

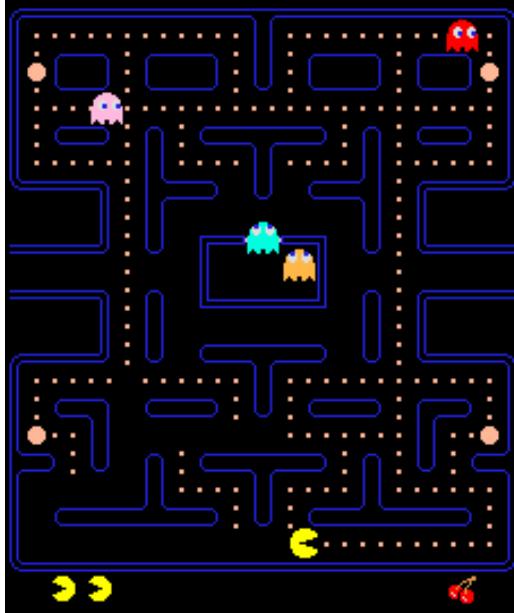
Sprite Graphics

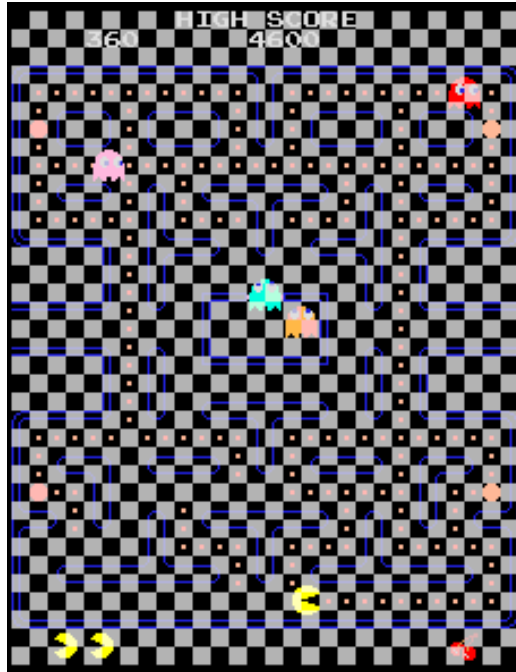
Stephen A. Edwards

Columbia University

Spring 2026

360 HIGH SCORE 4600





MARIO
000700

0x01

WORLD
8-1

TIME
242

0 0



NINTENDO



3RD
1:24:00



TIME
0:13:15

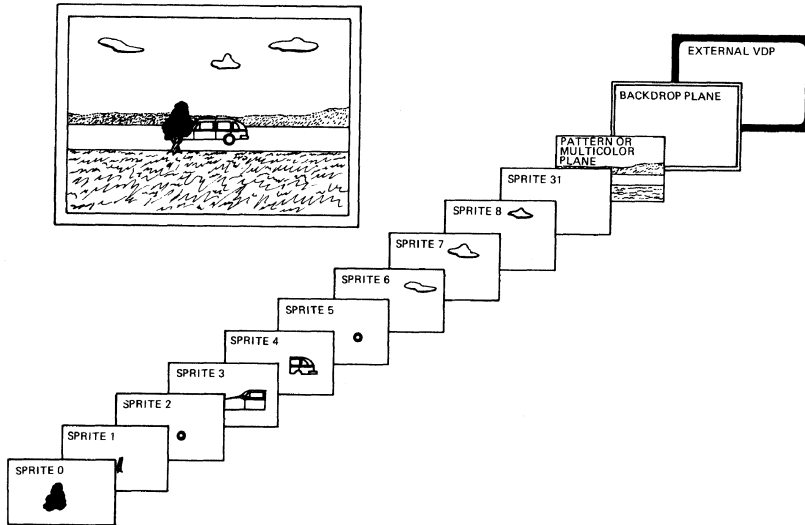
TUNNELS



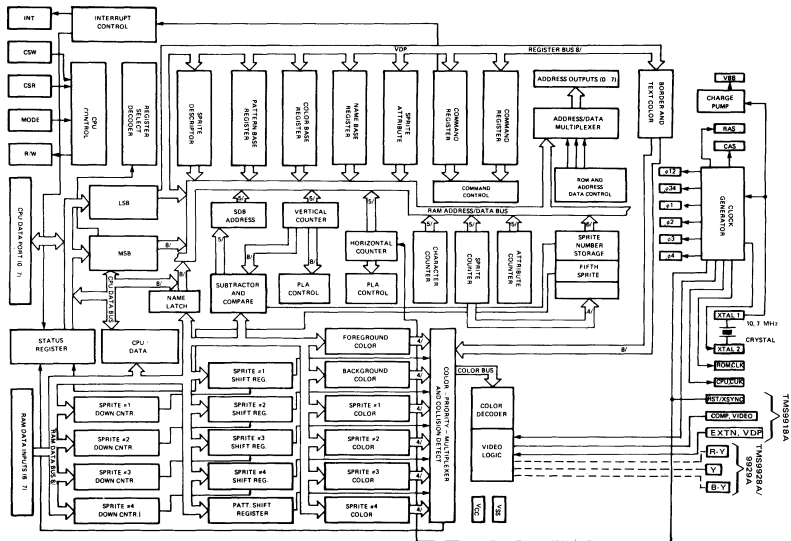
©1982

TEXAS INSTRUMENTS

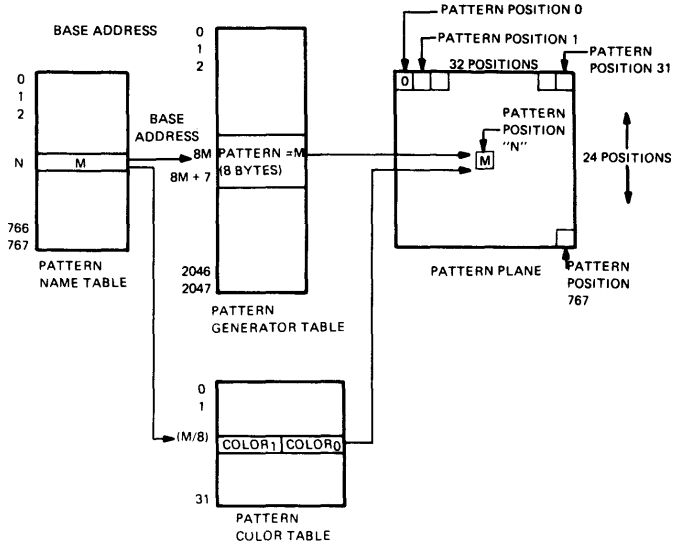
TMS9918 Video Display Processor



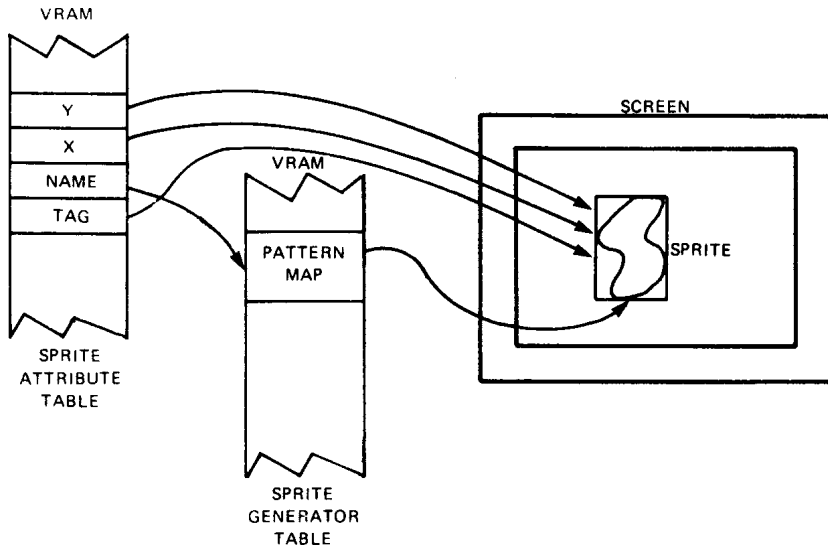
TMS9918 Video Display Processor



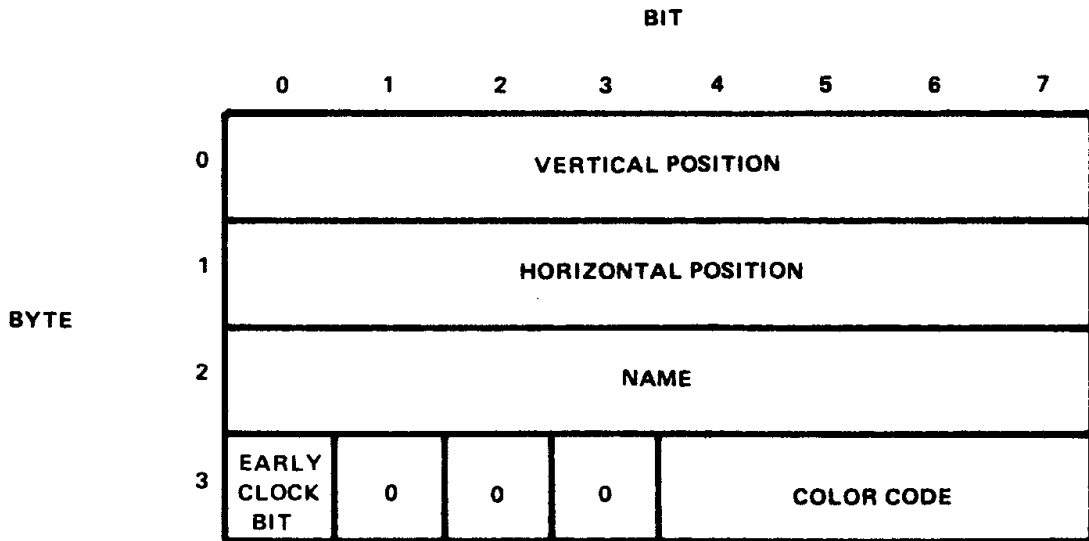
TMS9918 Pattern Generation



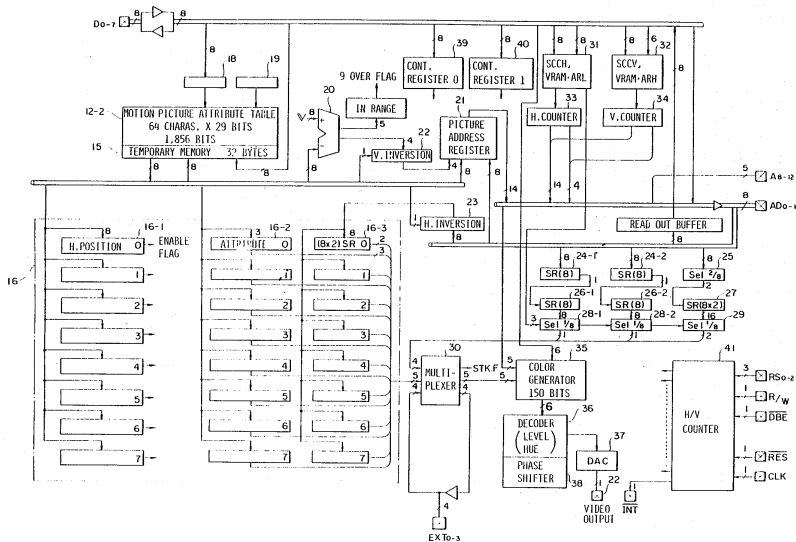
TMS9918 Sprite Generation



TMS9918 Sprite Attribute Table Entry



Nintendo NES/Famicom



Basic Operation

For each line,

- ▶ Fetch color palette
- ▶ Fetch tiles
- ▶ Fetch tile bitmaps
- ▶ Read sprite location data for 64 sprites
- ▶ Save and prioritize up to 8 visible sprites

Video RAM Memory Map

Palettes: Groups of 16 colors
selected from ≈ 60

Name Table: Tile numbers

Attribute Table: Extra tile color
information

Pattern Table: Tile bitmaps

Mirrors \$0000-\$3FFF	\$10000	Mirrors \$0000-\$3FFF	\$10000
Palettes	\$4000	Mirrors \$3F00-\$3F1F	\$4000
		Sprite Palette	\$3F20
		Image Palette	\$3F10
Name Tables	\$3F00	Image Palette	\$3F00
		Mirrors \$2000-\$2EFF	\$3F00
		Attribute Table 3	\$3000
		Name Table 3	\$2FC0
		Attribute Table 2	\$2C00
		Name Table 2	\$2BC0
		Attribute Table 1	\$2800
		Name Table 1	\$27C0
		Attribute Table 0	\$2400
		Name Table 0	\$23C0
		Pattern Table 1	\$2000
Pattern Tables	\$2000	Pattern Table 0	\$1000
			\$0000

A Sprite Attribute Table Entry

64 sprites max; 8 per line max

7 0							
Y coordinate							
Tile (bitmap) number							
Vertical Flip	Horizontal Flip	Priority	0	0	0	b3 color bits	b2
X coordinate							

Tiles are 2×8 bytes each. First 8 are bitmaps of LSB color value, next 8 are next color bit.

References

Steven Collins. Computer Graphics during the 8-bit Computer Game Era. Siggraph Newsletter, 32(2) May 1998.

NES Development <http://nesdev.parodius.com>

NES Palette Generator http://nesdev.parodius.com/kevin_palette.txt

Nintendo Entertainment System Documentation v. 0.40.

http://db.gamefaqs.com/console/nes/file/nes_tech.txt

Patrick Diskin, *Nintendo Entertainment System Documentation*, Version 1.0, August 2004,
<http://nesdev.parodius.com/NESDoc.pdf>

Ueda et al. TV Game System Having Reduced Memory Needs. United States Patent #4,824,106.
April 25, 1989.