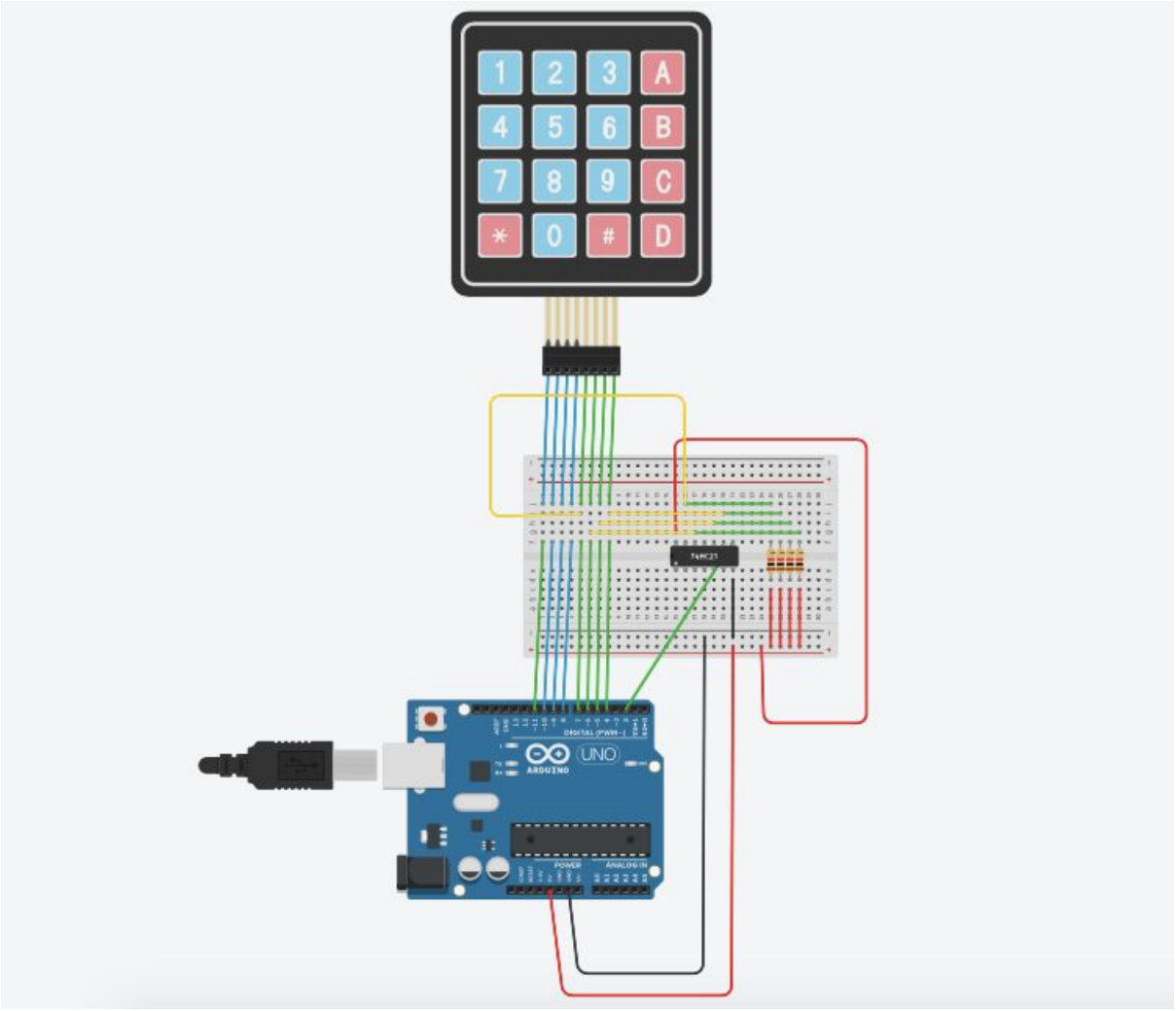


/* ====================================
File name: exerc_5_1.c (or cpp)
Date: 2020-02-27
Group nr 20
Members that contribute to the solutions
Chenyu Li
Xiang Xu
Emad Kikuni
Member not present at demonstration time:
Demonstration code: 27038
==================================== */

// ---- Program template for Arduino in Tinkercad VT 2020

/* --- Macros predefined for the compiler

DDRB Data direction register B

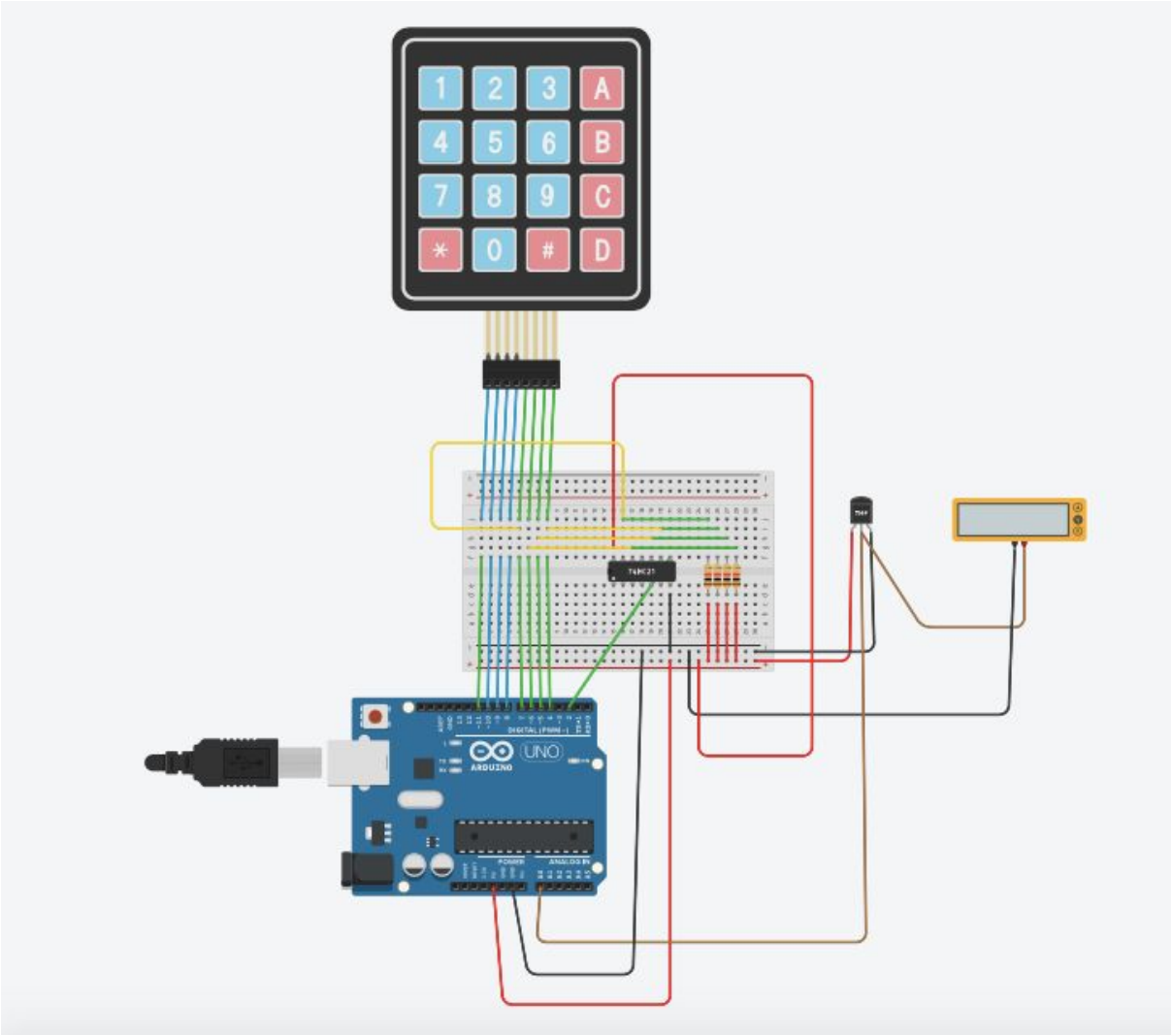
PORTB Outport B

```
PINB Inport B
DDRD Data direction register D
PORTD Outport D
PIND Inport D
*/
int row;
int col;
int outputValue;
int keyPressed;
char key;
char keymap[4][4]=
{
 {'0','1','2','3'},
 {'4','5','6','7'},
 {'8','9','A','B'},
 {'C','D','E','F'}
};
void setup() {
 Serial.begin(9600);
 DDRD = DDRD | B00000000; //To set all Port D bits as inbits.
 DDRB= DDRB | B00001111;//To set Port B (bit from 0-3) to outbits
 PORTB = B00000000;
 keyPressed = 0;
 attachInterrupt (digitalPinToInterrupt(2), keyboardirq , FALLING);
}
void loop() {
// ------ Main loop-------
  if (keyPressed == 1){
     Serial.println(key);
     keyPressed = 0;
     //attachInterrupt (digitalPinToInterrupt(2), keyboardirq , FALLING);
```

```
  }
}
//Set row n to LOW while others are HIGH
void setPortB(int n) {
 if(n == 1) {
   PORTB = B00000111;
 } else if (n == 2){
   PORTB = B00001011;
 } else if (n == 3){
   PORTB = B00001101;
 } else if (n == 4){
   PORTB = B00001110;
 }
}
int getCol(int outputValue) {
 if (outputValue == B00001110){
   return 4;
 } else if (outputValue == B00001101){
   return 3;
 } else if (outputValue == B00001011){
   return 2;
 } else if (outputValue == B00000111){
   return 1;
 }
}
void keyboardirq(){
// Read key number ------ .....
 //detachInterrupt(digitalPinToInterrupt(2)) ; // To detach the IRQ pin function
 outputValue = PIND >> 4;
 col = getCol(outputValue);
 int outputStatus, i;
```

```
if (keyPressed == 0)
{
  setPortB(1);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
    row = 1;
    key = keymap[row-1][col-1];
    keyPressed = 1;
  }
}
if (keyPressed == 0)
{
  setPortB(2);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
    row = 2;
    key = keymap[row-1][col-1];
    keyPressed = 1;
  }
}
if (keyPressed == 0)
{
  setPortB(3);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
    row = 3;
    key = keymap[row-1][col-1];
    keyPressed = 1;
```

```
  }
 }
 if (keyPressed == 0)
 {
  setPortB(4);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
   row = 4;
   key = keymap[row-1][col-1];
   keyPressed = 1;
  }
 }
 PORTB = B00000000;
}
```



/* ====================================
File name: exerc_5_2.c (or cpp)
Date: 2020-02-27
Group nr 20
Members that contribute to the solutions
Chenyu Li
Xiang Xu
Emad Kikuni
Member not present at demonstration time:
Demonstration code: 24067
==================================== */

// ---- Program template for Arduino in Tinkercad VT 2020

/* --- Macros predefined for the compiler

DDRB Data direction register B

PORTB Outport B

PINB Inport B

```
DDRD Data direction register D
PORTD Outport D
PIND Inport D
*/
int row;
int col;
int outputValue;
int keyPressed;
char key;
float temp;
char keymap[4][4]=
{
 {'0','1','2','3'},
 {'4','5','6','7'},
 {'8','9','A','B'},
 {'C','D','E','F'}
};
void setup() {
 Serial.begin(9600);
 DDRD = DDRD | B00000000; //To set all Port D bits as inbits.
 DDRB= DDRB | B00001111;//To set Port B (bit from 0-3) to outbits
 PORTB = B00000000;
 keyPressed = 0;
 attachInterrupt (digitalPinToInterrupt(2), keyboardirq , FALLING);
}
void loop() {
// ------ Main loop-------
int reading = analogRead(A0);
  float voltage = reading*5.0;
  voltage/=1024.0;
  temp = (voltage - 0.5)*100;
```

```
  Serial.print(temp);
  Serial.println();
  delay(500);
  if (keyPressed == 1){
     Serial.println(key);
     keyPressed = 0;
     //attachInterrupt (digitalPinToInterrupt(2), keyboardirq , FALLING);
   }
}
//Set row n to LOW while others are HIGH
void setPortB(int n) {
 if(n == 1) {
   PORTB = B00000111;
 } else if (n == 2){
   PORTB = B00001011;
 } else if (n == 3){
   PORTB = B00001101;
 } else if (n == 4){
   PORTB = B00001110;
 }
}
int getCol(int outputValue) {
 if (outputValue == B00001110){
   return 4;
 } else if (outputValue == B00001101){
   return 3;
 } else if (outputValue == B00001011){
   return 2;
 } else if (outputValue == B00000111){
   return 1;
 }
```

```
}
void keyboardirq(){
// Read key number ------ .....
 //detachInterrupt(digitalPinToInterrupt(2)) ; // To detach the IRQ pin function
 outputValue = PIND >> 4;
 col = getCol(outputValue);
 int outputStatus, i;
 if (keyPressed == 0)
 {
   setPortB(1);
   outputStatus = PIND >> 4;
   if (outputStatus != 15)
   {
     row = 1;
     key = keymap[row-1][col-1];
     keyPressed = 1;
   }
 }
 if (keyPressed == 0)
 {
   setPortB(2);
   outputStatus = PIND >> 4;
   if (outputStatus != 15)
   {
     row = 2;
     key = keymap[row-1][col-1];
     keyPressed = 1;
   }
 }
 if (keyPressed == 0)
 {
```

```
  setPortB(3);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
    row = 3;
    key = keymap[row-1][col-1];
    keyPressed = 1;
  }
 }
 if (keyPressed == 0)
 {
  setPortB(4);
  outputStatus = PIND >> 4;
  if (outputStatus != 15)
  {
    row = 4;
    key = keymap[row-1][col-1];
    keyPressed = 1;
  }
 }
 PORTB = B00000000;
}
```