

8-bit OAK Roots

Bernie Dugggs

@orclDoug / #OakTableSunday / #UKOUG2012



Who am I ?

Timeline

- 1980 Touched first ZX80 (not mine)
- 1982 ZX81 with 16k Memotech RAM
- 1983 Imagine Software
- 1984 Redundancy
- 1985 Ocean Software
- 1986 Odin Computer Graphics



Ping Pong
Hypaball
P.L.O.D

What am I going to talk about ?

(... and why ?)

Nostalgia

Software

Passion

Complexity

Simplicity

Some things last ...

My Personal Computer History

Sinclair ZX80 (1980)

£70 (1K RAM)

3.25 MHz Z80

4K ROM (O/S, Editor & Basic)

32 x 22 Character Black & White Display

64 x 44 Graphics

No Sound

'FAST' Mode Only

70,000 machines sold in less than a year



The importance of Milk and Peas



Sinclair ZX81 (1981)

£99.95 (1K)

3.25 MHz Z80

8K ROM (O/S, Editor and Sinclair Basic)

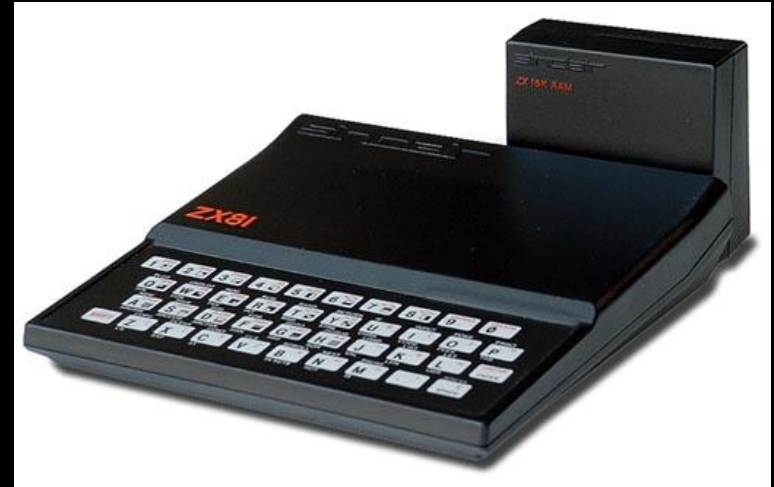
32 x 22 Character Black & White Display

64 x 44 Graphics

No Sound

'SLOW' Mode added and Games start appearing

1.5 million units sold



The importance of Blu-Tak

My Dev System History

SAGE II/IV (Imagine)

Motorola 68000
UCSD p-system
CPM/68K

In-house cross-assemblers & debuggers
In-house download cables



BBC Model B (Ocean/Odin)

6502

CP/M

Z80 expansion pack

Z80 cross-assembler

Only posh boys & girls need apply ;-)



Tatung Einstein (Ocean)

Z80

64K RAM (44 usable)

Xtal/DOS

Z80 assembler/debugger

Hitachi 3" disk drive (380K)



Something is missing ...

Sinclair ZX Spectrum

(1982)

£99 (16K) £125 (48K)

3.5 MHz Z80A

16K ROM (O/S, Editor and Sinclair Basic)

32 x 24 Character 8-Colour/Two-Tone Display

156 x 192 Graphics

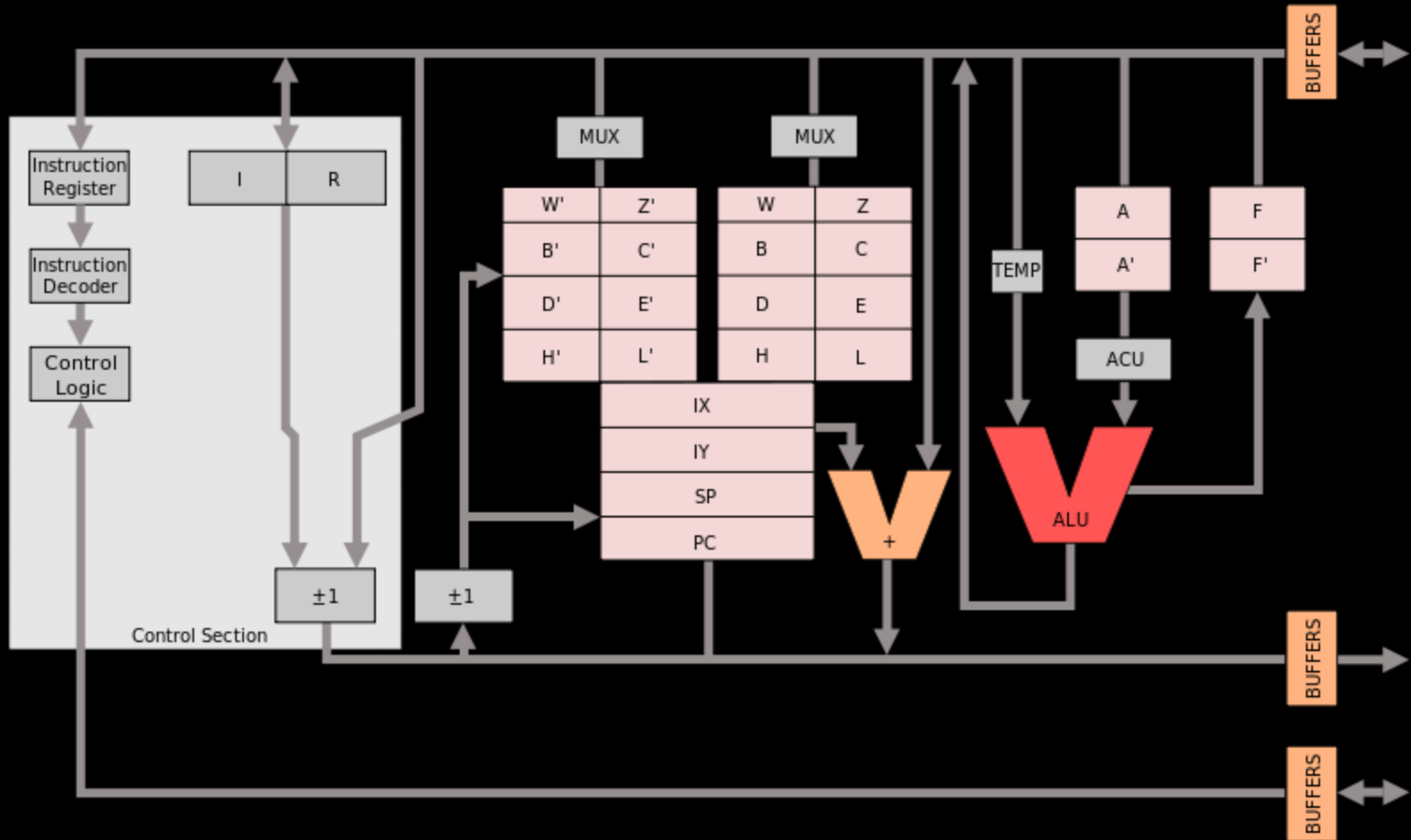
1 Voice/10 Octave Beeper

5 million units sold

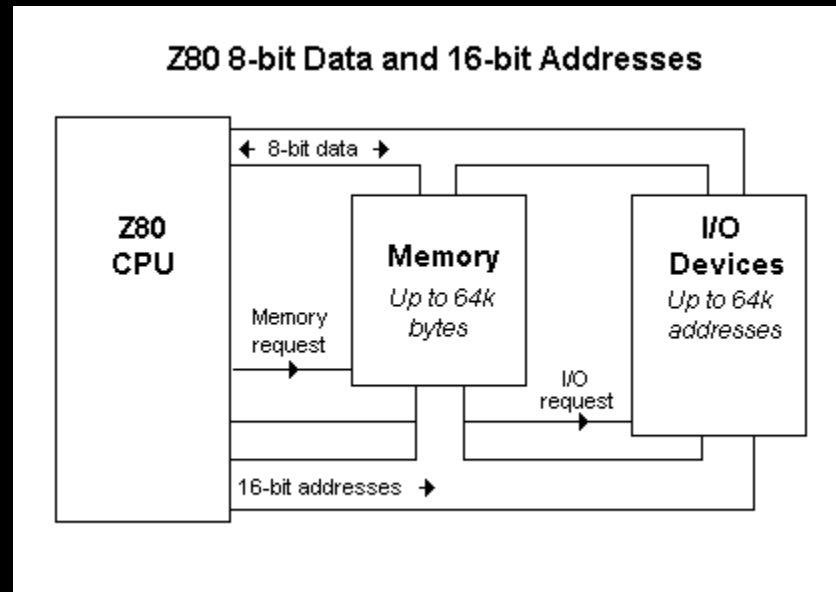


Developing Spectrum Games

Z80



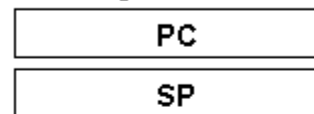
Z80



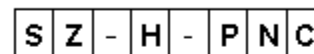
Z80

Z80 Processor Registers

Program Control



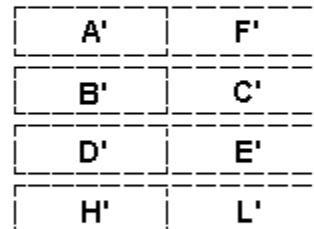
Flag Bits



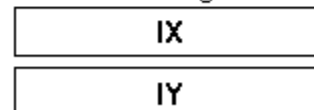
General Registers



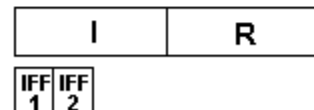
Alternate Registers



Index Registers



Hardware Control



Memory Map

Memory Range	Usage
0x0000 – 0x3fff	ROM
0x4000 – 0x57ff	Screen RAM – pixel data
0x5800 – 0x5aff	Screen RAM – attributes (colours)
0x5b0 – 0x5fff	Printer Buffer
0x5c00 – 0x5cbf	System Variables
0x5cc0 – 0x5cca	Reserved
0x5ccb – 0xff57	Available
0xff58 – 0xffff	Reserved

Display

"The display file stores the television picture. It is rather curiously laid out..."

Spectrum Manual ch24 p164

Interrupt Service Routines

Interrupt generated when the raster hits the bottom of TV screen

Takes approximately 14,200 T-states for raster fly-back and drawing top border

Shove data into screen memory *as quickly as possible* during that time so that raster never crosses a graphic you're drawing

Flicker-free Sprites

... and that's *almost* it!

Technical Stuff

Grog's Revenge Scroll

Unpublished and lost forever ...

Smooth horizontal scrolling at several speeds

1 bit, 2 bits, 4 bits, 8 bits

Redrawing large area of screen

LDIR LD with Increment and Repeat:16/21 T-States

LDI LD with Increment:16 T-States

Grog's Revenge Scroll

LDI

LDI

LDI

LDI

LDI

LDI

LDI

<snipped>

(Loop)

Inline Code

Instrumentation

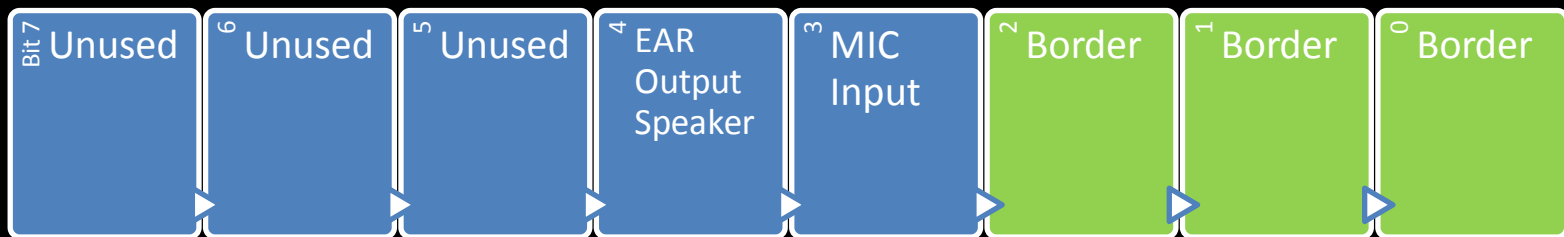
Given the importance of drawing sprites when the raster isn't crossing them, how do we *know*?

We need instrumentation!

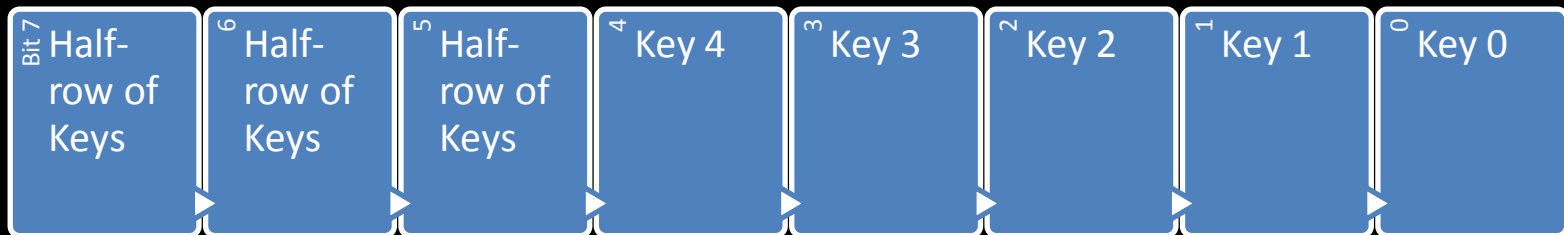
Must be extremely low-cost and non-intrusive

Port (FE) for Hardware Control

Output



Input



When people don't lock their screens

Modern Version

Use internal chat system to chat to team-mates 'I Love You Guys!' etc etc

Spectrum Coders Version

Find all occurrences of

LD A,0 : 7 T-States

Change to

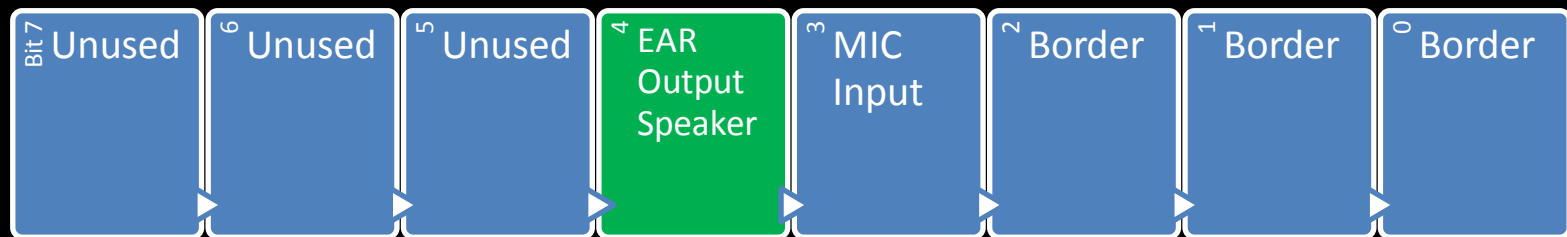
XOR A : 4 T-States

Add comment

; Clown!

Ping Pong Music

Green Beret wasn't ready to ship and short on memory



Joffa Smiff
Martin Galway

Plip-Plop Music Programming
Tunes

OUT (FE),A

12 T-states

Ping Pong Music

Crash Reviews (May 1986)

Green Beret	88%
Ping Pong	90%

That's a proper friend!

Lessons Learned

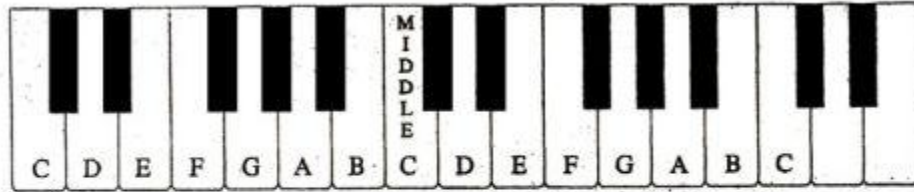
Efficiency is *still* a good thing

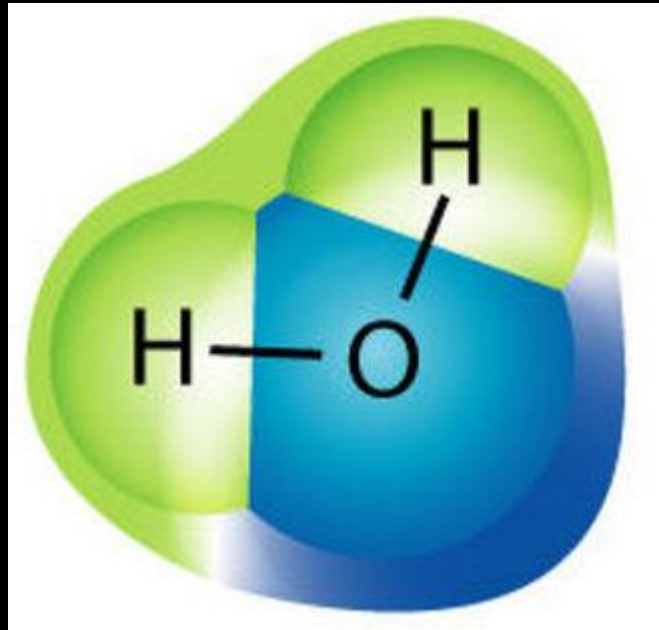
Moving data quickly

Performance analysis depends
on good *instrumentation*

Complexity from Simplicity







This man was a coding genius



SCORE 26957 AAA

1ST TRY	0
2ND TRY	0
3RD TRY	0

WORLD RECORDS

1ST	8.48	TON
2ND	7.98	JOF
3RD	7.66	GAL

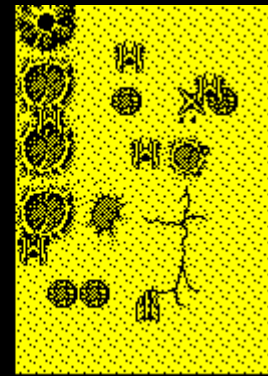
SPEED 1100 cm/sec



SC 000900

HI 215000

LI



SCORE 1400 HIGH 33000

STAGE 01

SCORE 009250

I'M THE CURE

SCORE 0013280 QUALIFY 006:50m

1st ATTEMPT	FOUL	RECORDS	ACE	007:72
2nd ATTEMPT	005:56	ACE	005:56	
3rd ATTEMPT	007:72	PRO	000:00	

ocean

SPEED 46 007:42 m

puremachinecode.co.uk

SCORE: 009670

003000 CLASS ROOM

FAILURE TEACHES SUCCESS

www.gamesbase.com

00017400

Rest In Peace, Jof

<http://www.worldofspectrum.org/tribute/en/SmithJonathanM.html>

Passion

There is hope ...



8-bit OAK Roots

Doug Burns

@orclDoug

dougburns@yahoo.com

<http://oracledoug.com>

