ATARI®

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A Warner Communications Company

Atari Stories

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Joe
thanks for all
your help.
Jay Miner

Agenda: stories

- Invention vs Contribution
- How I got the Atari job
- Technical contributions to Atari 2600
- Games written, and best original games
- Epiphany: need a roadmap
- Visit Sears store on Black Friday
- Bring it home for Christmas 1977
- Lessons learned
- Learn more
- Q&A
- Game demonstrations

Invention vs Contribution

- You can find web sites where I am credited with inventing Atari, or with inventing USB. Not true.

- I am honored to have the chance to contribute to the Atari game console (2600) and to the Atari 8-bit personal computers.

- The Atari 2600 was the first mass market cartridge programmable video game console. See Smithsonian "Art of the Video Game"
  - It sold 30M units in a dozen years; you can buy modern versions now

- The Atari 8-bit computers (400, 800, etc) was a decent personal computer AND a better game player
  - It sold 6M units in a decade; the Apple II sold 7M units; C64 sold 17M
  - It had the first serial bus (1979). USB started shipping in 1996.

How I got the job, 1 of 2

WESCON 75
Electronics in the next thousand days
Sept 16-19, Brooks Hall/Civic Auditorium, San Francisco

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- Luck favors the prepared mind
- I was working in medical research
  - I studied microprocessors as a hobby.
- In January 1975, Intel 8080 CPU cost $100 each
- MCS 6502 CPU announced in mid-1975, $25 each
- I bought one, plus the manuals, at WesCon in September
- Coincidentally
  - Steve Wozniak bought one, and used it in the Apple I, then Apple II
  - Ron Milner of Atari bought one, considering it for use at Atari

How I got the job, 2 of 2

- I lost my research job in October 1975
- I had experience in designing, building and testing computer controlled respiratory monitoring equipment
  - I found a job offer in Orange County to do this with microprocessors
- Through my network I interviewed at Atari
  - I ace'd the interview because I had studied the 6502
  - I also beat the interviewer on an Atari TANK arcade game
- I choose the Atari job for a mentor, Jay Miner
  - He taught me large scale integrated circuit design
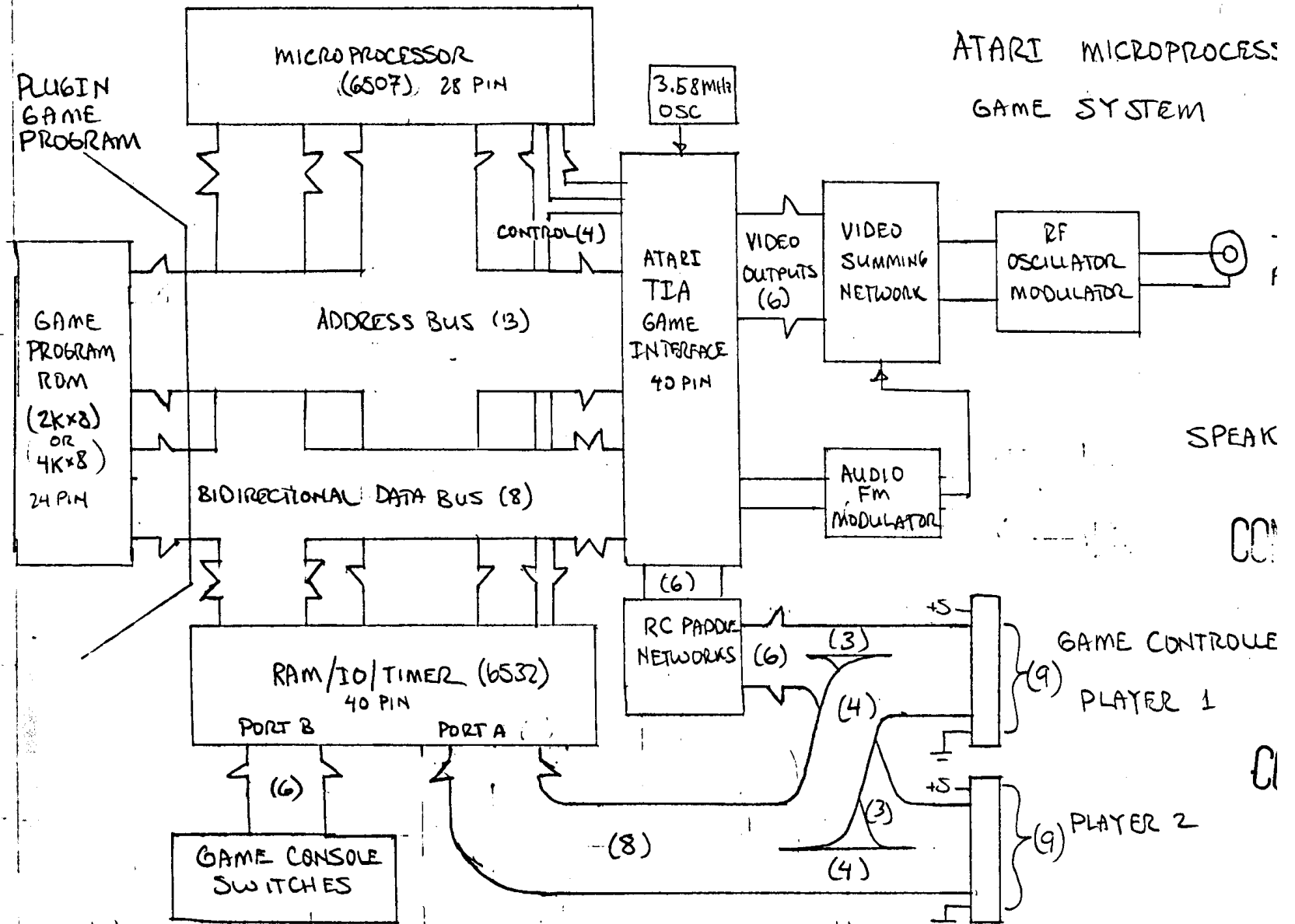 - We did that together at Atari and at Amiga

My contributions to Atari 2600

- First: Steve Mayer and Ron Milner invented the design
  - Simple fast CPU that can write the video a line at a time
- My first job: debug their concept prototype starting early 1976.
- I succeeded in the first month. They invited Atari management to witness it.
- They were happy. They moved me back to HQ.

System block diagram

ATARI MICROPROCESSOR GAME SYSTEM

MICROPROCESSOR (6507) 28 PIN

PLUGIN GAME PROGRAM

3.58 MHz OSC

GAME PROGRAM ROM (2K×8) OR (4K×8) 24 PIN

CONTROL (4)

ATARI TIA GAME INTERFACE 40 PIN

VIDEO OUTPUTS (6)

VIDEO SUMMING NETWORK

RF OSCILATOR MODULATOR

ADDRESS BUS (13)

BIDIRECTIONAL DATA BUS (8)

AUDIO FM MODULATOR

SPEAK

(6)

RC PADDLE NETWORKS (6)

RAM/IO/TIMER (6532) 40 PIN

PORT B   PORT A

(3)

(4)

+S

GAME CONTROLLE (9) PLAYER 1

(6)

GAME CONSOLE SWITCHES
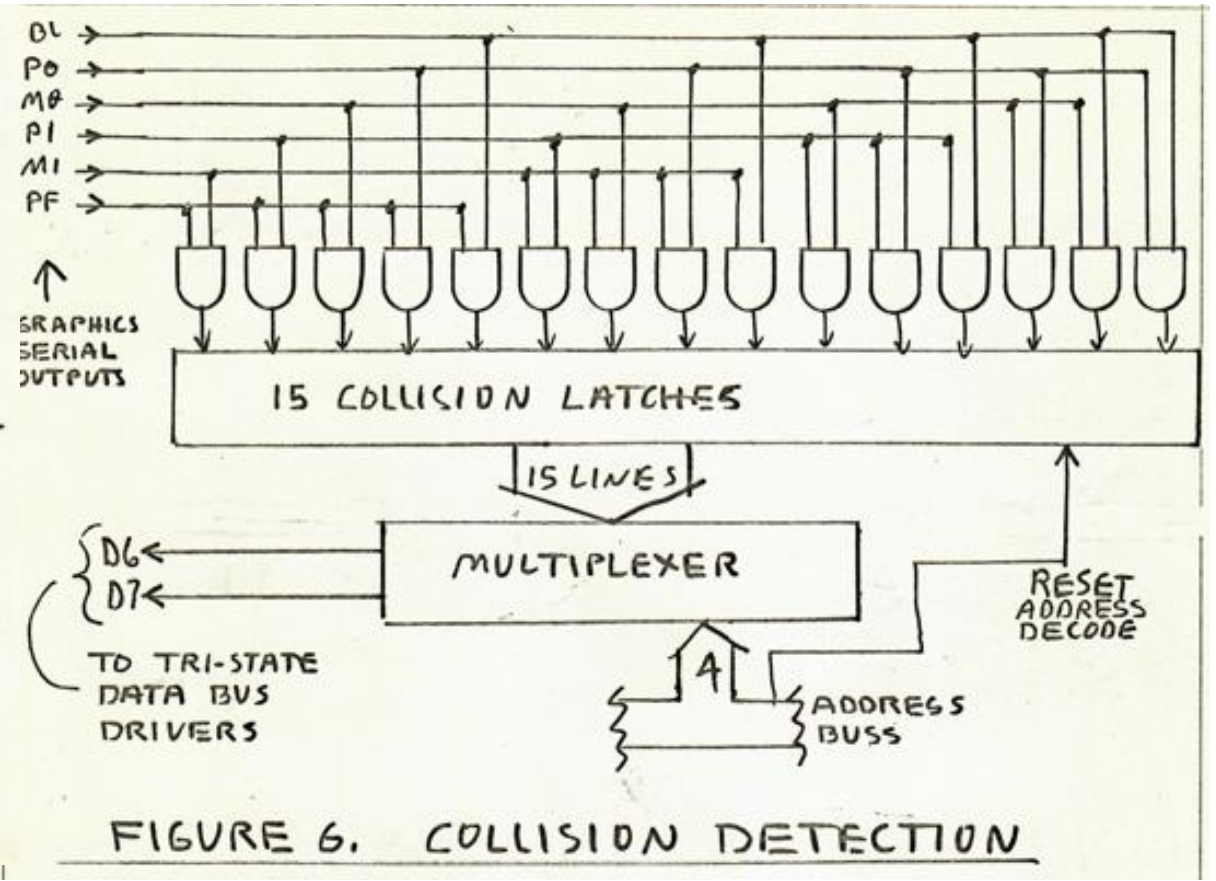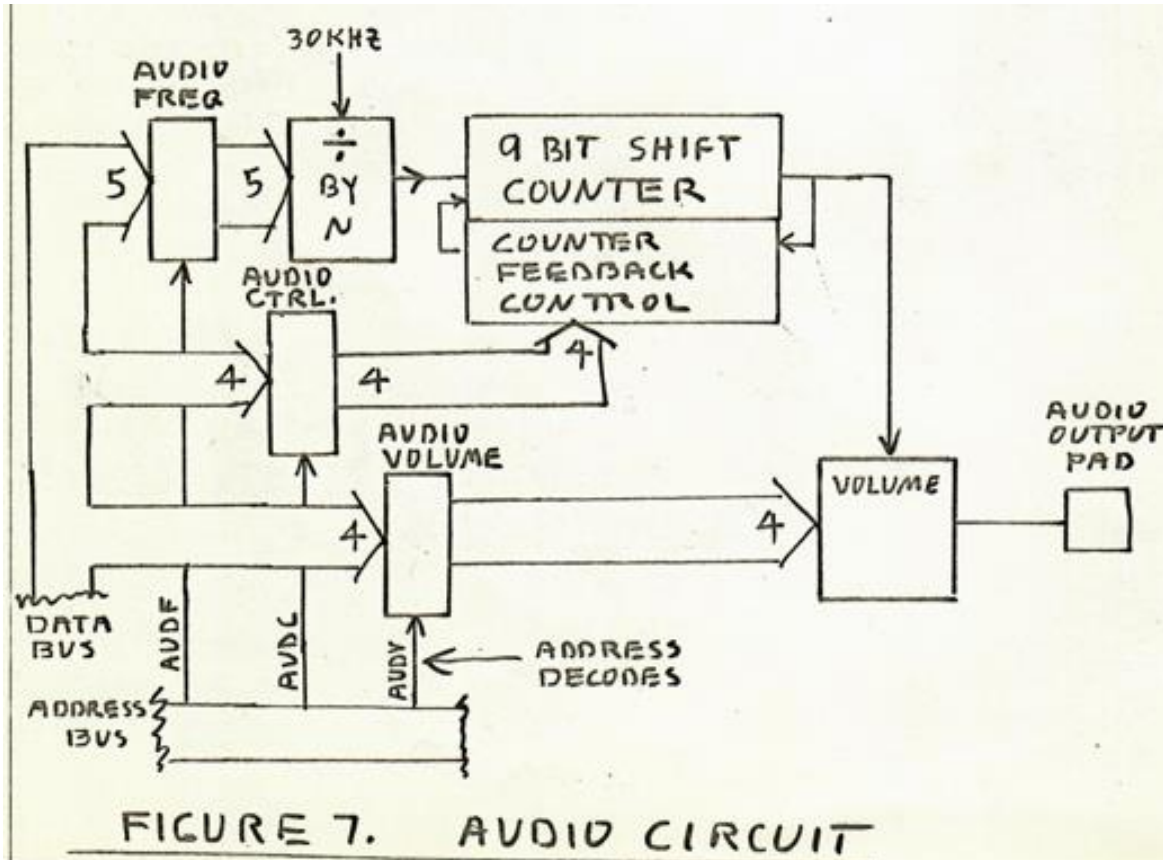
(8)

(3)

(4)

+S

(9) PLAYER 2

CC: TIA DESCRIPT

Working for Jay

- Defined the system
- Defined the requirements for the TIA (television interface adaptor) IC
- Designed and tested the sound circuits on the TIA
- Wrote the main parts of the Combat cartridge
- Defined a horizonal device positioning subroutine, widely used by the other game designers
- What we shipped:
  - Main console
  - My games: Combat and Video Olympics

- 4 sets of game controllers:
  - Joysticks (most games)
  - Potentiometers (Pong, Breakout
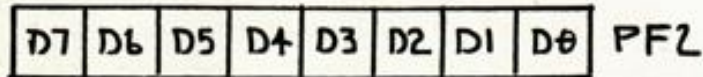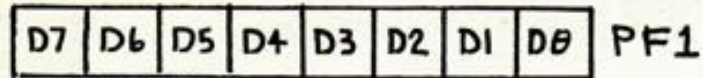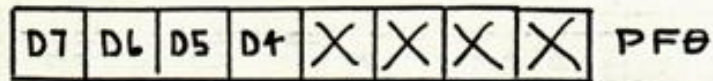 - Rotary (grey-coded) driving
  - keyboard

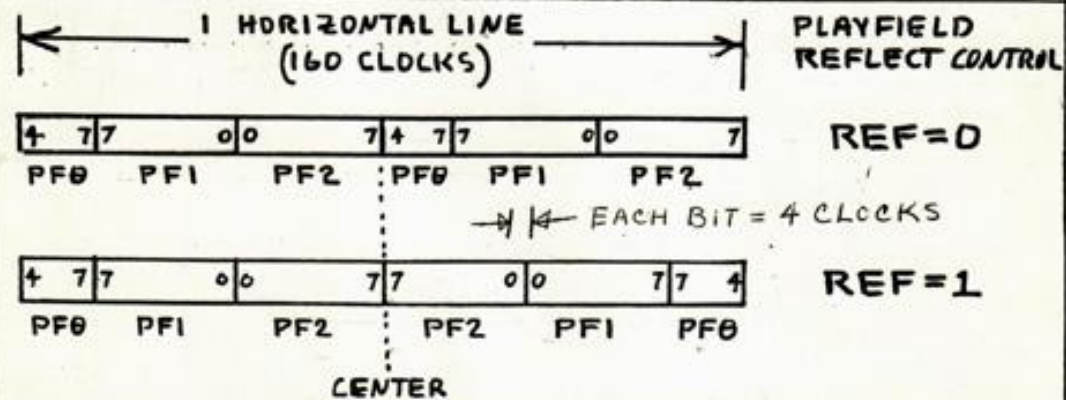# My TIA contributions: audio and collision detect

FIGURE 7. AUDIO CIRCUIT

FIGURE 6. COLLISION DETECTION

Some TIA controls

PF0 (PF1, PF2)

THESE ADDRESSES ARE USED TO WRITE INTO THE PLAYFIELD REGISTERS

D7	D6	D5	D4	X	X	X	X	PF0

D7	D6	D5	D4	D3	D2	D1	D0	PF1

D7	D6	D5	D4	D3	D2	D1	D0	PF2

PLAYFIELD REGISTERS SERIAL OUTPUT

1 HORIZONTAL LINE (160 CLOCKS)

PLAYFIELD REFLECT CONTROL

REF=0

PF0 PFI PF2 :PF0 PFI PF2

→ ← EACH BIT = 4 CLOCKS

REF=1

PF0 PFI PF2 : PF2 PFI PF0

CENTER

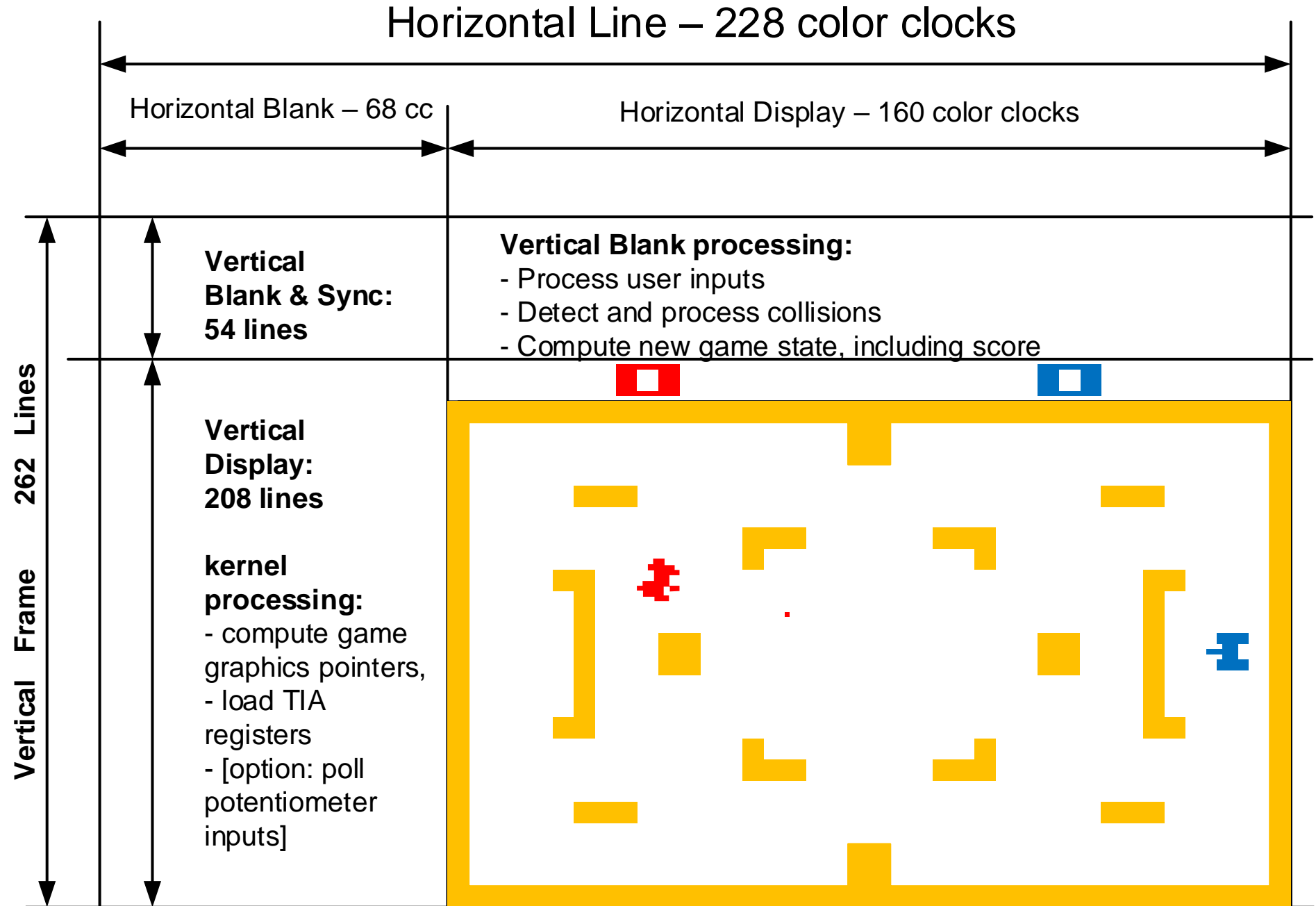## COLUP0 (COLUP1, COLUPF, COLUBK)

THESE ADDRESSES WRITE DATA INTO THE PLAYER, PLAYFIELD, AND BACKGROUND COLOR-LUMINANCE REGISTERS.

	COLOR				LUM			
COLOR	D7	D6	D5	D4	D3	D2	D1	X	LUM
NONE	0	0	0	0	0	0	0	BLACK
GOLD	0	0	0	1	0	0	1	DARK GREY
	0	0	1	0	0	1	0	⋮
	0	0	1	1	0	1	1	GREY
PINK-OR	0	1	0	0	1	0	0	
	0	1	0	1	1	0	1	⋮
PURP	0	1	1	0	1	1	0	LIGHT GREY
	0	1	1	1	1	1	1	WHITE
BLUE	1	0	0	0				
	1	0	0	1				
BLUE	1	0	1	0				
	1	0	1	1				
GREEN	1	1	0	0				
	1	1	0	1				
YEL-GRN	1	1	1	0				
	1	1	1	1				

Program flow and timing

Horizontal Line – 228 color clocks

Horizontal Blank – 68 cc

Horizontal Display – 160 color clocks

262 Lines

Vertical Frame

Vertical Blank & Sync: 54 lines

Vertical Blank processing:
- Process user inputs
- Detect and process collisions
- Compute new game state, including score

Vertical Display: 208 lines

kernel processing:
- compute game graphics pointers,
- load TIA registers
- [option: poll potentiometer inputs]

Epiphany: we needed a roadmap

- This machine was barely cheap enough to ship and sell in 1977
  - Bill-Of-Materials was ~$65; suggested retail ~$200.
  - At that time, you could buy a car for $2500, or a house for $25,000.
- Our marketing people expected a 3-year shelf life before we or our competitors made it obsolete.
- Idea: add $1 to the BOM, to use a 30-pin vs 24-pin game cartridge connector, and a buy a 40-pin CPU vs 28-pin CPU
  - This would allow Atari to define a series of machines, so that the customers could keep using the game cartridges that they would buy
- **I was too late.** Our second machine was so different that the customers' game libraries would be obsolete.

Black Friday, 1977

- We were shipping. Sears set up a demonstration system nearby.
- Parents would drop off their children, who would wait (patiently or not) for a turn to try out the Tank game in Combat.
- Fortunately, the demonstrations were sufficiently self explanatory
  - Children learned quickly watching other children

- There would always be a big tantrum if a child did not get a turn before their parents returned to claim them.

THIS was an astonishing experience!

GETTING THE ATARI 2600 WAS ONE OF THE BEST DAYS OF YOUR LIFE.

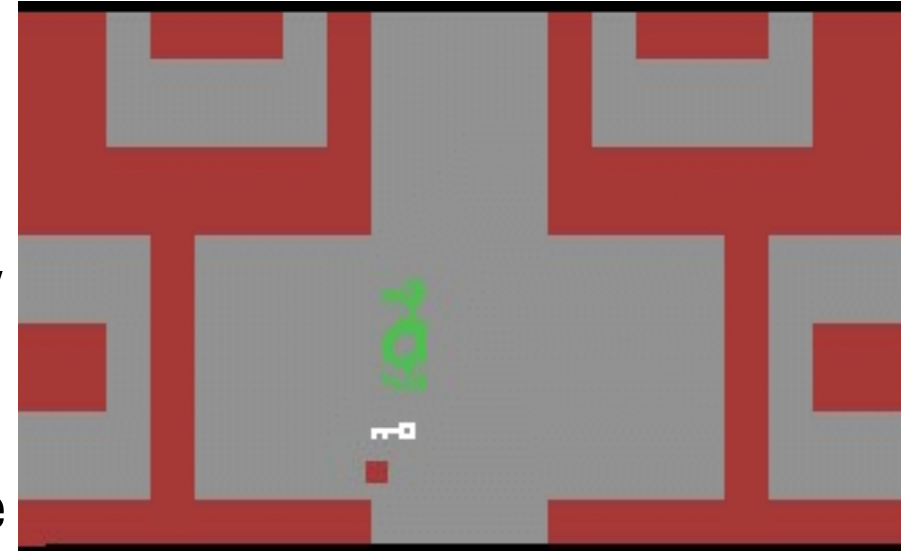ATARI VIDEO COMPUTER SYSTEM

facebook / EightiesMusicForever

Bring it home, Christmas 1977

- Part of getting the job: playing TANK with my Brother Bob, then my Atari interviewer.

- At Atari, I got to help design the console

- I wrote most of the Combat game cart, including TANK

- I brought it home for Christmas

- My younger brother Bob beat me again!

Games!

- About 1000 game cartridges were written
  - Some great, some junk
  - AtariAge promotes new game development now
  - See 8bitworkshop.com

- IMO, the best original games:

- Adventure, Pitfall!, River Raid, Yar's Revenge

THE ATARI® VIDEO COMPUTER SYSTEM™

More fun. More games. More entertainment. When it comes to video games, no other manufacturer stacks up to Atari. Today, Atari offers you a library of 42 exciting Game Program™ cartridges. And, new games are constantly under development.

The games that made Atari famous. If you've just purchased your Atari Video Computer System, get ready for some real excitement on your home television set. Your Video Computer System comes with the exciting "Combat" Game Program...27 thrilling games and variations. There are literally dozens of exciting, entertaining and educational games in the Atari Game Library.™ Games that challenge. Games that instruct. Games with skill levels that increase as your skill increases.

At home in your home. The Atari Video Computer System is easily installed. Just connect it to your television set and plug it in. It does not interfere with normal television viewing. To play a game, simply plug in the appropriate paddle, joystick, keyboard or steering controller (a list of cartridges and controllers is included in the last pages of this catalog). Then, insert the Game Program cartridge and turn power to the "ON" position. Don't turn on the power unless a game cartridge has been inserted. Now, choose the game and level of difficulty you want to play. Start the game by pressing the "Game Reset" button and you're ready for action.

Years of challenging entertainment. The Atari Video Computer System is designed to offer your family years of satisfaction. Atari's interchangeable controllers and game cartridges provide sophisticated, action-packed entertainment for the whole family. What's more, Atari never stops developing new and more challenging games. Atari games combine crisp color (on a color TV), action and true-to-life sound effects to bring you one of today's great values in home entertainment. And with several levels of built-in difficulty, you'll find that Atari games get better as you get better.
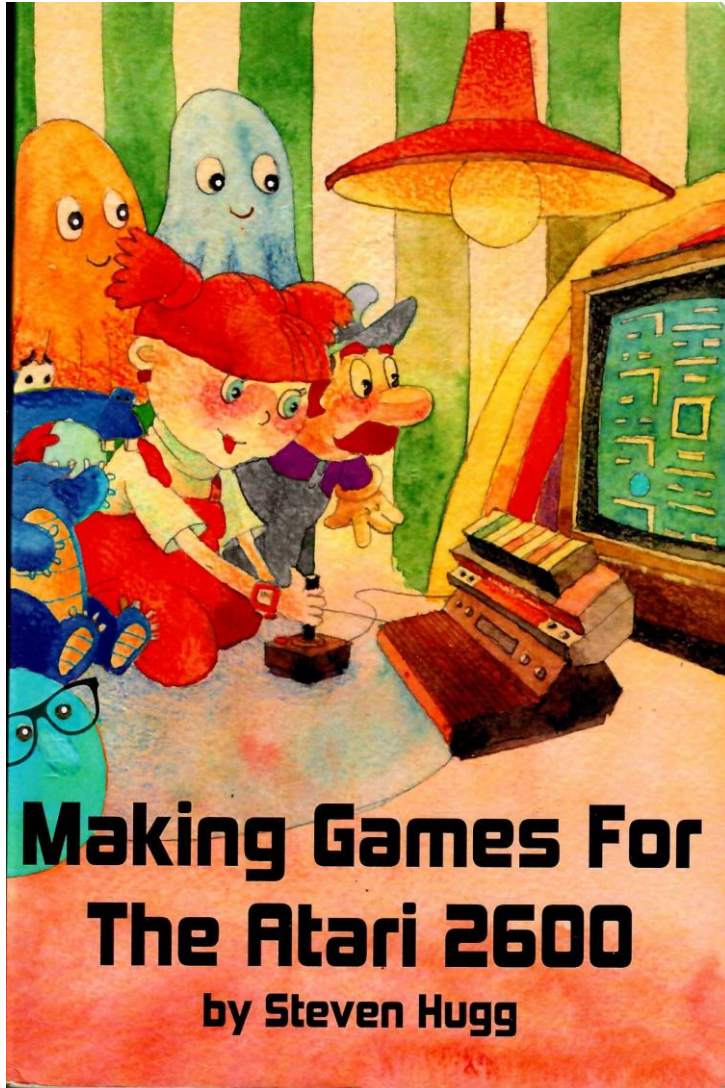
Atari takes fun seriously. There is no "it's only a game" attitude at Atari. It means we have the integrity to put quality where you may not always see it. From design to manufacturing, Atari quality control insures years of top performance from your VCS. The inevitable net result: the best you can buy. That's something we just don't joke about.

Lessons learned from the 2600

- We put the definition of the display in the hands of the game designers, who were smarter than we hardware designers expected.

- Our conclusion was that our second system should not simply be a bit map and a processor.

- We had created a platform for the art of others, and we planned to build on that for the next system.

- We thought we needed to move fast. The Atari PCS (8-bit computers) came out two years later, in 1979.

  - Much better game players, for another day
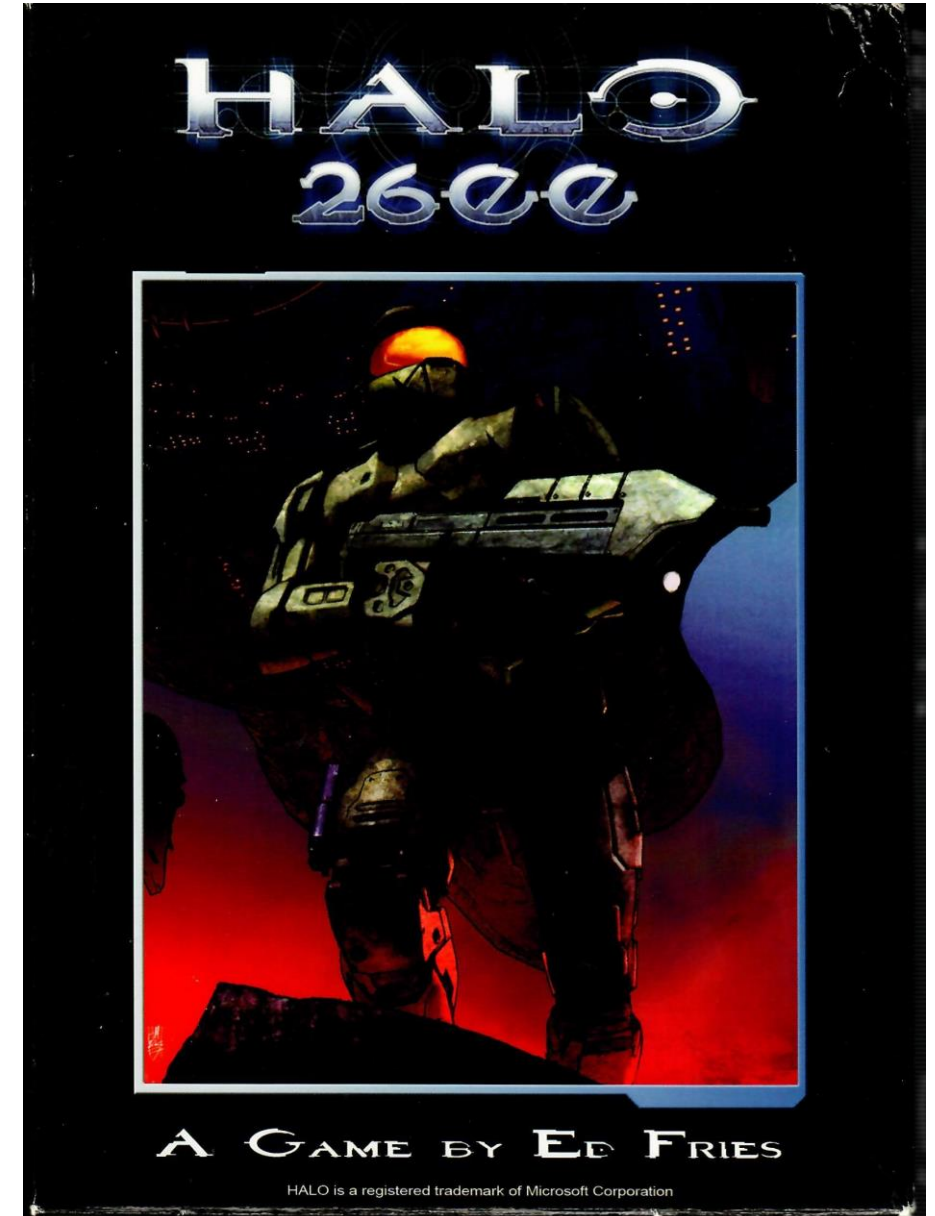
Ongoing game development

Making Games For The Atari 2600 by Steven Hugg

www.8bitworkshop.com

Build and play 2600 games using a web browser.

AtariAge supports ongoing game development
Example: Ed Fries, who wrote Halo for the original Microsoft Xbox then ported the game to the 2600.
IMO, the graphics are obviously inferior, but it plays well.

HALO 2600
A GAME BY ED FRIES
HALO is a registered trademark of Microsoft Corporation

Learn More:

- Racing the Beam, Montfort & Bogost, MIT Press, 2009
- Atari Age – Emergence of Video games in America, Newman, MIT Press, 2017
- Adventure – Atari 2600 at the Dawn of Console Gaming, Lendino, Ziff Davis, 2018
- Atari Inc – Business is Fun, Goldberg & Vendel, Syzygy Press, 2012
- Design Case History: Atari Video Computer System, IEEE Spectrum, vol 20, no 3, pp 45-51, March 1983
- Champions in our Midst, Corcoran & Decuir, IEEE Consumer Electronics Magazine, vol 4, no 3, PP 59-66, July 2015
- Art of Video Games: From Pac-Man to Mass Effect, Melissions & O'Rourke, Smithsonian American Art Museum, 2012
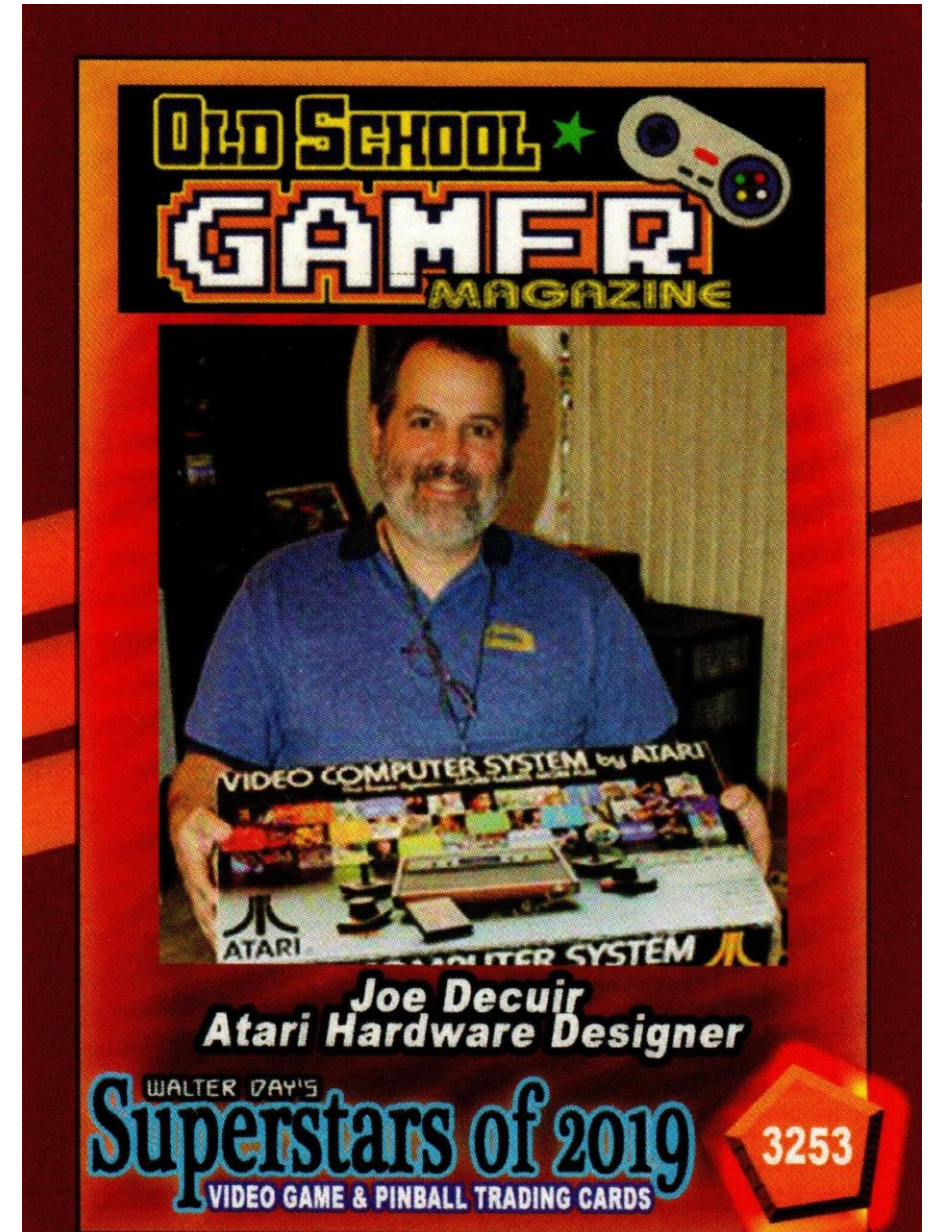
My contact information

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IEEE Fellow, for contributions to computer graphics and video games = Atari and Amiga

https://en.wikipedia.org/wiki/Joseph_C._Decuir

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Questions?

Games to demonstrate, now or later:

1. Adventure
2. Boxing – Activision
3. Boxing – Atari
4. Breakout
5. Centipede
6. Combat
7. Defender
8. Donkey Kong
9. Joust
10. Missile Command
11. Ms Pac-Man
12. Pitfall!
13. Raiders of the Lost Ark
14. River Raid
15. Skiing
16. Space Invaders
17. Super Breakout
18. Video Chess
19. Video Olympics
20. Yars' Revenge