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Microcontrollers Course Project

Mini Arcade Games

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Topics

- Introduction
- Devices
- Flow Charts & Code
- Simulation
- PCB
- Suggestions
- References

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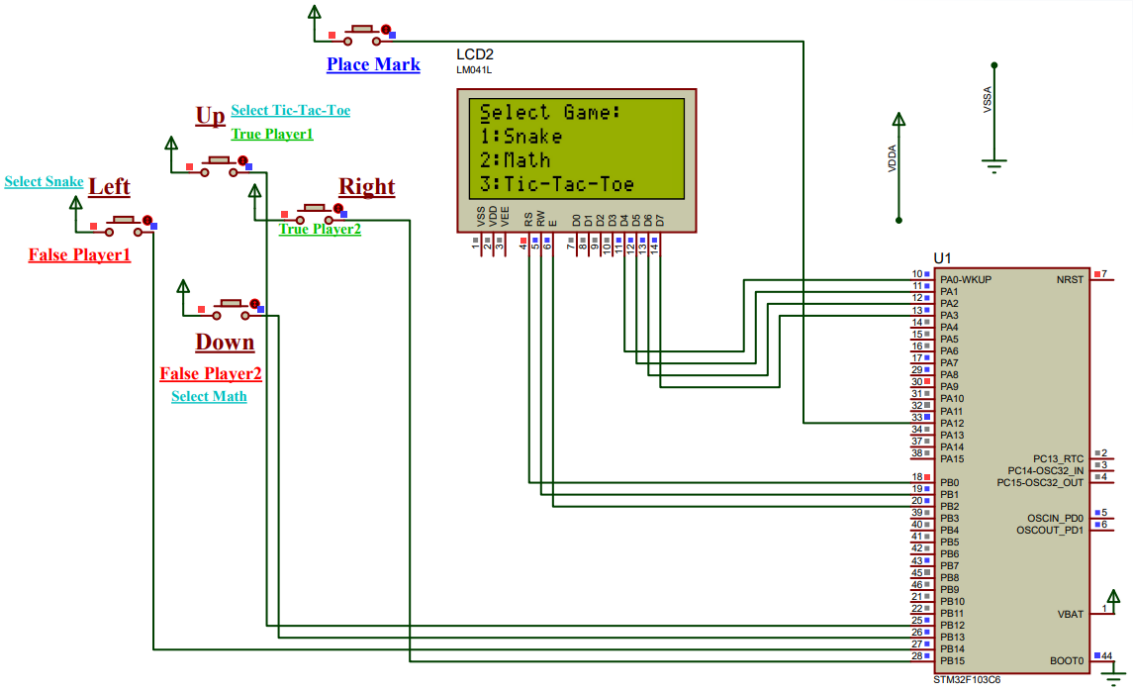
Mini Games:

- Snake
- Math
- Tic-Tac-Toe



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Devices:

- STM32F103 Chip
- Alphanumeric LCD Module
- Push Buttons
- PCB Elements (Capacitors, Resistors, Connectors, Regulators)

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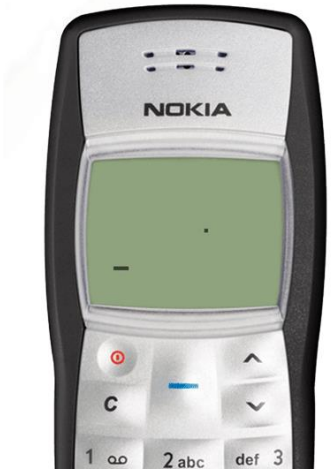
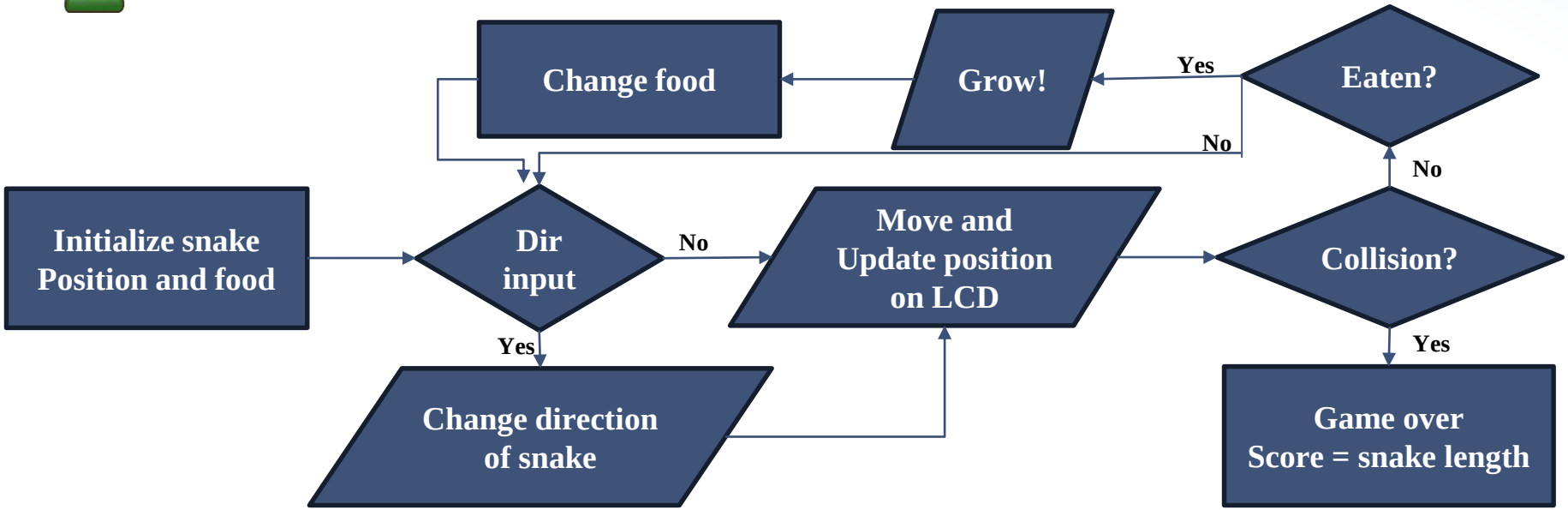
What is Snake Game?



Snake Game : Flowchart



Snake Game : Code

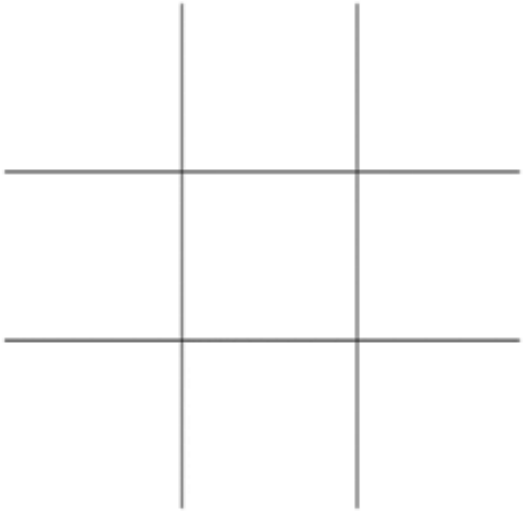
`void handle_snake_input(void)` : to change direction when button is pressed

`void spawn_food(void)` : it generates random place for food

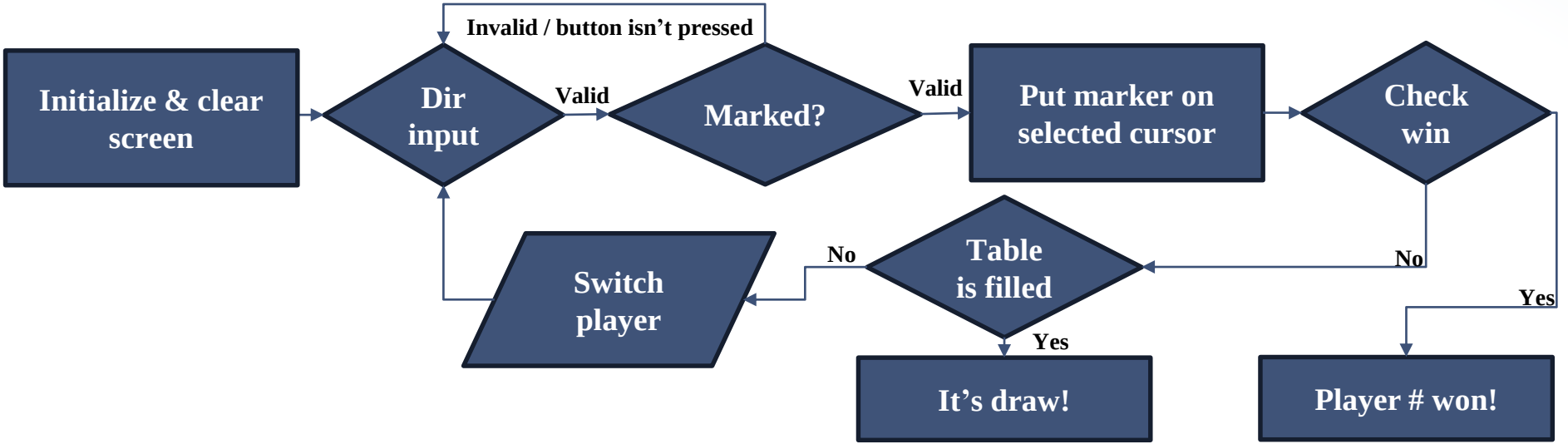
`void update_snake(void)` : to change direction of snake and increase length of snake

`void draw_snake(void)` : to draw snake on display

What is Tic-tac-toe ?



Tic-toc-to Game : Flowchart



Tic-tac-toe : Code

`void display_board(charboard[3][3],intcursor_row,int cursor_col)` **: display status of board & cursor**

`void handle_input(int *row, int *col)` **: move cursor and place players mark**

`int check_winner(char board[3][3])` **: check all state of win to end game**

`int check_draw(char board[3][3])` **: end game with draw status**

All these functions run in `loop` until `check_draw` or `check_winner` happen

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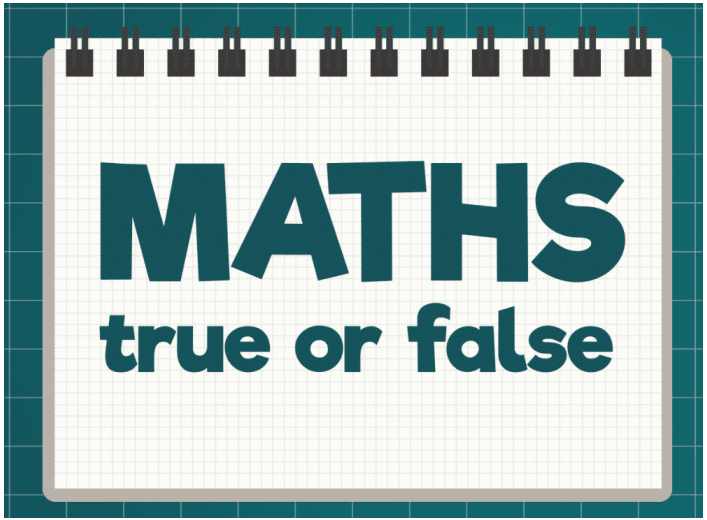
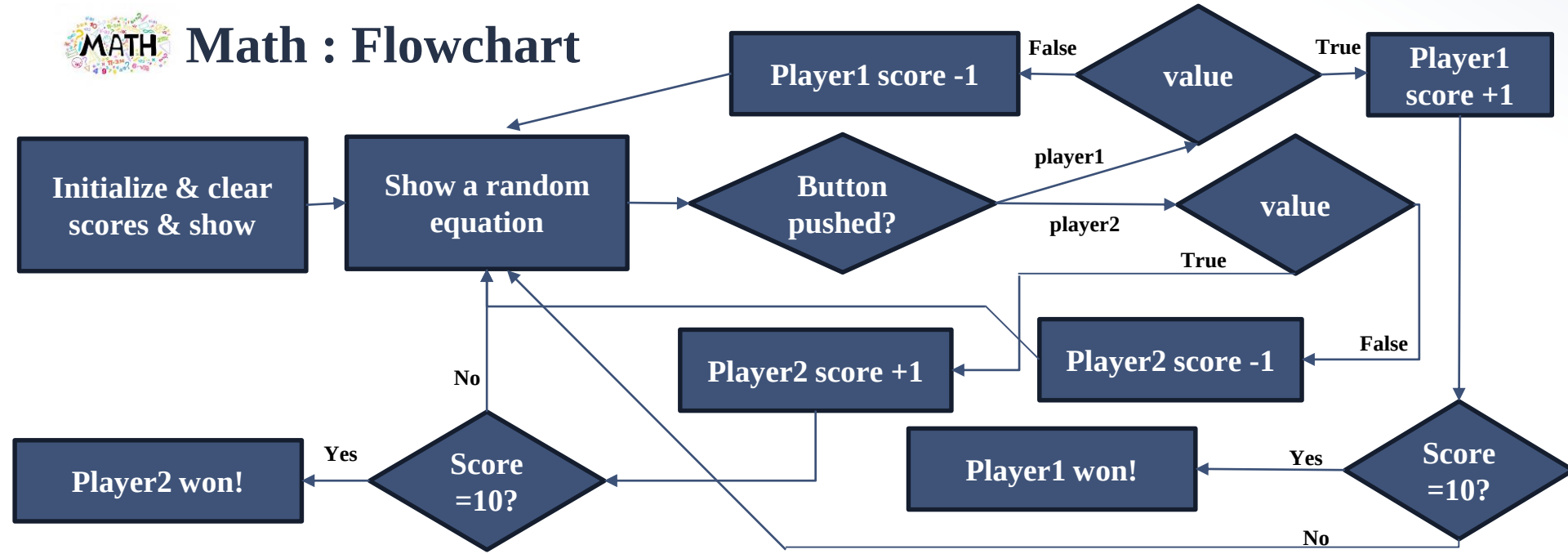
How is Math game played ?



True	False
12=6+6	15-2=13
10-5=8	12+3=15
16-9=10	13+3=16

Math : Flowchart



Math : Code

```
void display_problem(int num1, int num2, int result);
```
: display a math problem to players

```
int get_user_input(void);
```
: get players feedback on the problem

```
void play_math_game(void);
```
: generate problems

```
#define PLAYER1_CORRECT_BUTTON GPIO_PIN_12
#define PLAYER1_INCORRECT_BUTTON GPIO_PIN_14
#define PLAYER2_CORRECT_BUTTON GPIO_PIN_15
#define PLAYER2_INCORRECT_BUTTON GPIO_PIN_13
```
: assign push buttons to players

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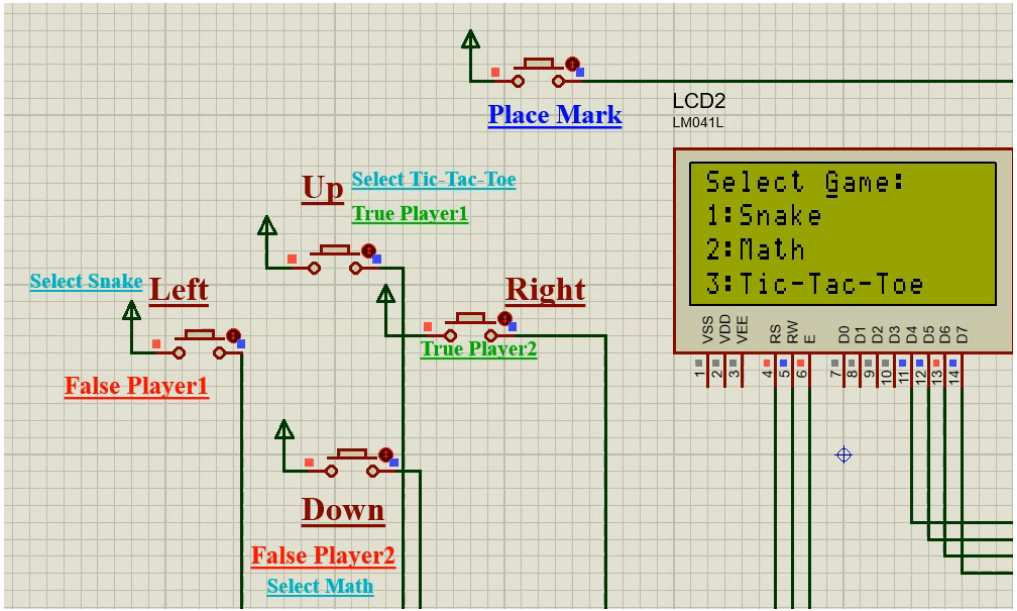
Snake Game : Simulation in proteus



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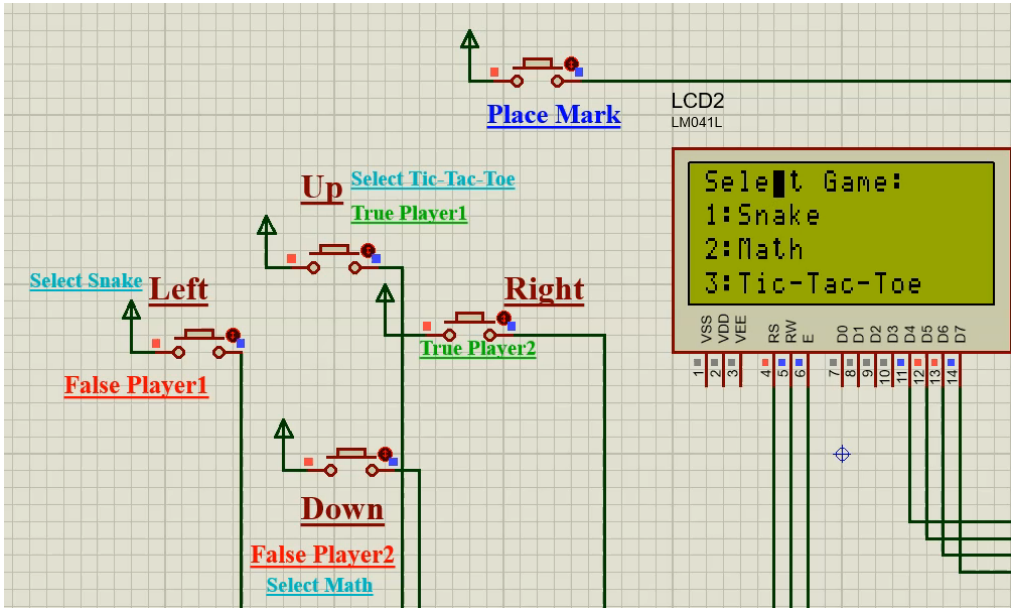
Tic-tac-toe : Simulation in proteus



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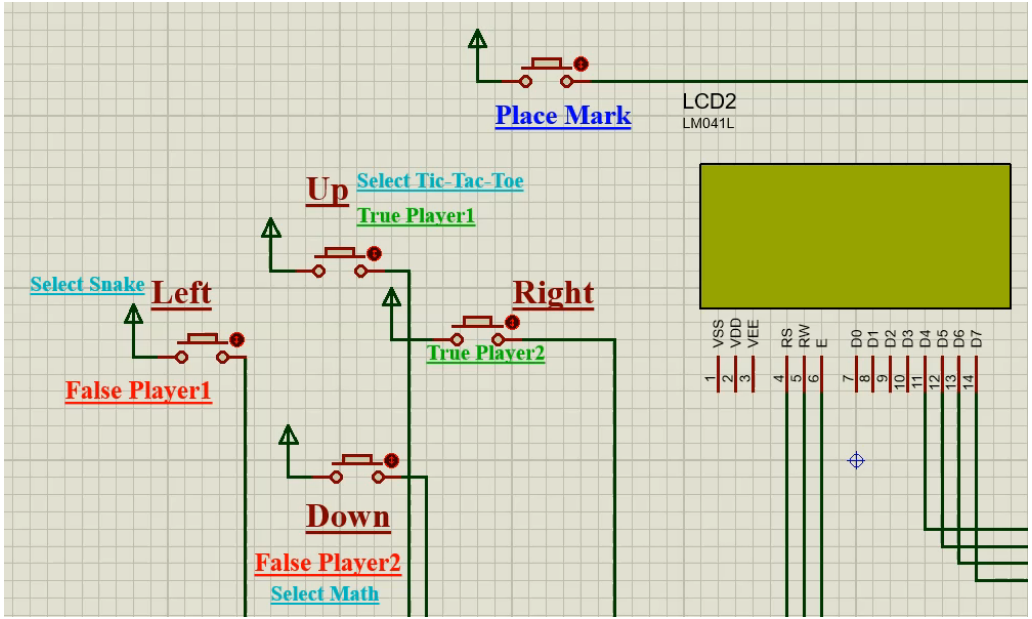
Math : Simulation in proteus



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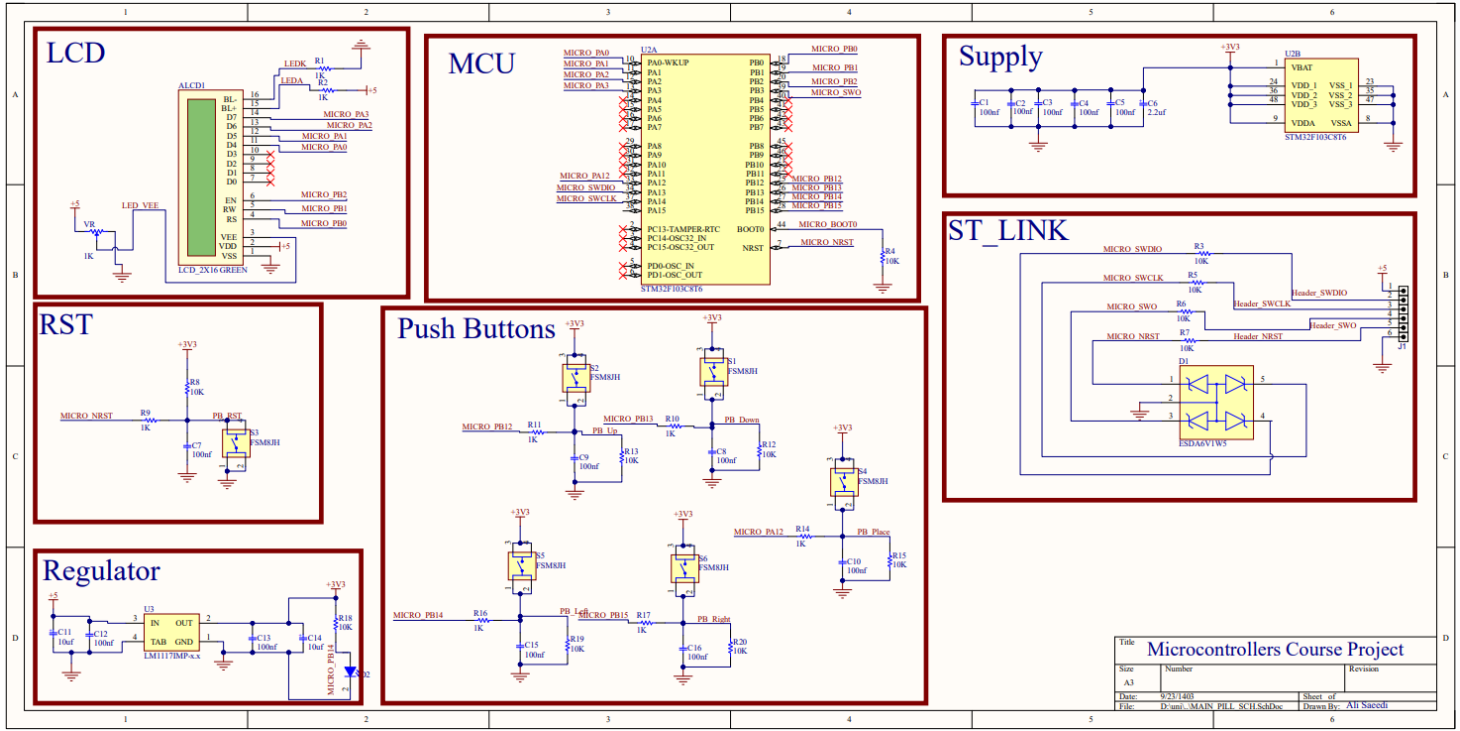
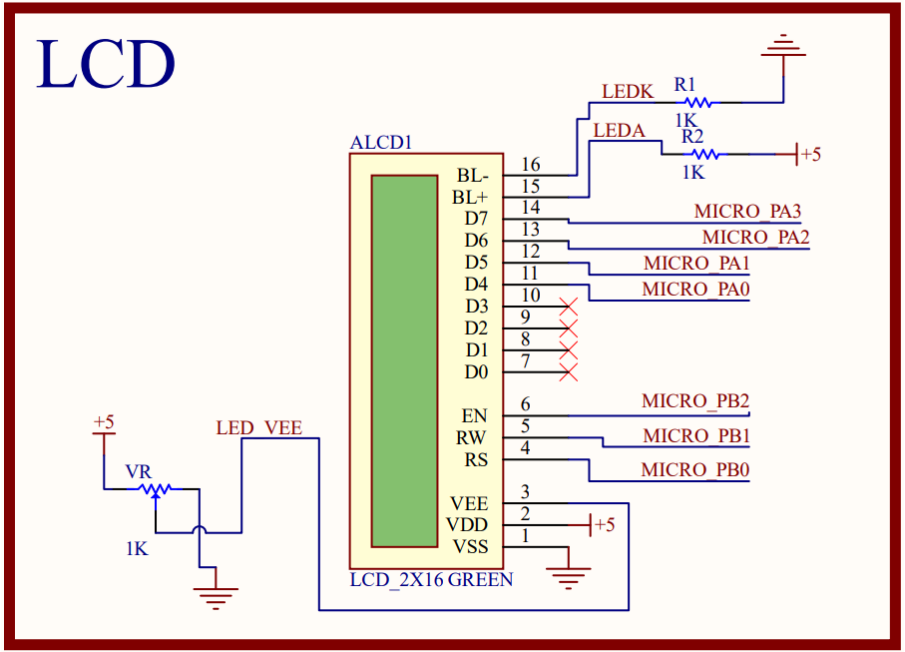
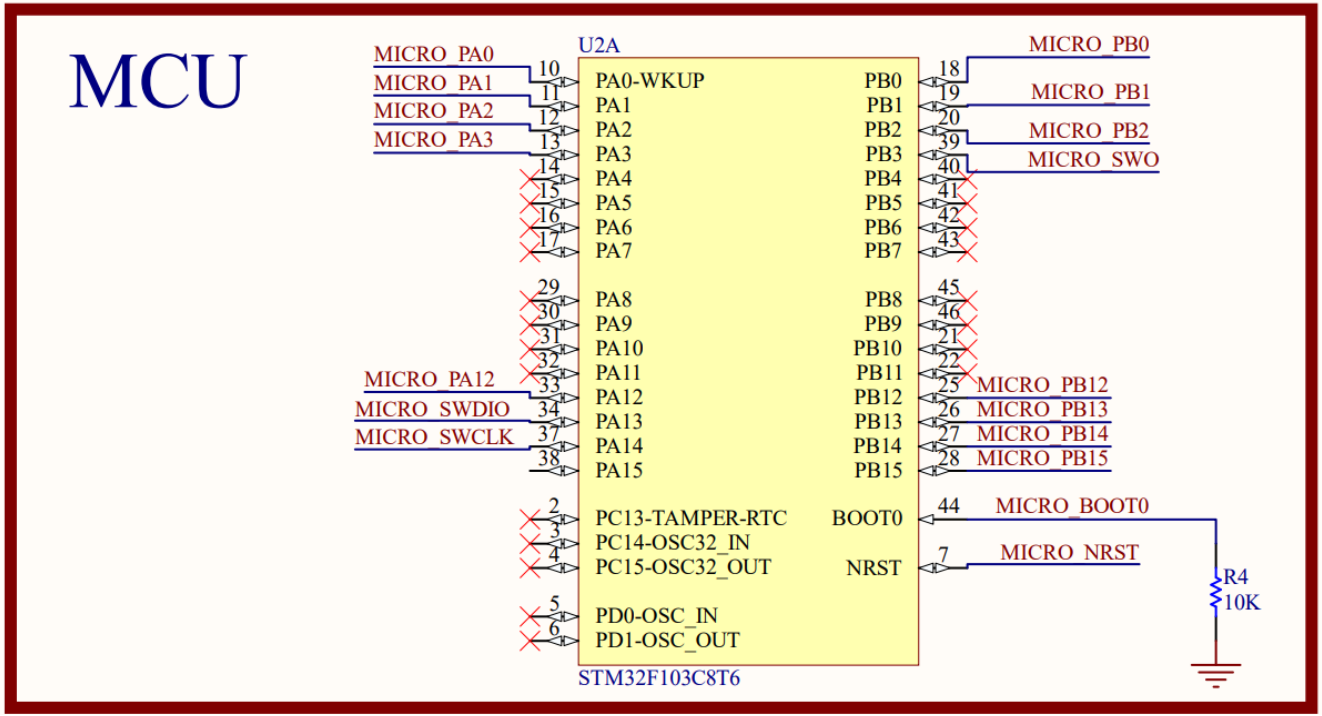
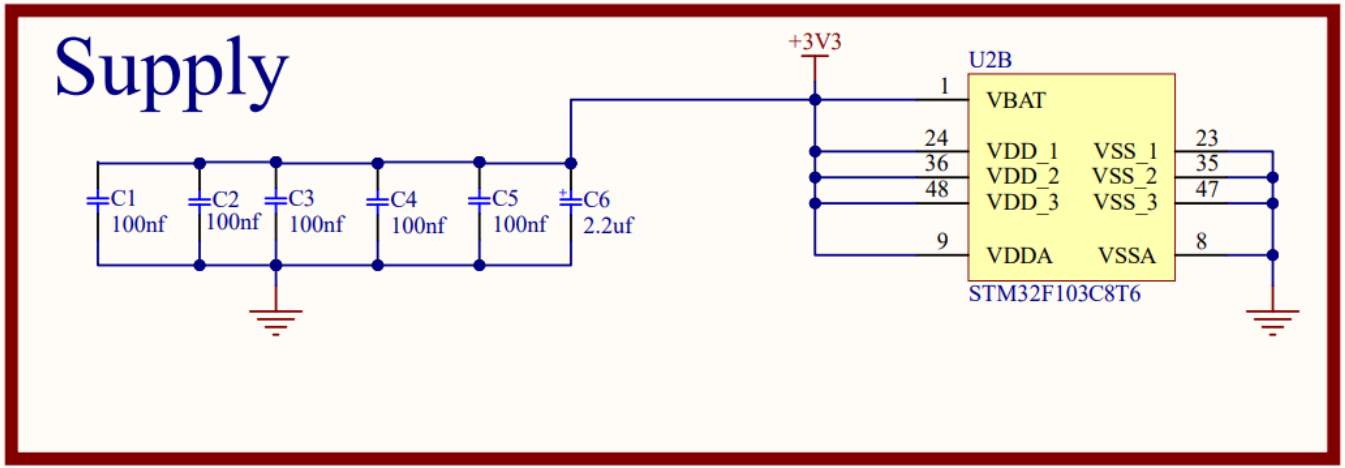
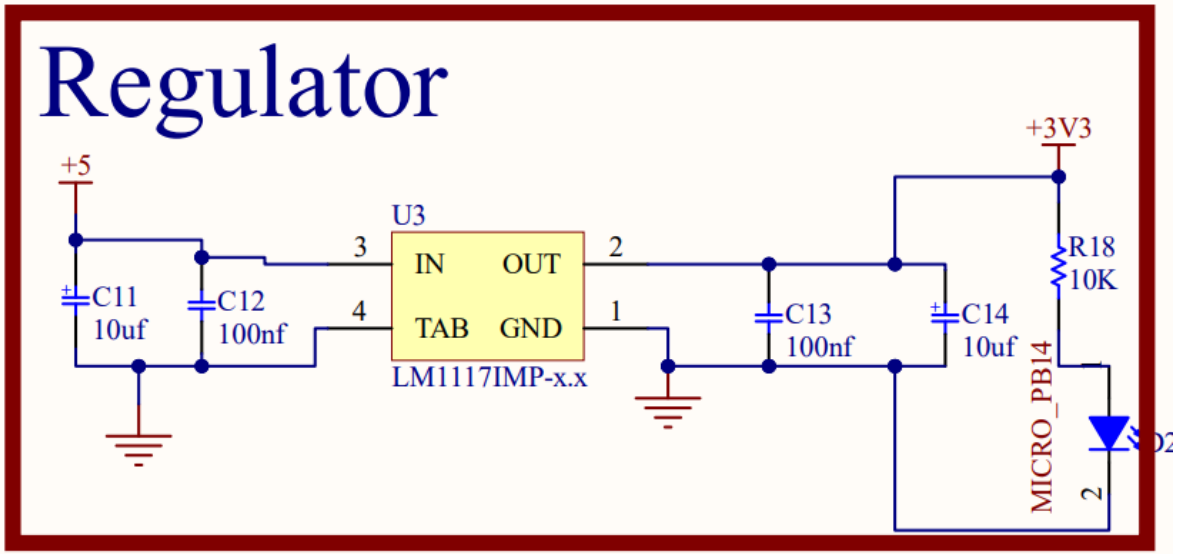
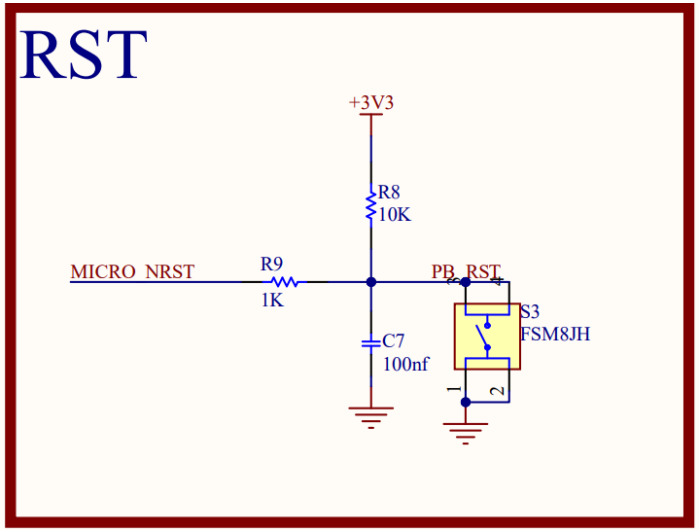


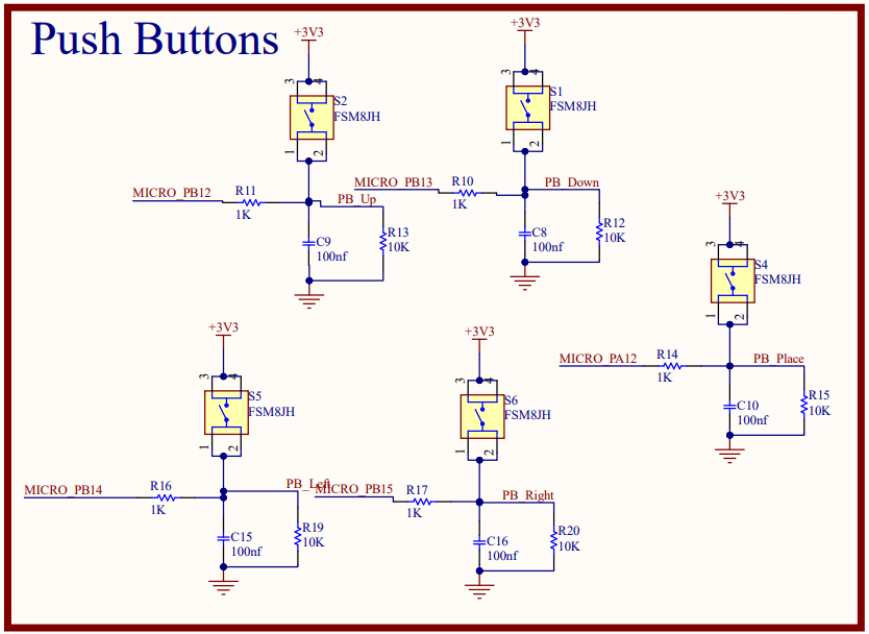

LCD
ALCD1
LEDK
R1
1K
LEDA
R2
1K
+5
BL-
BL+
D7
D6
D5
D4
D3
D2
D1
D0
EN
RW
RS
VEE
VDD
VSS
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
MICRO_PA3
MICRO_PA2
MICRO_PA1
MICRO_PA0
MICRO_PB2
MICRO_PB1
MICRO_PB0
+5
LED_VEE
VR
1K
LCD_2X16 GREEN

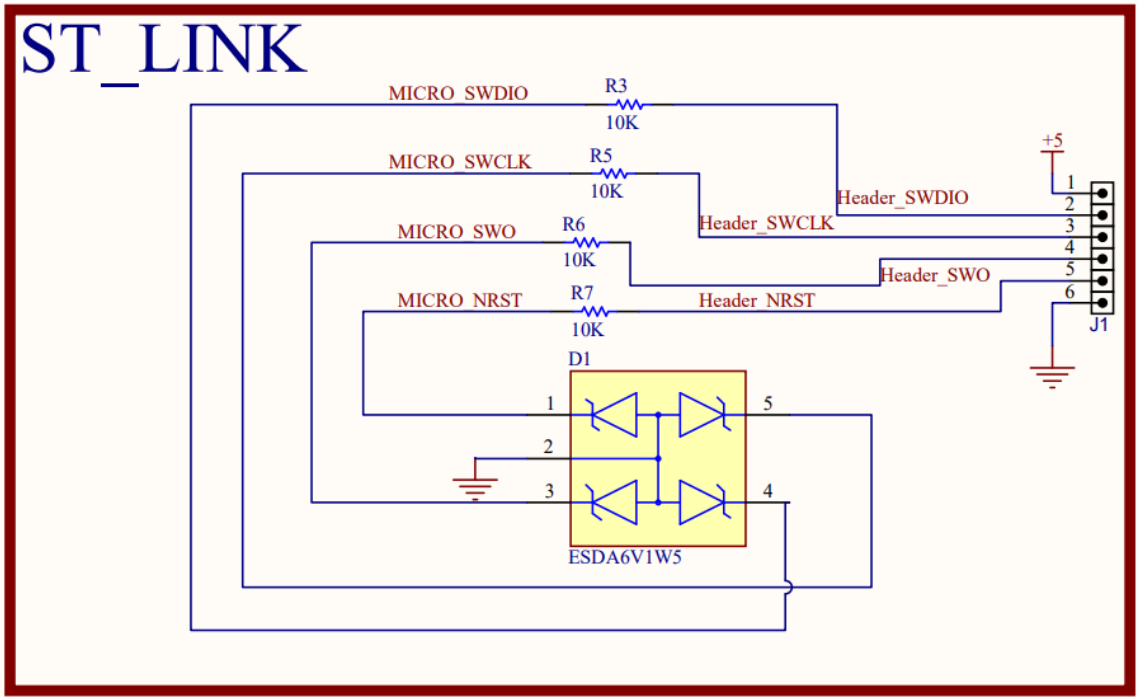

MCU
U2A
MICRO_PA0
MICRO_PA1
MICRO_PA2
MICRO_PA3
MICRO_PA12
MICRO_SWDIO
MICRO_SWCLK
PA0-WKUP
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
PC13-TAMPER-RTC
PC14-OSC32_IN
PC15-OSC32_OUT
PD0-OSC_IN
PD1-OSC_OUT
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PB8
PB9
PB10
PB11
PB12
PB13
PB14
PB15
BOOT0
NRST
MICRO_PB0
MICRO_PB1
MICRO_PB2
MICRO_SWO
MICRO_PB12
MICRO_PB13
MICRO_PB14
MICRO_PB15
MICRO_BOOT0
MICRO_NRST
R4
10K
STM32F103C8T6


Supply
+3V3
U2B
1
VBAT
24
36
48
VDD_1
VDD_2
VDD_3
VSS_1
VSS_2
VSS_3
23
35
47
9
VDDA
VSSA
8
STM32F103C8T6
C1
100nf
C2
100nf
C3
100nf
C4
100nf
C5
100nf
C6
2.2uf


Regulator
+5
+3V3
U3
IN
OUT
TAB
GND
LM1117IMP-x.x
C11
10uf
C12
100nf
C13
100nf
C14
10uf
R18
10K
MICRO_PB14


RST
+3V3
R8
10K
MICRO_NRST
R9
1K
PB_RST
S3
FSM8JH
C7
100nf


Push Buttons
+3V3
S2
FSM8JH
S1
FSM8JH
MICRO_PB12
R11
1K
PB_Up
MICRO_PB13
R10
1K
PB_Down
C9
100nf
R13
10K
C8
100nf
R12
10K
+3V3
S4
FSM8JH
MICRO_PA12
R14
1K
PB_Place
C10
100nf
R15
10K
+3V3
S5
FSM8JH
+3V3
S6
FSM8JH
MICRO_PB14
R16
1K
PB_Left
MICRO_PB15
R17
1K
PB_Right
C15
100nf
R19
10K
C16
100nf
R20
10K


ST_LINK
MICRO_SWDIO
R3
10K
MICRO_SWCLK
R5
10K
MICRO_SWO
R6
10K
MICRO_NRST
R7
10K
Header_SWDIO
Header_SWCLK
Header_SWO
Header_NRST
+5
J1
D1
ESDA6V1W5

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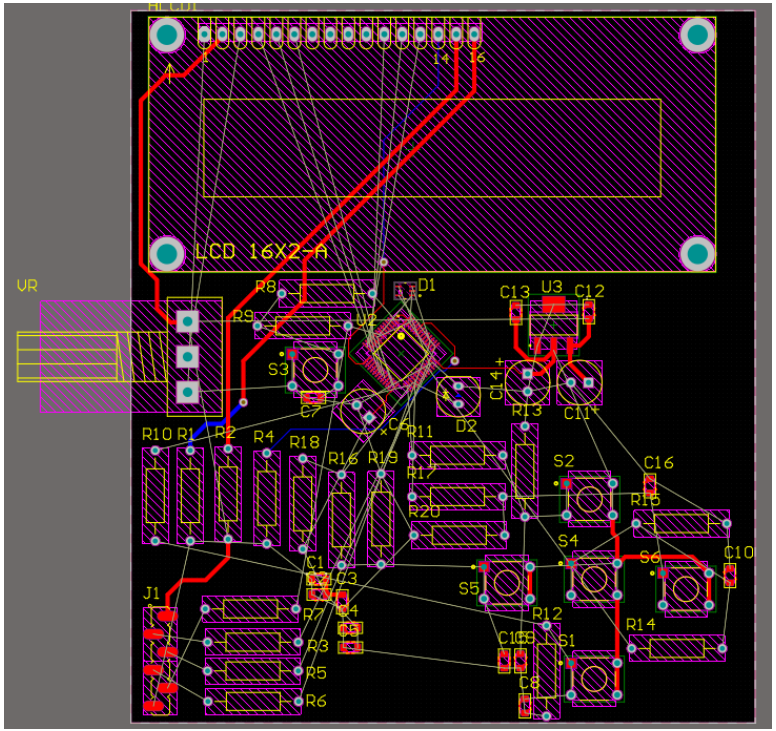

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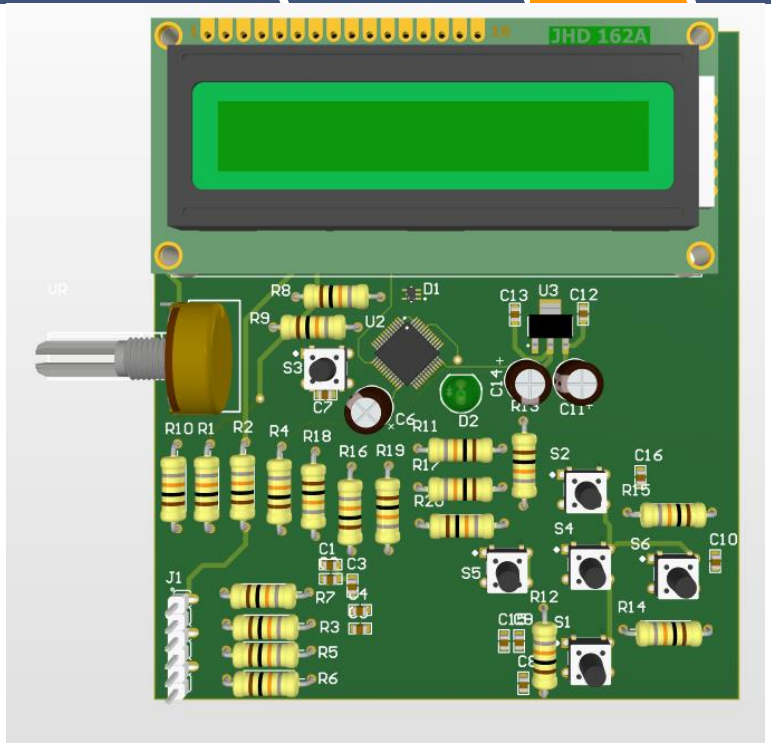

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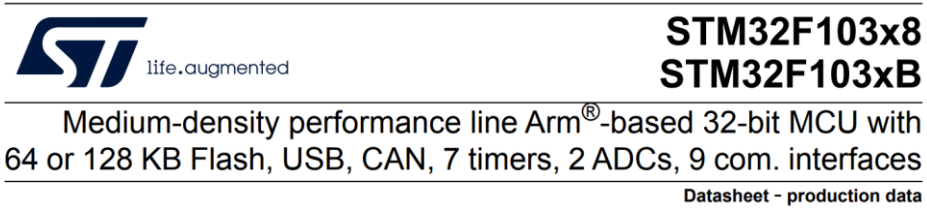
Suggestions:

- OLED screen
- More games
- Joysticks
- USB-C programming
- Wireless Controllers

References:



SisOog

Chila board

perplexity

GitHub Copilot

THANKS!

Any questions?