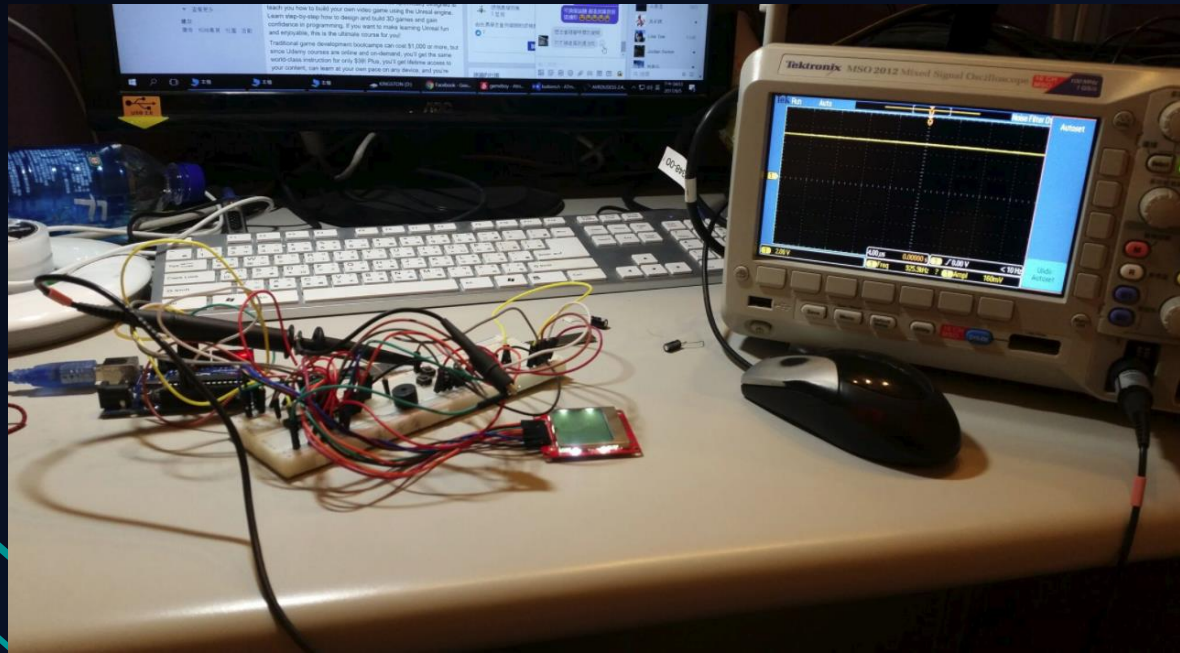


# 2017 MCU Final Project

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BIME, NTU, Taiwan





We made a

# Handheld Game Console



# Components

- MCU
- LCD
- Buttons
- Others

Somewhere





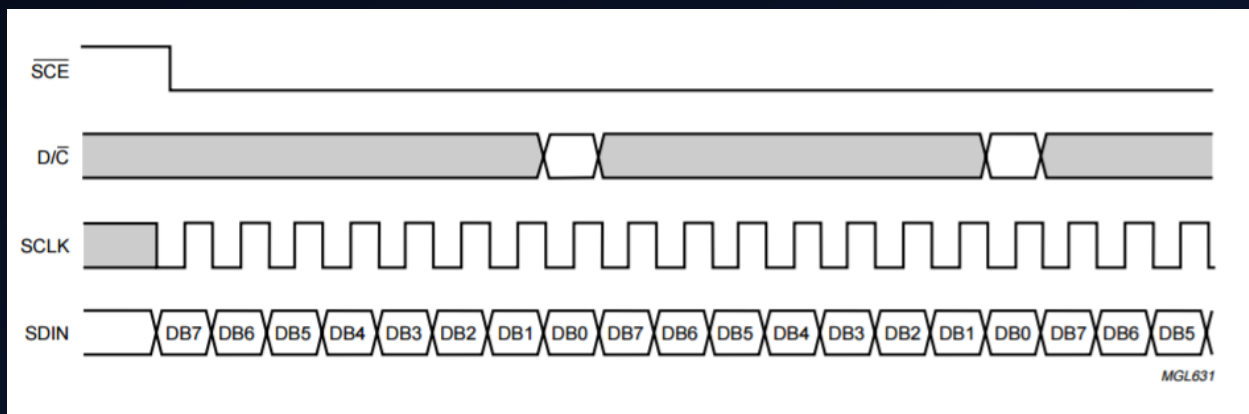
# LCD

- Nokia5110 LCD



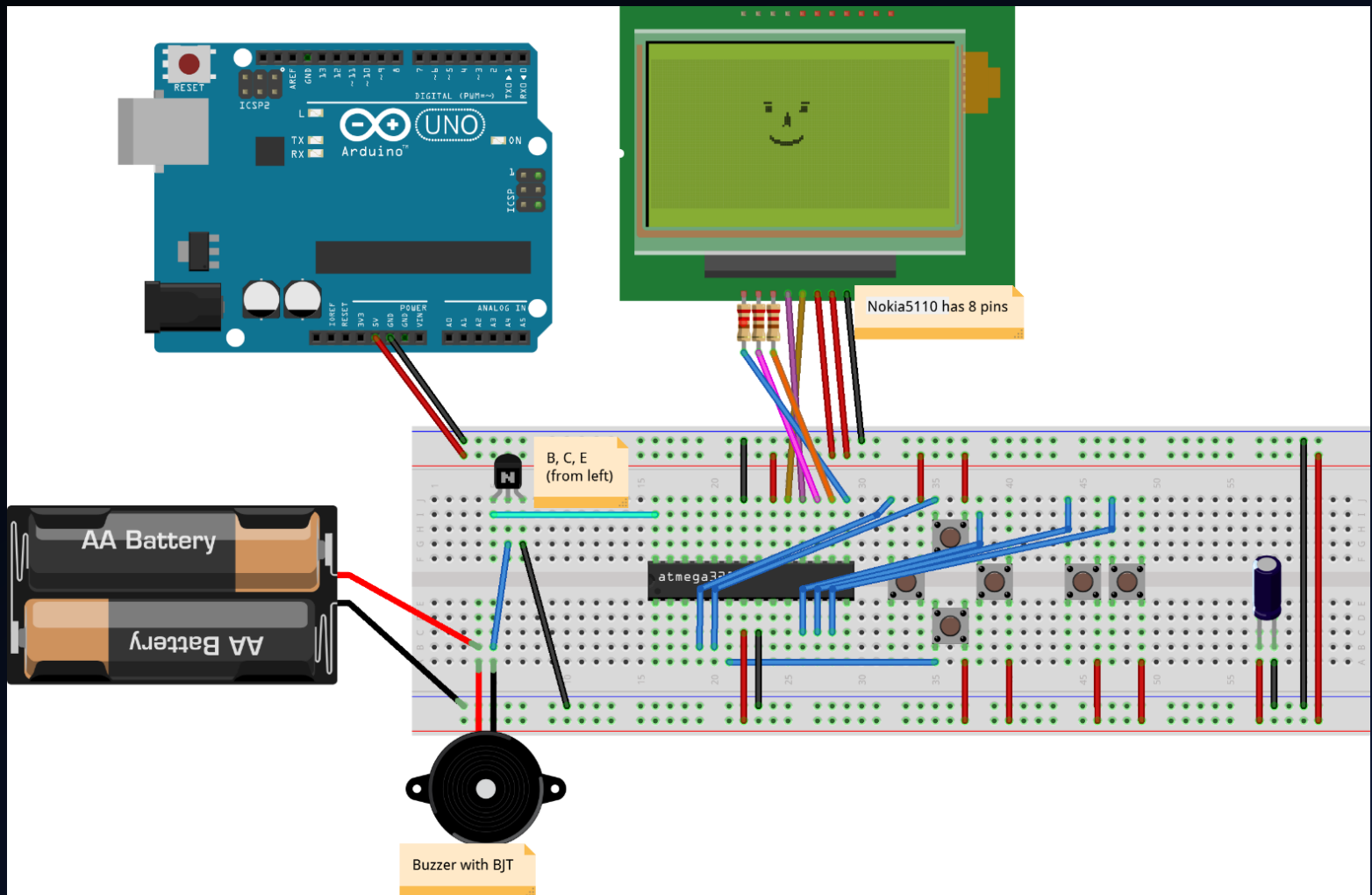
# Nokia5110

- 48 × 84 pixels matrix
- PCD8544 Controller
  - CMOS
- [Data Sheet](#)



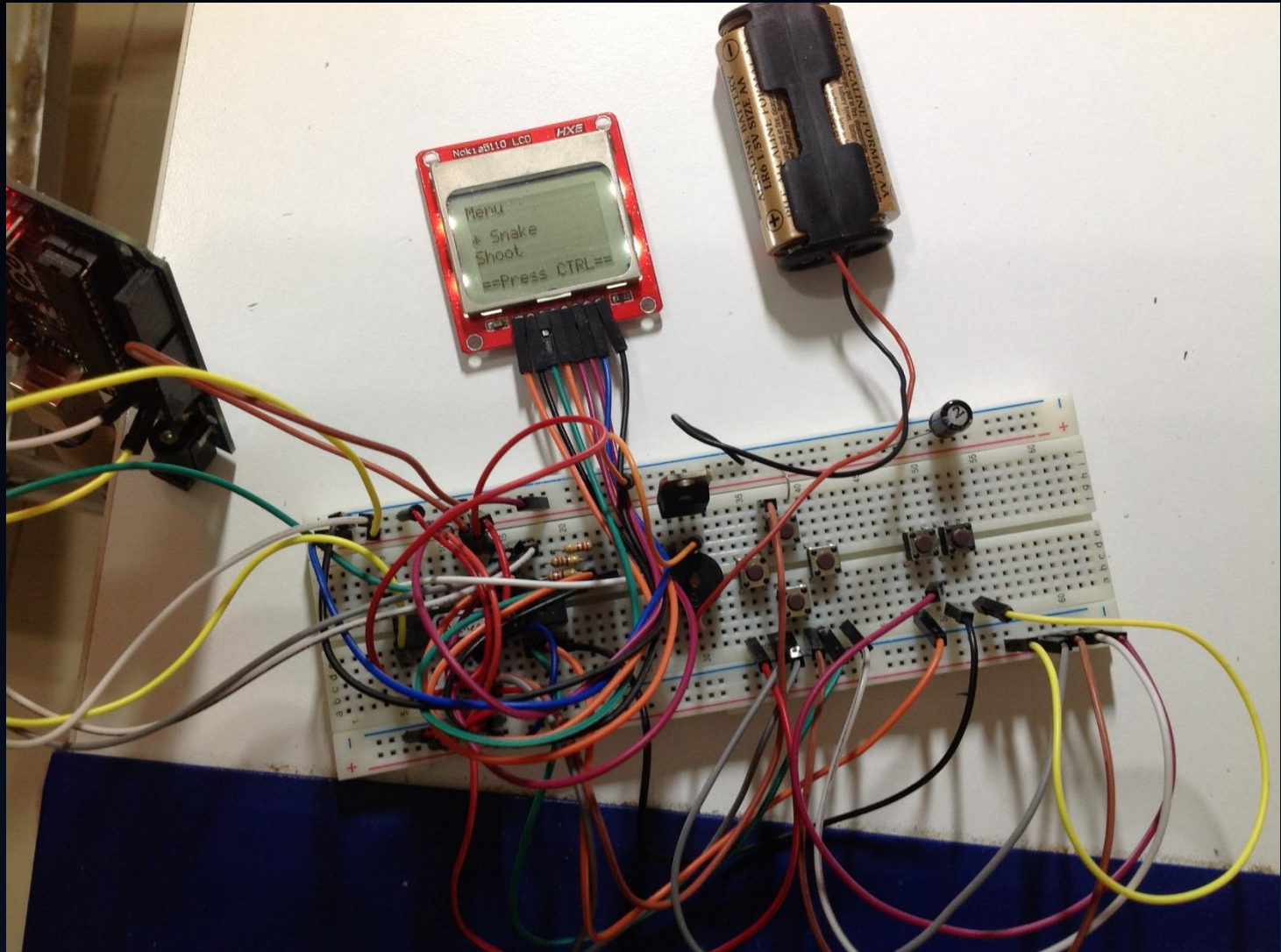
Pin No.	Pin Label	Pin Function	I/O	Notes
1	VCC	Positive power supply	Input	Supply range is between 2.7V and 3.3V
2	GND	Ground	Input	
3	SCE	Chip select	Input	Active low
4	RST	Reset	Input	Active low
5	D/C	Mode select	Input	Select between command mode (low) and data mode (high).
6	DN(MOSI)	Serial data in	Input	
7	SCLK	Serial clock	Input	
8	LED	LED backlight supply	Input	Maximum voltage supply is 3.3V.

# Circuit Diagram





# Photo



# Video

- [https://www.dropbox.com/s/jr5x41fuszlm30k/ATmega328P\\_Nokia5110\\_gameboy.mov?dl=0](https://www.dropbox.com/s/jr5x41fuszlm30k/ATmega328P_Nokia5110_gameboy.mov?dl=0)
- Adjust the volume

# Limitations & Problems

- RAM

- Many AVR's have limited amount of RAM in which to store data, but may have more Flash space available.

```
unsigned char mydata[11][10] PROGMEM =  
{  
    {0x00,0x01,0x02,0x03,0x04,0x05,0x06,0x07,0x08,0x09},  
    {0x0A,0x0B,0x0C,0x0D,0x0E,0x0F,0x10,0x11,0x12,0x13},  
    {0x14,0x15,0x16,0x17,0x18,0x19,0x1A,0x1B,0x1C,0x1D},  
    {0x1E,0x1F,0x20,0x21,0x22,0x23,0x24,0x25,0x26,0x27},  
    {0x28,0x29,0x2A,0x2B,0x2C,0x2D,0x2E,0x2F,0x30,0x31},  
    {0x32,0x33,0x34,0x35,0x36,0x37,0x38,0x39,0x3A,0x3B},  
    {0x3C,0x3D,0x3E,0x3F,0x40,0x41,0x42,0x43,0x44,0x45},  
    {0x46,0x47,0x48,0x49,0x4A,0x4B,0x4C,0x4D,0x4E,0x4F},  
    {0x50,0x51,0x52,0x53,0x54,0x55,0x56,0x57,0x58,0x59},  
    {0x5A,0x5B,0x5C,0x5D,0x5E,0x5F,0x60,0x61,0x62,0x63},  
    {0x64,0x65,0x66,0x67,0x68,0x69,0x6A,0x6B,0x6C,0x6D}  
};
```

- Memory


- 32 KB

- CPU Speed

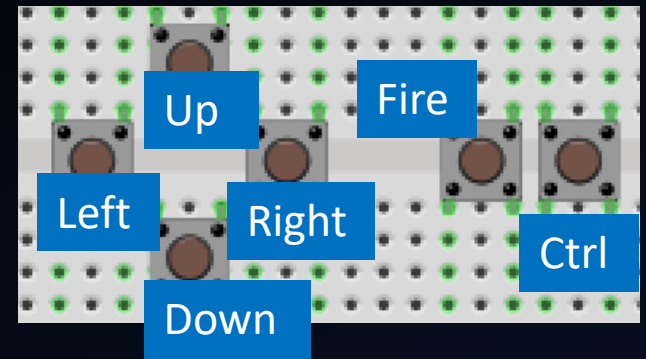
# Architecture

```
C main.c x
1  /*
2  ** @author tigercosmos
3  */
4  #define F_CPU 1000000UL
5
6  #include "../dependencies/index.h"
7
8  int main(void)
9  {
10     sound_init();
11     nokia_lcd_init();
12     print_hello();
13     welcome_sound();
14     enter_menu();
15 }
16
```

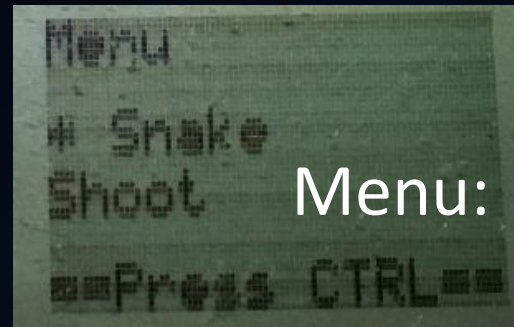
```
gameboy
├── Debug
├── dependencies
│   ├── buttons.c
│   ├── buttons.h
│   ├── index.h
│   ├── menu.c
│   ├── menu.h
│   ├── nokia5110_chars.h
│   ├── nokia5110.c
│   ├── nokia5110.h
│   ├── screen.c
│   ├── screen.h
│   ├── shootGame.c
│   ├── shootGame.h
│   ├── snakeGame.c
│   ├── snakeGame.h
│   ├── sound.c
│   └── sound.h
├── gameboy.componentinfo.xml
├── gameboy.cproj
└── main.c
```



# Game Process



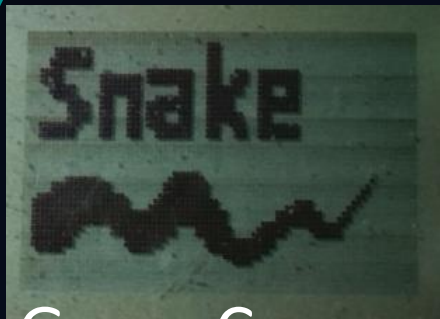
Welcome



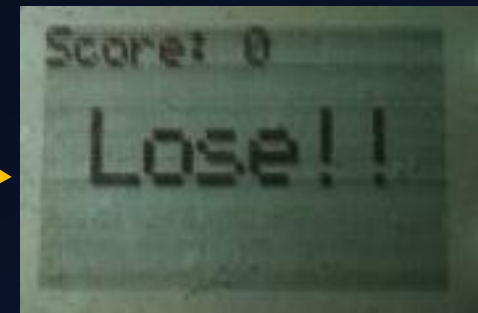
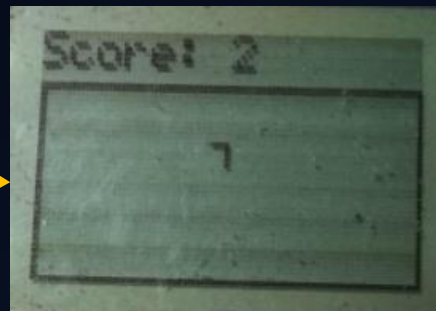
Menu: Up, Down

Press Ctrl

Press Ctrl



Game Cover





# Game Logic

- Snake snake
  - See snakeGame.h
  - See snakeGame.c
  - Feel free to ask me
- Special
  - Circular queue as snake body
  - Use buttons clicks as random seed

```
C snakeGame.h x
1  typedef struct Direction
2  {
3      signed char dirX;
4      signed char dirY;
5  } Direction;
6
7  typedef struct Position
8  {
9      unsigned char x;
10     unsigned char y;
11 } Position;
12
13 void snake_play();
14 void enter_snake();
15 void snake_init();
16 void snake_show_score();
17 void make_food();
18 void make_snake();
19 void move();
20 void snake_set_grids();
21 uint8_t collide();
22 uint8_t isFull();
23 uint8_t eat();
24 void grow(Position pos);
25 void snake_win();
26 void snake_lose();
```

# DIY Yourself

[https://github.com/tigercosmos/ATmega328P\\_Nokia5110\\_gameboy](https://github.com/tigercosmos/ATmega328P_Nokia5110_gameboy)



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## DIY Handheld Game Console Made With ATmega328P and Nokia5110 LCD

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