6502
Atari 8-bit
Sizecoding

F#READY

- Software Engineer
- Retrocomputing
- Demoscene (oldskool)
- Atarian
- Cycloholic

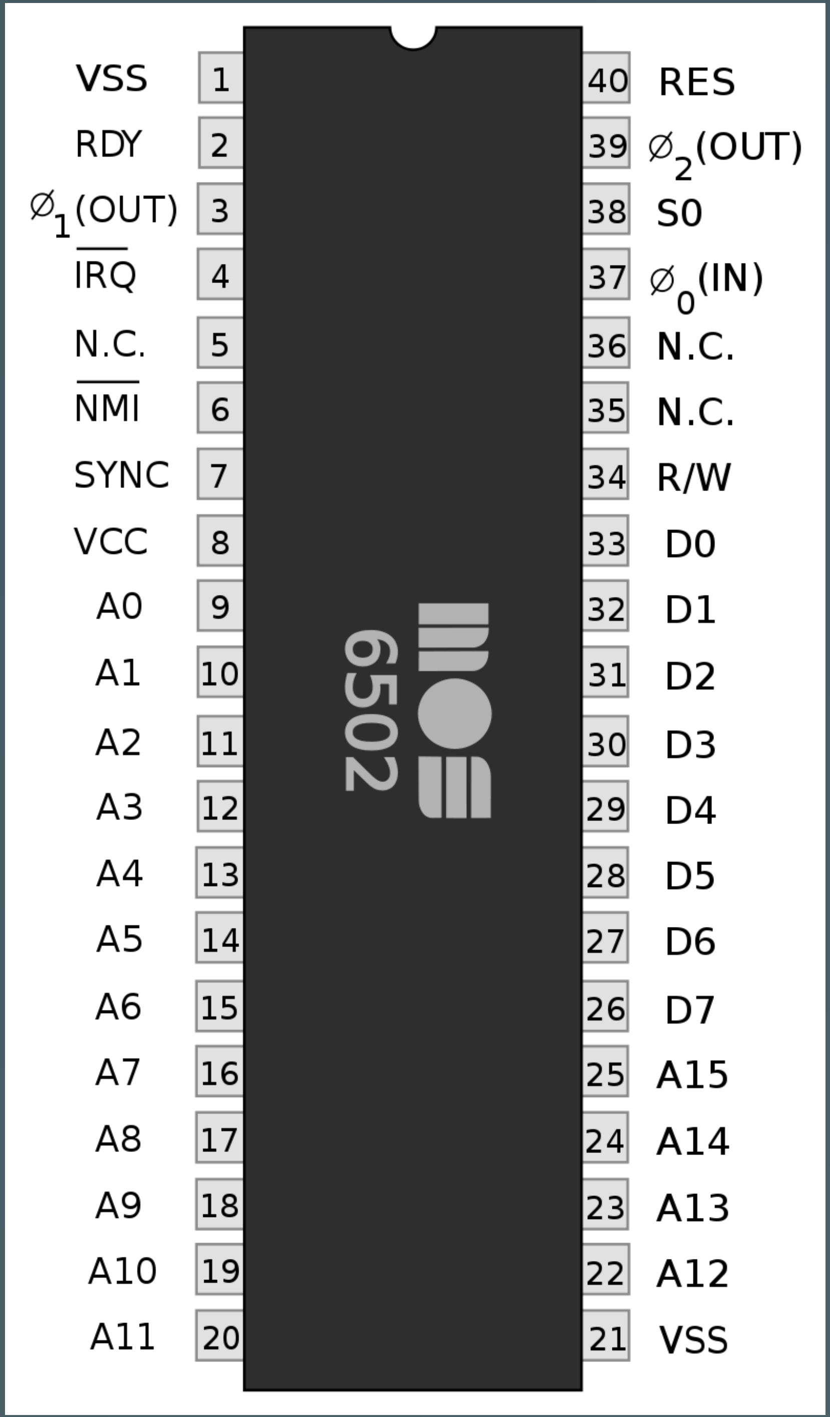
Why sizecoding?

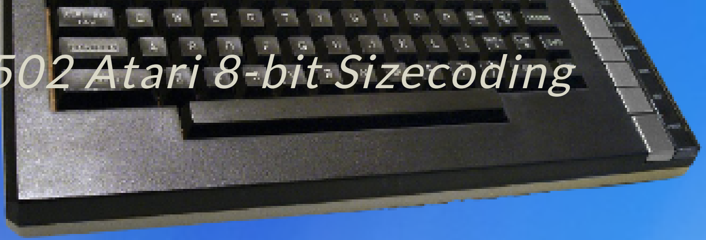
- Creative limitation
- In full control
- Demo appreciation
- Fun 😎

Contents

PART 1

6502 sizecoding





6502

6502 overview

- 56 instructions
- No multiply, divide
- No trig instructions
- Three 8-bit registers
- 1..2 MHz

Branch vs jump

Absolute jump

```
    jmp label       ; 3
```

Relative branch

```
    bne label       ; 2
```

Watch your N,Z,V flags
Use the non-changing one as jmp

Inline subroutine

```
        ...main code...
        jsr subroutine  ; 3

subroutine
        ...subroutine code...
        rts                             ; 1
```

Saves 4 bytes

```
        ...main code...
        ...subroutine code...
```

Loops

Countup

```
        org $8000

        ldx #0      ; 2
next
        lda foo,x   ; 3
        ...
        inx         ; 1
        cpx #10     ; 2
        bne next    ; 2
```

10 bytes

Loops

Countdown

```
        org $8000

        ldx #9      ; 2
next
        lda foo,x   ; 3
        ...
        dex         ; 1
        bpl next    ; 2
```

8 bytes

Loops

Countdown on zeropage

```
        org $80

        ldx #9       ; 2
next
        lda foo,x    ; 2 - zp,x
        ...
        dex          ; 1
        bpl next     ; 2
```

7 bytes

Copy

Copy <= 129 bytes

```
        ldx #128
copy
        lda from,x              ; from [128..0]
        sta to,x
        dex
        bpl copy
```

Easy!

Copy

Copy 256 bytes

```
        ldx #0
copy
        lda from,x              ; from [0, 255..1]
        sta to,x
        dex
        bne copy
```

Easy!

Copy

Copy 129 to 256 bytes (e.g. 200)

```
        ldx #199
copy
        lda from,x              ; from [199..0]
        sta to,x                ; to [199..0]
        dex
        cpx #255                ; want to include 0
        bne copy
```

Upcount doesn't help

Copy

Getting rid of cpx

```
        ldx #200
copy
        lda from-1,x    ; from [199..0]
        sta to-1,x
        dex
        bne copy
```

Saved 2 bytes

Copy

Do not worry about extra bytes copied

```
        ldx #0
copy
        lda from,x              ; from [0, 255..1]
        sta to,x
        dex
        bne copy
```

Copy 256 bytes is easy!

Re-use x,y

```
        ldx #0
loop1
        ... using x...
        ldy #0
loop2
        ... using y...
        dey
        ... need another index register :(

        bne loop2
        bne loop1
```

Out of registers already?

Re-use x,y

Use the stack?

```
        ... need another index register :(
        tya
        pha
        ... use y again
        pla
        tay
```

4 bytes

Destroys A :(

Re-use x,y

Use zeropage

```
        ... need another index register :(
        sty temp_y
        ... use y again
        ldy temp_y
```

4 bytes + temp_y on zero page

Re-use x,y

Self-modifying code

```
         ... need another index register :(
         sty here
         ... use y again
here = *+1
         ldy #0
```

4 bytes

Initialise variables

Schoolbook example

```
some_var
        dta 0               ; 1

        lda #42             ; 2
        sta some_var        ; 2 (zp)
        ...

        lda some_var        ; 2 (zp)
        ...
```

7 bytes

Initialise variables

Self-modifying code, zero page

```
some_var = *+1
         lda #42              ; 2
         ...

         lda some_var         ; 2
         ...
```

4 bytes

Add/substract

```
        lda some_var        ; 2
        clc                 ; 1
        adc #3              ; 2
        sta some_var        ; 2
```

Adding 1, 2 or 3? Use inc

```
        inc some_var        ; 2
        inc some_var        ; 2
        inc some_var        ; 2
```

Substract? Same...

Use register state

```
        ldx #0
loop
        ...
        dex
        bne loop

        lda #0
        sta some_var
```

Can we use something else?

Use register state

```
        ldx #0
loop
        ...
        dex
        bne loop

        stx some_var    ; x = 0 after bne
```

Saved 2 bytes

Combine loops

Two loops (19 bytes)

```
        ldx #0
p1      txa
        sta table256,x          ; fill page 0..255
        inx
        bne p1

        ldx #0
p2      lda #42
        sta page42,x            ; fill with 42
        inx
        bne p2
```

Combine loops

One loop (14 bytes)

```
        ldx #0
p1
        txa
        sta table256,x            ; fill page 0..255
        lda #42
        sta page42,x              ; fill with 42
        inx
        bne p1
```

Saved 5 bytes

Undocumented opcodes

```
        lda $1234
        tax
```

Load A and X from memory

```
        lax $1234
```

Most are very obscure :)

Links

F#READY

https://github.com/FreddyOffenga

https://demozoo.org/sceners/35273/

Sizecoding

http://www.sizecoding.org