Arduino Nano: Combining different gadgets

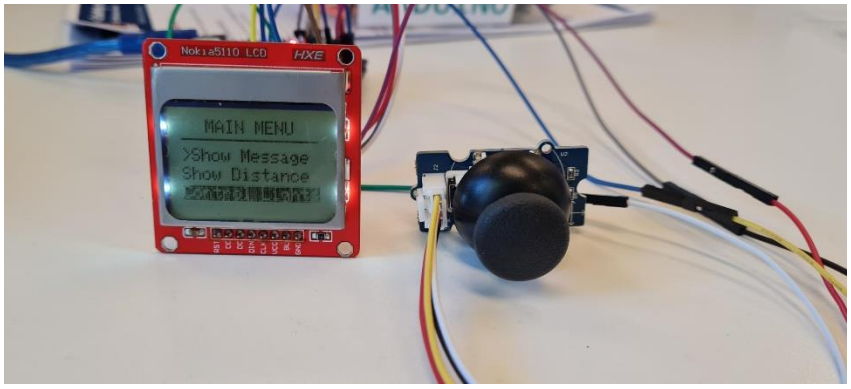
ECU Makerspace Group

Written by Julia Szymanski

Getting started…

In this workshop we are going to **add another gadget:** the joystick.

We are going to use the screen again, but this time we are going to **display different menu options** to the screen and use a joystick to browse through the menu. Adding functions to the different menu options and adding more sensors of gadgets is an option for Session 5.



First, we need to make sure we **include the libraries** that are required to use the screen

```
#include <SPI.h>
#include <Adafruit_GFX.h>
#include <Adafruit_PCD8544.h>
#include <Wire.h>
```

We also need to **include <Wire.h>** as this is required for the joystick.

Next, we are going to set up the display screen as we did in the previous workshop, connected to pins 7, 6, 5, 4, 3

To be able to switch from one menu option to another, we also need to set up an integer variable called menuitem, that we can update in the code, depending on which item we want to select with the joystick.

In order to be able to show the different menu options, we also set up an integer variable for page 1, which will be the page of the main menu.

```
Adafruit_PCD8544 display = Adafruit_PCD8544(7,6,5,4,3);
int menuitem = 1;
int page = 1;
```

Now it is time to move to the void set up() function. We are going to set it up exactly the same as in the previous workshop, so you can refer to it here.

This is what your code should now look like:

Session4Final.ino

```
#include <SPI.h>
#include <Adafruit_GFX.h>
#include <Adafruit_PCD8544.h>
#include <Wire.h>


int menuitem = 1;
int page = 1;
int checkLights = digitalRead(7);


Adafruit_PCD8544 display = Adafruit_PCD8544(7,6,5,4,3);

void setup()   {
  Serial.begin(115200);
  display.begin();
  display.setContrast(50);
  display.clearDisplay();
  display.setTextSize(1);
  display.setTextColor(BLACK);
  display.setCursor(10,10);
  delay(5000);
  display.display();
}
```

So that the menu can be displayed on the screen

We are going to create a new function called **drawMenu()** which is where we set up the first page (the main menu) as well as the different menu options.

```
void drawMenu()
  {
```

If the menu is currently switched to page 1, we want the following settings to apply:

- Set the text size of the display to 1
- Clear any other from the screen that may still be on there
- Set the text color of the display to black and white
- Set the cursor of the display to 15, 0
- Print “MAIN MENU” on the screen

```
if (page==1)
  {
    display.setTextSize(1);
    display.clearDisplay();
    display.setTextColor(BLACK, WHITE);
    display.setCursor(15, 0);
    display.print("MAIN MENU");
    display.drawFastHLine(0,10,83,BLACK);
    display.setCursor(0, 15);
```

In the next step, we want to **set up the screen** for when menu item 1 is selected with the joystick. If menu item is 1, we want the text color of the display to be set to WHITE, BLACK. This means that the text is going to be in white, with a black background. **This makes it easier to identify which menu item we have currently selection.**

If the menu item is not 1, we want the text color if the display to be set to BLACK, WHITE, so that the menu option is listed but does not look as though it is selected. We then print the menu option (depending on what you would like to name it) to the screen. In the last step, we set the display cursor to 0, 25.

```
if (menuitem==1)
    { display.setTextColor(WHITE, BLACK);}
    else
    {display.setTextColor(BLACK, WHITE);}
    display.print(">Show Message");
    display.setCursor(0, 25);
```

We repeat the same for menu item 2, however we don't need to set the cursor here. Just make sure you give menu option 2 a different name so you can distinguish it from option 1 and 3.

For menu item 3, we set the cursor to 0, 35.

This is what your code should now look like:

Session4Final.ino

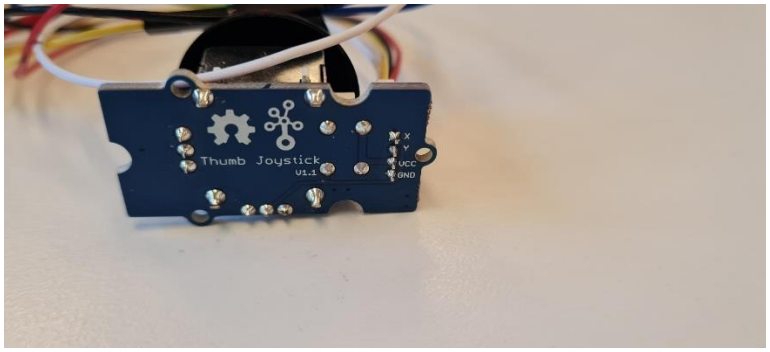
```
27  void drawMenu()
28   {
29
30   if (page==1)
31   {
32     display.setTextSize(1);
33     display.clearDisplay();
34     display.setTextColor(BLACK, WHITE);
35     display.setCursor(15, 0);
36     display.print("MAIN MENU");
37     display.drawFastHLine(0,10,83,BLACK);
38     display.setCursor(0, 15);
39
40     if (menuitem==1)
41     { display.setTextColor(WHITE, BLACK);}
42     else
43     {display.setTextColor(BLACK, WHITE);}
44     display.print(">Show Message");
45     display.setCursor(0, 25);
46
47     if (menuitem==2)
48     {display.setTextColor(WHITE, BLACK);}
49     else
50     {display.setTextColor(BLACK, WHITE);}
51     display.print(">Show Distance");
```

```
53     if (menuitem==3)
54     {
55       display.setTextColor(WHITE, BLACK);
56     }
57     else
58     {display.setTextColor(BLACK, WHITE);}
59     display.setCursor(0, 35);
60     display.print(">Control Lights");
61     display.display();
62   }
63  }
```

Well done so far! 😊

Inside the void loop() function, we are going to call the drawMenu() function. This means that every time we go to the main menu, it will create the menu layout automatically.

```
void loop(){
drawMenu();
```



Now take a close look at the joystick. On the bottom you might notice GND, VCC as well as X and Y. The joystick uses an X and Y axis to determine into which direction it has been moved.

The pins for the joystick are analog, so we need to connect X with A0, the analog pin 0, and Y with A1, the analog pin 1. You'll find these on the left side of the Arduino, or you can refer back to the instructions from Session 1 where the Arduino and its different pins were explained.

We need to tell our program what is connected to analog pin 1 and analog pin 0, and the output from these pins need to be stored in two variables.

We are going to name them int xAxis for the x pin, and yAxis for the y pin.

```
//X Axis
  int xAxis = analogRead(A0);

  //Y Axis
  int yAxis = analogRead(A1);
```

To be able to determine which page or menu item to switch to, we first need to determine which menu item or page is currently selected and into which direction the joystick has been moved.

Page 1 is the main menu. Page 2 is connected to menu option 1, so if menu option 1 is selected and the joystick is moved to the right, the program moves to page 2.
Similarly, page 3 is connected to menu option 2, so if we are on menu option 2 and move the joystick to the right, this will take is to page 3. If we are on menu option 3 and move the joystick to the right, we will get to page 4.

At first we set up a way to **return to the menu**. We only need to do this once, as we can return to the menu from any of the pages by moving the joystick to the left. If we currently are not on page 1 (the main menu) and we move the joystick to the left, we set the page to 1.

```
if (page != 1 && xAxis < 270) {
  page = 1;
}
```

The **direction into which the joystick is moved** is calculated by values on the x and y axis. For the movement of the joystick to be recognized as UP, DOWN, RIGHT and LEFT it needs to be within certain ranges. We have already done the calculation for you, so you only need to folow it.

For UP, movement on the yAxis needs to be greater than 750.

For DOWN, movement on the yAxis needs to be less than 260.

For RIGHT, movement on the xAxis needs to be greater than 730.

For LEFT, movement on the xAxis needs to be less than 270.

To be able to move through the different menu options and pages, we need to set up a number of if-statements.

If menu item selected is 1 and the movement on the xAxis is greater than 730, the program will move to page 2.

```
if (menuitem == 1 && xAxis > 730 )
{page = 2;}
```

If menu item selected is 2 and movement on the xAxis is greater than 730, the program will move to page 3.

```
if (menuitem == 2 && xAxis > 730 )
{page = 3;}
```

If menu item selected is 3 and movement on the xAxis is greater than 730, the program will move to page 4.

```
if (menuitem == 3 && xAxis > 730 )
{page = 4;}
```

To **switch between the different menu items**, we need to set up another set of if-statements.

If the current menu item is 1 and the movement on the yAxis is less than 260 (DOWN), menu item 2 will get selected on the screen

```
if (menuitem == 1 && yAxis < 260)
{menuitem = 2;}
```

If the current menu item is 2 and the movement on the yAxis is less than 260 (DOWN), menu item 3 will get selected on the screen.

```
else if (menuitem == 2 && yAxis < 260)
{menuitem = 3;}
```

If menu item 3 is selected and the movement on the yAxis is greater than 750 (UP), menu item 2 will get selected on the screen.

```
else if (menuitem == 3 && yAxis > 750)
{menuitem = 2;}
```

If menu item 2 is selected and the movement on the yAxis is greater than 750 (UP), menu item 1 will get selected on the screen.

```
else if (menuitem == 2 && yAxis > 750)
{menuitem = 1;}
```

This allows us to move from one menu option to another.

We just need to add a delay of 200 at the end so the program doesn't move too quickly between the different menu options.

```
delay(200);
```

All done! Good job! 😊

Your code should now look like this:

```
64
65  void loop(){
66  drawMenu();
67
68   //X Axis
69    int xAxis = analogRead(A0);
70
71    //Y Axis
72    int yAxis = analogRead(A1);
73
74  if (page != 1 && xAxis < 270) {
75    page = 1;
76  }
77
78  if (menuitem == 1 && xAxis > 730 )
79  {page = 2;}
80
81  if (menuitem == 2 && xAxis > 730 )
82  {page = 3;}
83
84  if (menuitem == 3 && xAxis > 730 )
85  {page = 4;}
```

```
86
87  if (menuitem == 1 && yAxis < 260)
88  {menuitem = 2;}
89
90  else if (menuitem == 2 && yAxis < 260)
91  {menuitem = 3;}
92
93  else if (menuitem == 3 && yAxis > 750)
94  {menuitem = 2;}
95
96  else if (menuitem == 2 && yAxis > 750)
97  {menuitem = 1;}
98
99  delay(200);
100 }
101
```