Sound Processing - Summary

# Overview

* Method of capturing sound needs to be made for computers as they use binary
* Microphones do this
* Two main types of microphones are Dynamic and Condenser microphones

# Condenser Microphones

* Have diaphragm (also known as front plate) and a stationary back plate
* Diaphragm moves in and out in response to sound wave
* Back plate remains still as current flows between the diaphragm and the back plate
* Electrical current alterations reflection soundwave. Current sent to an ADC (analogue to digital converter) which transfers the electrical current into digital data

# Dynamic Microphone

* Three main components; diaphragm, copper coil of wire and magnet
* Diaphragm attached to copper coil of wire, which is surrounded by a magnet
* Diaphragm moves in and out in response to the soundwave and so does the copper coil, creating an electric current with the magnetic field from the magnet
* Electric current sent to an ADC to transform into digital data

# Sound Sampling

* Electric current from microphones fed into capacitor, ADC measures current in capacitor
* SAR (successive approximation register) produces binary number eg. 225 to 0
* DAC (digital to analogue converter) transforms binary number in to electrical current
* Comparator compares electrical current in DAC to electrical current in capacitor
* If same electrical current, comparator informs SAR to store number generated
* Typical sampling rates; 22,000Hz and 44,100Hz

# Reproducing Sound

* Amplitude of sound samples changed into electrical current
* Speaker contains diaphragm connected to copper coil of wire surrounded by magnet
* Electrical current causes copper coil to vibrate in response to fluctuating magnetic field
* Causes diaphragm to move, creating compressions and rarefactions in the air we hear as sound

# Historical Development

* **Acoustic Era:** Phonograph for recording sound. Poor quality. Frequencies of 250Hz to 2,500Hz recorded
* **Electronic era:** Electronic microphones, amplifiers and electronic disc cutters. Better quality sound. Frequencies of 60Hz to 6,000Hz recorded
* **Magnetic Era:** Magnetic tape recorder. Improved sound fidelity, more portable
* **Digital era:** Binary, sound sampled at 44,100Hz. USBs, Hard Drives and CDs used to store sound. High quality sound recorded. Can capture all frequencies humans can hear