65010039 กลวัชร อินทร์แป้น
65010429 ธนศักดิ์ สองศรี

Assignment 5 : Finite State Machine

State Transition Table

Num	Name	Lights	Input							
			0	1	2	3	4	5	6	7
0	waitWest	B10010100	goWest	goWest	goWest	goWest	goWEst	goWest	goWest	goWest
1	goWest	B10100001	goWest	goWest	waitSouth	waitSouth	wait_Walk_West	wait_Walk_West	waitSouth	waitSouth
2	waitSouth	B10100010	goSouth	goSouth	goSouth	goSouth	goSouth	goSouth	goSouth	goSouth
4	wait_Walk_South	B10010100	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk
5	wait_Walk_West	B10100010	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk	goWalk
6	goWalk	B01100100	goWalk	button1_OFF	button1_OFF	button1_OFF	goWalk	button1_OFF	button1_OFF	button1_OFF
7	button1_OFF	B00100100	button1_ON	button1_ON	button1_ON	button1_ON	button1_ON	button1_ON	button1_ON	button1_ON
8	button1_ON	B01100100	button2_OFF	button2_OFF	button2_OFF	button2_OFF	button2_OFF	button2_OFF	button2_OFF	button2_OFF
9	button2_OFF	B00100100	button2_ON	button2_ON	button2_ON	button2_ON	button2_ON	button2_ON	button2_ON	button2_ON
10	button2_ON	B01100100	button3_OFF	button3_OFF	button3_OFF	button3_OFF	button3_OFF	button3_OFF	button3_OFF	button3_OFF
11	button3_OFF	B00100100	button3_ON	button3_ON	button3_ON	button3_ON	button3_ON	button3_ON	button3_ON	button3_ON
12	button3_ON	B01100100	goWalk	goWest	goSouth	goWest	goWalk	goWest	goSouth	goWest

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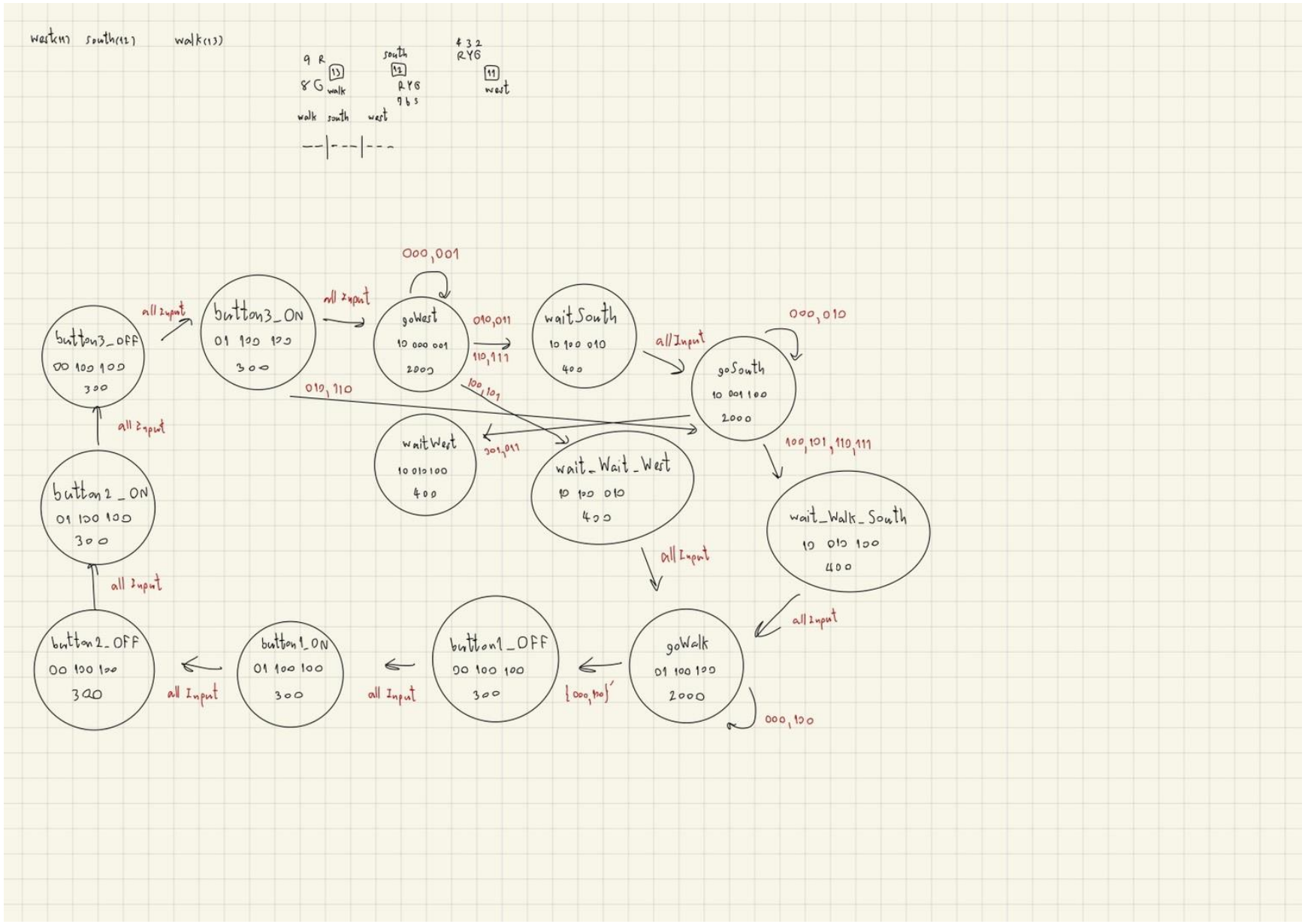

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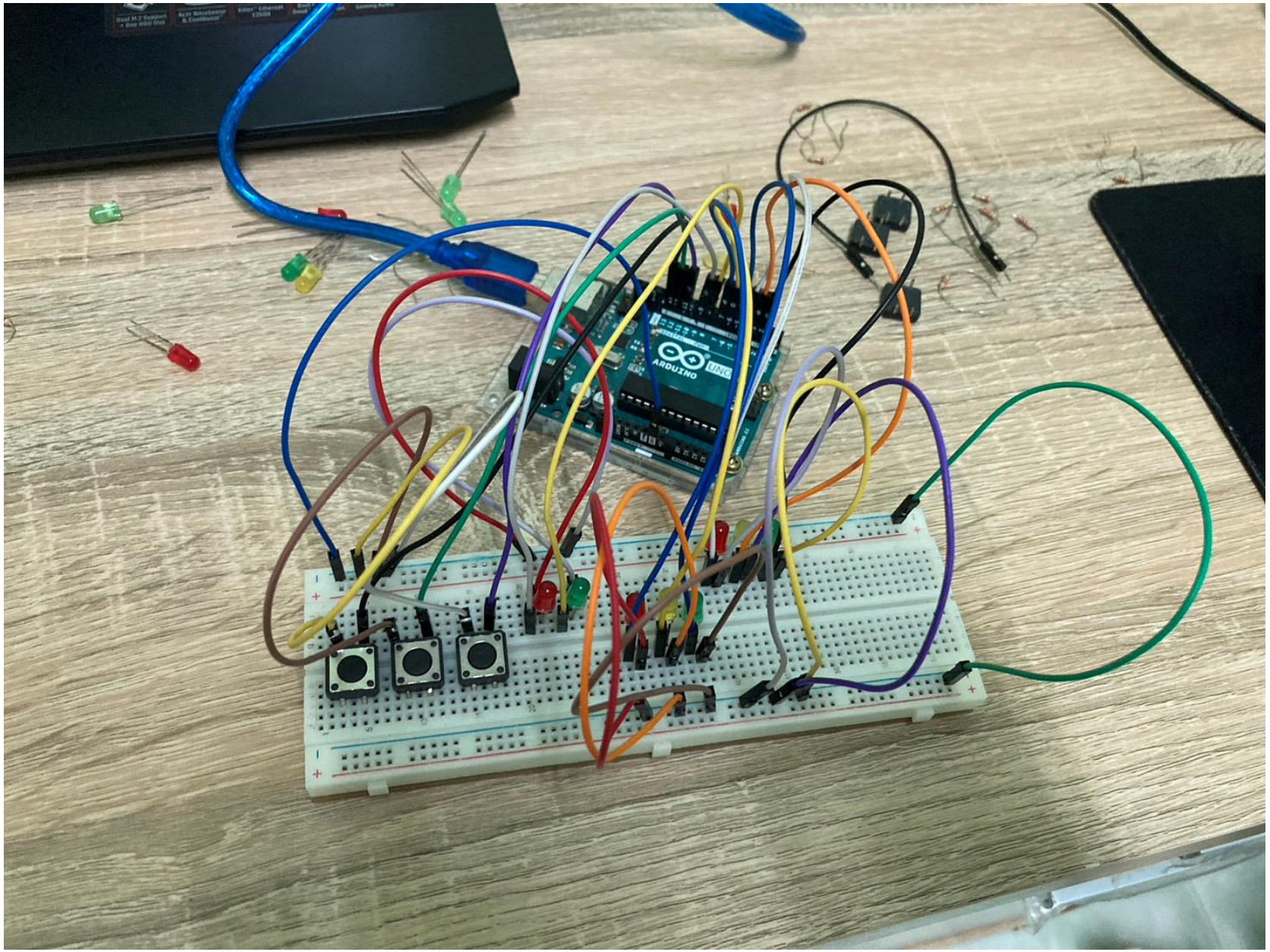

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```
#define LED_W_R 4
#define LED_W_Y 3
#define LED_W_G 2
#define WEST_BUTTON_PIN 11

#define LED_S_R 7
#define LED_S_Y 6
#define LED_S_G 5
#define SOUTH_BUTTON_PIN 12

#define LED_WALK_G 8
#define LED_WALK_R 9
#define WALK_BUTTON_PIN 13

#define waitWest 0
#define goWest 1
#define waitSouth 2
#define goSouth 3
#define wait_WALK_SOUTH 4
#define wait_WALK_WEST 5
#define goWalk 6
#define b1_OFF 7
#define b1_ON 8
#define b2_OFF 9
#define b2_ON 10
#define b3_OFF 11
#define b3_ON 12
```

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```c
struct State
{
  unsigned long ST_Out;
  unsigned long Time;
  unsigned long Next[8];
};
typedef const struct State SType;
```

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```
SType FSM[13] = {
    {B10010100, 400, {goWest, goWest, goWest, goWest, goWest, goWest, goWest,
goWest}},                                                  // waitWest
    {B10100001, 2000, {goWest, goWest, waitSouth, waitSouth, wait_WALK_WEST, wait_WALK_WEST, waitSouth,
waitSouth}},               // goWest
    {B10100010, 400, {goSouth, goSouth, goSouth, goSouth, goSouth, goSouth, goSouth,
goSouth}},                                        // waitSouth
    {B10001100, 2000, {goSouth, waitWest, goSouth, waitWest, wait_WALK_SOUTH, wait_WALK_SOUTH, wait_WALK_SOUTH,
wait_WALK_SOUTH}}, // goSouth
    {B10010100, 400, {goWalk, goWalk, goWalk, goWalk, goWalk, goWalk, goWalk,
goWalk}},                                                  // wait_WALK_SOUTH
    {B10100010, 400, {goWalk, goWalk, goWalk, goWalk, goWalk, goWalk, goWalk,
goWalk}},                                                  // wait_WALK_WEST
    {B01100100, 2000, {goWalk, b1_OFF, b1_OFF, b1_OFF, goWalk, b1_OFF, b1_OFF,
b1_OFF}},                                                 // goWalk
    {B00100100, 300, {b1_ON, b1_ON, b1_ON, b1_ON, b1_ON, b1_ON, b1_ON,
b1_ON}},                                                        // b1_OFF
    {B01100100, 300, {b2_OFF, b2_OFF, b2_OFF, b2_OFF, b2_OFF, b2_OFF, b2_OFF,
b2_OFF}},                                                  // b1_ON
    {B00100100, 300, {b2_ON, b2_ON, b2_ON, b2_ON, b2_ON, b2_ON, b2_ON,
b2_ON}},                                                        // b2_OFF
    {B01100100, 300, {b3_OFF, b3_OFF, b3_OFF, b3_OFF, b3_OFF, b3_OFF, b3_OFF,
b3_OFF}},                                                  // b2_ON
    {B00100100, 300, {b3_ON, b3_ON, b3_ON, b3_ON, b3_ON, b3_ON, b3_ON,
b3_ON}},                                                        // b3_OFF
    {B01100100, 300, {goWalk, goWest, goSouth, goWest, goWalk, goWest, goSouth,
goWest}},                                                 // b3_ON
};
unsigned long S = 0;
```

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```
void setup()
{
  Serial.begin(9600);
  pinMode(LED_W_G, OUTPUT);
  pinMode(LED_W_Y, OUTPUT);
  pinMode(LED_W_R, OUTPUT);
  pinMode(WEST_BUTTON_PIN, INPUT);

  pinMode(LED_S_G, OUTPUT);
  pinMode(LED_S_Y, OUTPUT);
  pinMode(LED_S_R, OUTPUT);
  pinMode(SOUTH_BUTTON_PIN, INPUT);

  pinMode(LED_WALK_G, OUTPUT);
  pinMode(LED_WALK_R, OUTPUT);
  pinMode(WALK_BUTTON_PIN, INPUT);
}
```

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```
int West, South, Walk, input;
void loop()
{
  digitalWrite(LED_W_G, FSM[S].ST_Out & B00000001);
  digitalWrite(LED_W_Y, FSM[S].ST_Out & B00000010);
  digitalWrite(LED_W_R, FSM[S].ST_Out & B00000100);

  digitalWrite(LED_S_G, FSM[S].ST_Out & B00001000);
  digitalWrite(LED_S_Y, FSM[S].ST_Out & B00010000);
  digitalWrite(LED_S_R, FSM[S].ST_Out & B00100000);

  digitalWrite(LED_WALK_G, FSM[S].ST_Out & B01000000);
  digitalWrite(LED_WALK_R, FSM[S].ST_Out & B10000000);

  delay(FSM[S].Time);
  West  = !digitalRead(WEST_BUTTON_PIN);
  South = !digitalRead(SOUTH_BUTTON_PIN);
  Walk  = !digitalRead(WALK_BUTTON_PIN);
  input = Walk * 4 + South * 2 + West;
  Serial.print(Walk);Serial.print(South);Serial.println(West);
  Serial.println(input);Serial.println("-------------");
  S = FSM[S].Next[input];
}
```