

# COMPUTER MUSIC

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## COMPUTER MUSIC

- ◉ Basic definition
- ◉ History
- ◉ MIDI
- ◉ Digital audio
- ◉ Audio programming language
- ◉ Miscellaneous

## BASIC DEFINITION

- ◉ Originally used within academia to describe a field of study relating to the applications of computing technology in music composition
  - including the theory and application of new and existing technologies in music
    - such as **sound synthesis, digital signal processing, sound design, sonic diffusion, acoustics, and psychoacoustics**

## CURRENT UNDERSTANDING

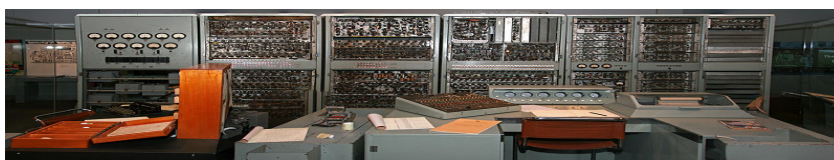
- ◉ Any music that has been created using computing technology
  - the advent of personal computing, and the growth of home recording

# HISTORY

- ◉ Electronic music
- ◉ Computer music has drawn on the relationship between music theory and mathematics
- ◉ No hard recording technique before computer music showed up
- ◉ **CSIRAC** - first computer to play music

# CSIRAC

- ◉ **Trevor Pearcey**
- ◉ November 1949
- ◉ First digital computer, and the fourth stored program computer
- ◉ **Mathematician Geoff Hill** programmed the CSIRAC to play popular musical melodies from the very early 1950s
- ◉ <http://dl.screenaustralia.gov.au/module/367/>



## MICROPROCESSOR-BASED COMPUTERS

- ◉ 90s
- ◉ Real-time generation of computer music
- ◉ General programs and algorithms
- ◉ Advances in computing power
- ◉ Sophisticated audio synthesis
- ◉ computer-based synthesizers, digital mixers

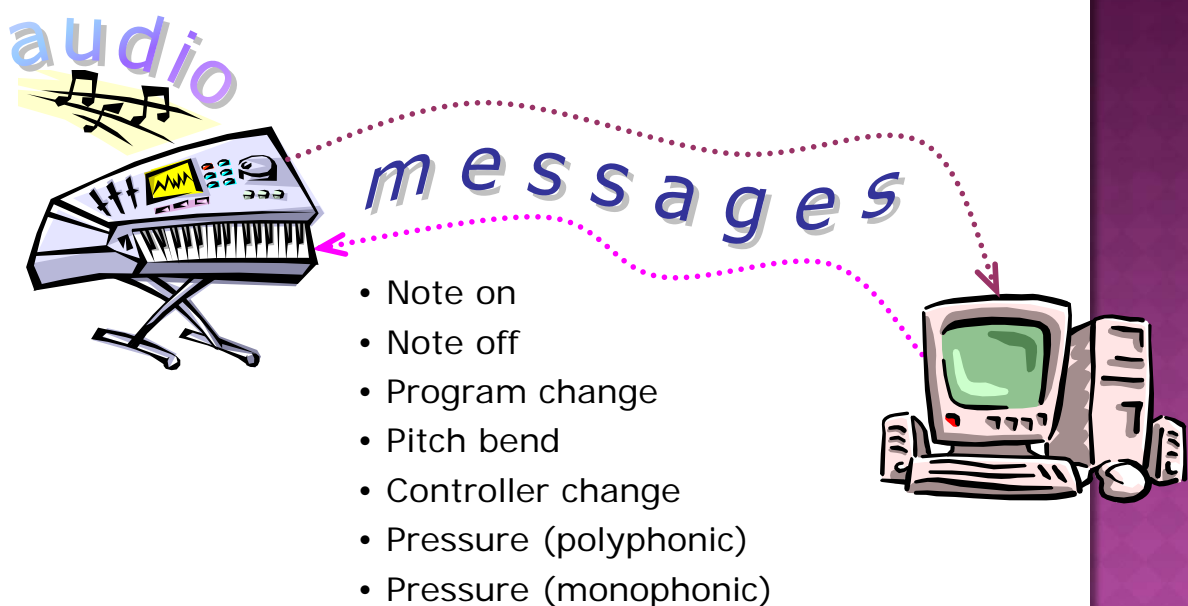
## COMPUTER GENERATED MUSIC

- ◉ Music in which a computer generated the score, which could be performed by humans
- ◉ Music which is both composed and performed by computers

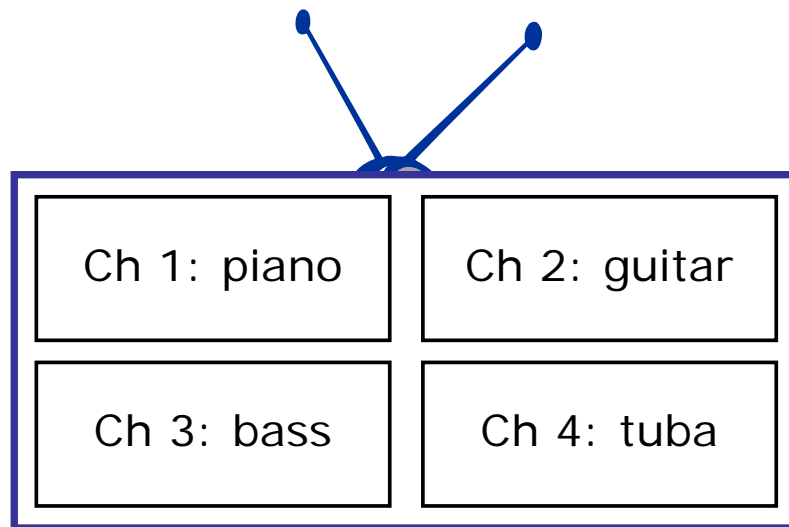
# MUSICAL INSTRUMENT DIGITAL INTERFACE

- ◆ The MIDI protocol – a “language” that lets synthesizers, computers and other devices (electronic musical instruments) talk to each other
- ◆ Early 1980s
- ◆ limits of mechanical, rigid and non-natural tones
  - Not transmit an audio signal or media
  - “Event messages” - the pitch and intensity of musical notes to play, control signals for parameters

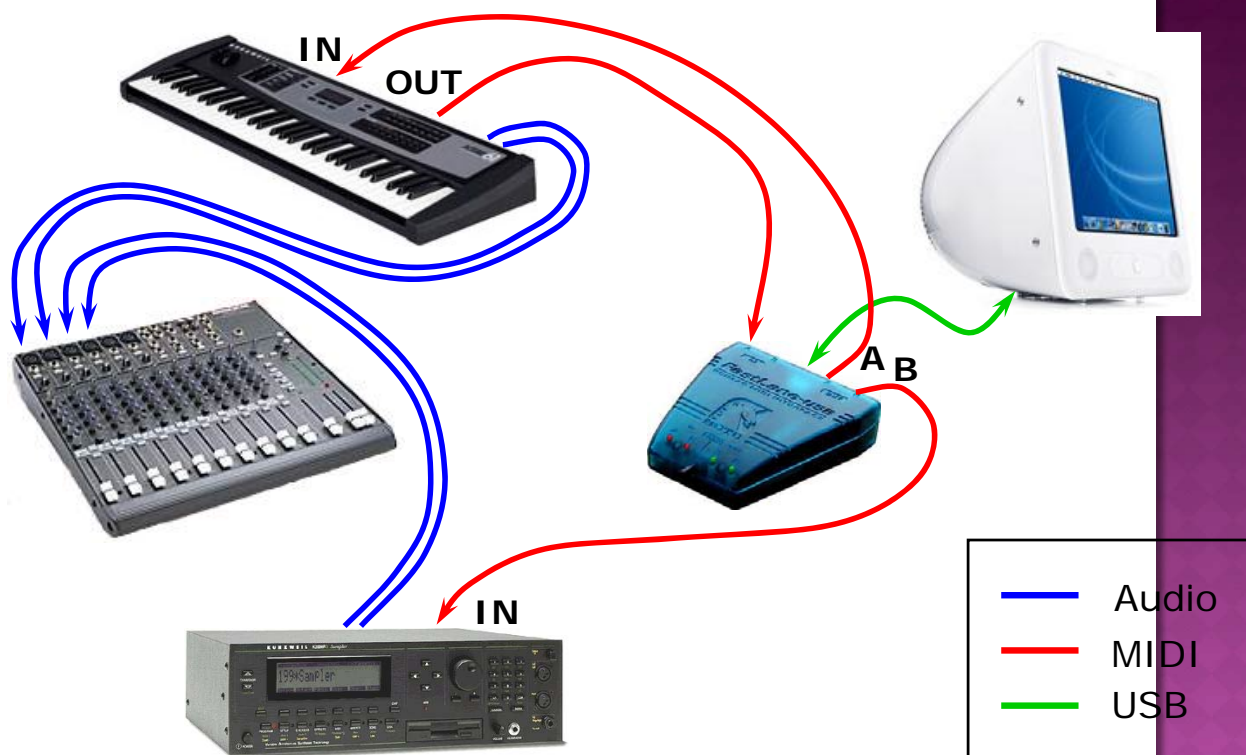
## MIDI DEVICES COMMUNICATE USING MESSAGES...



# MIDI Channels



MIDI cable carries **16 channels**

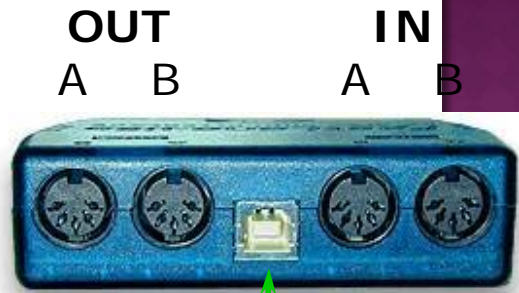


## Multi-port MIDI Interface (2 in/out pairs)



Lights!

**Thru** switch – connects In to Out,  
for use without a computer  
**Leave in 'out' position!**



USB port



## Multi-port MIDI Interface (8 in/out pairs)



Front



Back

Each MIDI cable can  
carry **16** channels.

USB port

# Two Kinds of MIDI Network

Purpose: provide pathways for MIDI messages



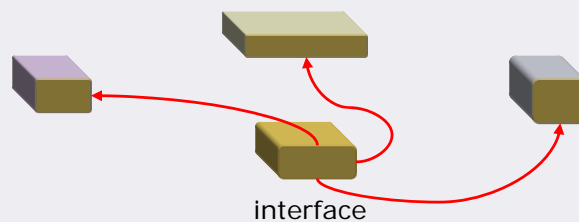
## MIDI Daisy-chain Network

Devices connected in series:

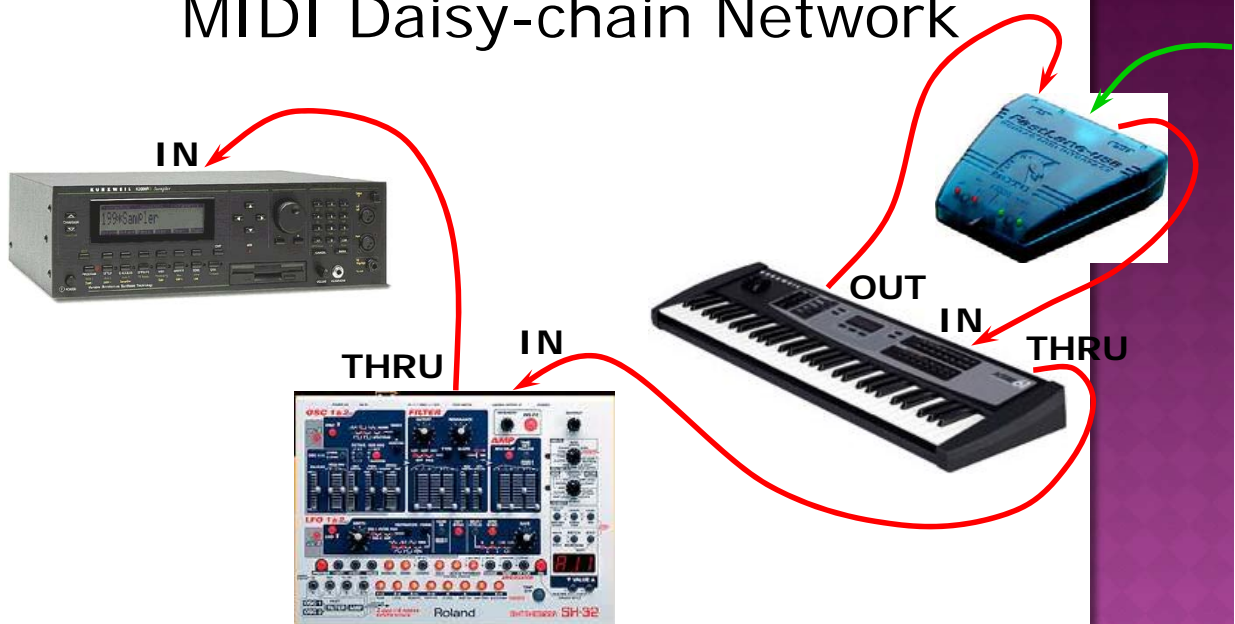


## MIDI Star Network

Devices connected in parallel:



# MIDI Daisy-chain Network



**THRU** port: transmits copy of messages from **IN** port  
The 3 devices must **share 16 channels**.





# MIDI Star Network



Each device has **16 channels** all to itself.  
Any device can act as a **controller**.



## Pros and Cons



### MIDI Daisy-chain Network

- does not require multi-port MIDI interface



### MIDI Star Network

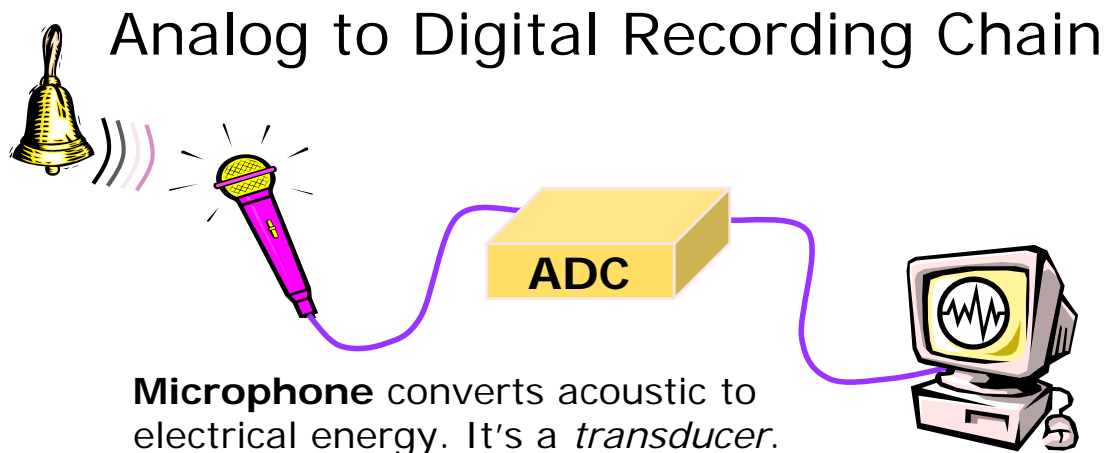
- more accurate timing
- more channels
- more than one device can act as controller

## EXAMPLE

- ◉ Drum sample #1
- ◉ Drum sample #2
- ◉ Bass sample #1
- ◉ Bass sample #2
- ◉ Singing in the Rain – Original
- ◉ Singing in the Rain - Remix

## DIGITAL AUDIO

- ◉ Recorded normal sounds and customized for playing on the computer
- ◉ Microphone-based recording
- ◉ Direct Recording - the effector linked to the electric instruments



Continuously varying electrical energy is an **analog** of the sound pressure wave.

**ADC** (Analog to Digital Converter) converts analog to digital electrical signal. Digital signal transmits binary numbers.

**DAC** (Digital to Analog Converter) converts digital signal in computer to analog for your headphones.

## AUDIO PROGRAMMING LANGUAGE

- ◆ Programming language specifically targeted to sound and music production or sound synthesis
- ◆ Chuck : strongly-timed, concurrent, and on-the-fly audio programming language
- ◆ FAUST (programming language) : compiled language for realtime audio signal processing
- ◆ SAOL (part of the MPEG-4 Structured Audio standard)
- ◆ [Zebra 2](#)- NO need patch codes, just change in models

## MISCELLANEOUS

- ◉ International Computer Music Association
- ◉ The Seoul International Computer Music Festival  
(since 1994 is one of the biggest electro-acoustic music festivals in Asia, and also internationally well-known)
- ◉ “Computer music” monthly magazine
- ◉ *Computer Music Journal (CMJ)* provided by MIT since 1977
- ◉ Course on Computer music study provided by the best universities in the world such as MIT, Carnegie Mellon, and Indiana university

THANKS TO THE TECHNOLOGY,  
PEOPLE CAN GET MUSIC EVER  
MORE CONVENIENTLY