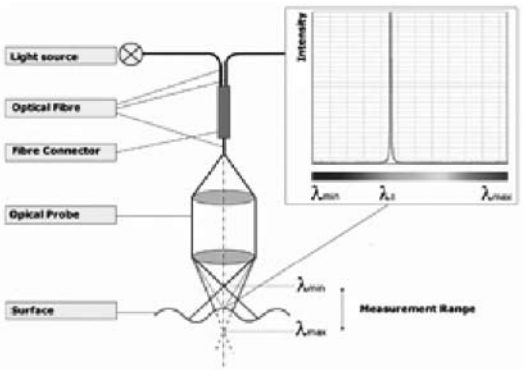
It was found that the white light sensor was most suitable for this scanning application.



Confocal laser

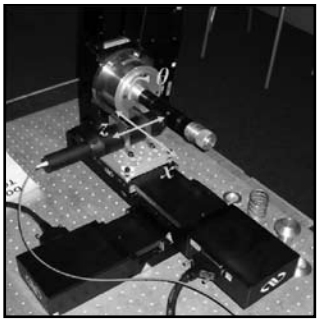


Laser triangulation



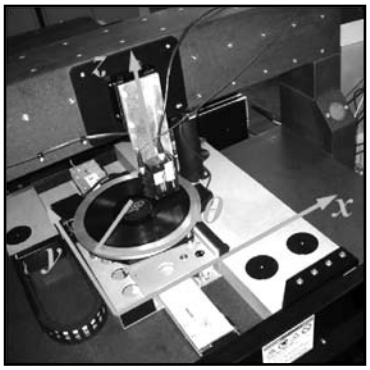
White light sensor

The project is able to scan cylinder recordings, in which case the sensor traverses along the cylinder's axis to produce a linescan. The cylinder is mounted on a rotary stage providing rotation of the cylinder after every completed linescan in preparation for the next.



Scanning a cylinder

The flat disc scanning system uses an air-bearing system. The sensor system is mounted on an overhead gantry pointing downwards onto the disc.



Scanning a disc

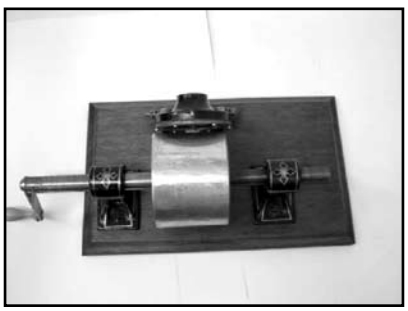
The scanning of the surface of a mechanical recording measures the groove, the recording itself, allowing a 'virtual stylus' to replay the sound.

The project was the winner in 2008 of the inaugural James A. Lindner Prize. This annual prize is awarded jointly by the South East Asia Pacific Audio Visual Archives Association (SEAPAVAA), The Association for Moving Image Archivists (AMIA), and the International Association of Sound and Audiovisual Archives (IASA).

A discussion of the project can be found as a podcast at http://www.bl.uk/onlinegallery/whatson/downloads/files/surfacescanning.mp3, and more information about the project, including audio examples and moving images of scanning can be found at http://www.archivesound.co.uk.

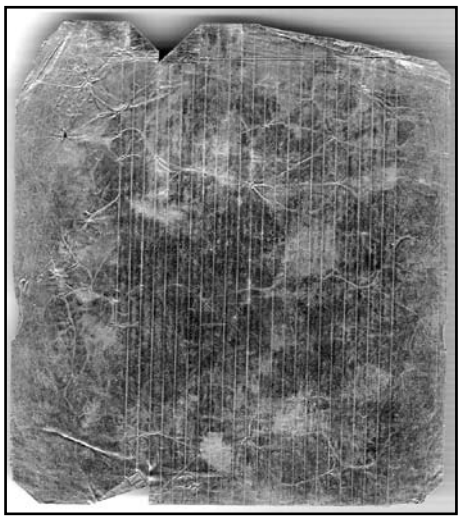
Case Study: The Tinfoil Recording

The British Library Sound Archive lent to the project their earliest artefact containing recorded sound, an Edison tinfoil phonograph. Thomas Alva Edison invented this process in 1877 and it is the first true recording machine in that it allows for sound to be recorded as well as be played back. The carrier of the recording was a piece of tinfoil wrapped round a cylindrical drum. The sound waves at the mouthpiece vibrated a diaphragm and created undulations in the tinfoil. As the cylinder rotated – turned by hand – it was carried slowly from right to left under the mouthpiece by a screw mechanism, leaving consecutive lines of undulations in the tinfoil.


Edison Tinfoil Phonograph

Two things made intelligibility of the recording difficult. First, there was no amplification, either while the recording was taking place or during its reproduction. A speaker would rely on sheer lung power alone, addressing the mouthpiece at a distance of about 2 centimetres at the top of their voice. Second, there was considerable background noise imposed by the tinfoil.

Not many genuine tinfoil recordings have survived.



British Library's Tinfoil Recording

The British Library's Tinfoil Recording has an accompanying letter from EMG Hand-made Gramophones Ltd. addressed to a Mrs Morris Davis and dated 16 April 1937. She had asked EMG to transfer the recording. EMG couldn't because, "we have no method whatever of playing (the recording) and we doubt very much whether any such method is in existence". Quite how the recording arrived at the British Library is not known. The letter's envelope also bears the name 'Harriet Martineau'. This always was the cause of some speculation as to whether the recording was of Harriet Martineau but this idea was always impossibility. Harriett Martineau was an English writer and philosopher, renowned in her day as a journalist, political economist, slavery abolitionist and feminist. She died in 1876, crucially the year before Edison invented the technology. It cannot be her.

Professor John McBride and his team at Southampton scanned the tinfoil recording and recovered the sound. On the transfer of the tinfoil we can just about make out a woman's voice but no words are discernable. It can be heard at the end of the above-mentioned podcast. Although the audio is, by modern standards, of poor quality, it's extraordinary that the 130-year-old recording survives and is recoverable at all.