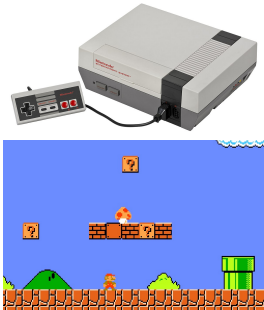


COMP310: Legacy Game Systems

## **2: De-make culture**

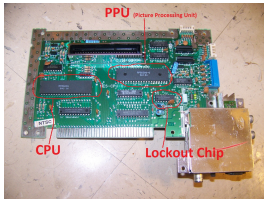
**NES hardware**

# Nintendo Entertainment System (NES)



- ▶ Released in **1983**
- ▶ Sold as the **Famicom** (Family Computer) in Japan
- ▶ Nearly **62 million** units sold worldwide
- ▶ Biggest selling game: **Super Mario Bros**
- ▶ Credited with reviving the games industry after the **video game crash** of the early 80s

# Nintendo Entertainment System (NES)



- ▶ CPU: Ricoh 2A03 (closely based on MOS 6502)
- ▶ Picture Processing Unit (PPU): Ricoh RP2C02 or RP2C07
- ▶ RAM: 2 kilobytes for CPU + 2 kilobytes for PPU
- ▶ Cartridge ROM: up to 1 megabyte, but typically less
- ▶ Screen resolution:  $256 \times 240$

# Technical limitations

- ▶ Around **2270 CPU cycles per frame**
- ▶ Only **2 kilobytes** of writable memory to work with
- ▶ 6502 instruction set is limited
  - ▶ 8-bit integer maths only
- ▶ The following are possible but need implementing as subroutines:
  - ▶ > 8 bit numbers
  - ▶ Multiplication
  - ▶ Division
  - ▶ Fractional numbers

# Graphical limitations

- ▶ Display is made up of **sprites** and **background**
- ▶ Sprites:
  - ▶ Maximum 64 on screen
  - ▶ Maximum 8 on the same scanline (horizontal line)
  - ▶  $8 \times 8$  pixels, 3 colours + transparency
  - ▶ Can flip horizontally or vertically
  - ▶ No rotation, scaling etc.
- ▶ Background:
  - ▶ Made of  $8 \times 8$  pixel tiles
  - ▶  $32 \times 32$  blocks must share the same 4-colour palette
  - ▶ Limitations on types of scrolling

`https:  
//wiki.nesdev.com/w/index.php/Limitations`

# Examples of NES games

<https://youtu.be/um-GMygsRg4>



# Designing your de-make

- ▶ Pitches **next week!**
- ▶ Make sure you consider technical limitations carefully

# **Developing for the NES**

# Tools

- ▶ An **emulator**

- ▶ Recommended: FCEUX
- ▶ <http://www.fceux.com/>

- ▶ An **assembler**

- ▶ Recommended: NESASM
- ▶ <http://www.nespowerpak.com/nesasm/NESASM3.zip>

- ▶ A **sprite editor**

- ▶ Recommended: YY-CHR
- ▶ <https://www.romhacking.net/utilities/119/>

- ▶ A **text editor**

# Let's jump in!

- ▶ `http://nintendoage.com/forum/messageview.cfm?catid=22&threadid=7974`
- ▶ Download `controller.zip`

# Exercise

Modify `controller.asm` so that all of Mario moves left and right, not just the back of his head...