```c
#include "stm32f10x.h"
#include "LCDlab.h"

void CMD2LCD(uint8_t data)
{
  GPIOB->BSRR = LCD_CM_ENA; //RS low, E high
  // GPIOC->ODR = data; //BAD: may affect upper bits on port C
  GPIOC->ODR &= 0xFF00; //GOOD: clears the low bits without affecting high bits
  GPIOC->ODR |= data; //GOOD: only affects lowest 8 bits of Port C
  delay(8000);
  GPIOB->BSRR = LCD_CM_DIS; //RS low, E low
  delay(80000);
}

void DAT2LCD(uint8_t data)
{
  GPIOB->BSRR = LCD_DM_ENA; //RS low, E high
  // GPIOC->ODR = data; //BAD: may affect upper bits on port C
  GPIOC->ODR &= 0xFF00; //GOOD: clears the low bits without affecting high bits
  GPIOC->ODR |= data; //GOOD: only affects lowest 8 bits of Port C
  delay(8000);
  GPIOB->BSRR = LCD_DM_DIS; //RS low, E low
  delay(80000);
}

/*
* Name:         void delay()
* Paramaters:   32 bit delay value, ( a value of 6000
                gives approximately 1 mS of delay)
* Description:  This function creates a delay
*/
void delay(uint32_t count)
{
    int i=0;
    for(i=0; i< count; ++i)
    {
    }
}

void LCD_IO_INIT()
  {
  //Sets all ports needed in the enable register
  RCC->APB2ENR |= RCC_APB2ENR_IOPAEN | RCC_APB2ENR_IOPBEN | RCC_APB2ENR_IOPCEN;

  GPIOC->CRL |= GPIO_CRL_MODE7 | GPIO_CRL_MODE6 | GPIO_CRL_MODE5 | GPIO_CRL_MODE4 | GPIO_CRL_MODE3 | GPIO_CRL_MODE2| GPIO_CRL_MODE1 | GPIO_CRL_MODE0;
  GPIOC->CRL &= ~GPIO_CRL_CNF7 & ~GPIO_CRL_CNF6 & ~GPIO_CRL_CNF5 & ~GPIO_CRL_CNF4 & ~GPIO_CRL_CNF3 & ~GPIO_CRL_CNF2 & ~GPIO_CRL_CNF1 & ~GPIO_CRL_CNF0;

  GPIOB->CRL |=  GPIO_CRL_MODE5 | GPIO_CRL_MODE1 | GPIO_CRL_MODE0;
  GPIOB->CRL &= ~GPIO_CRL_CNF5 & ~GPIO_CRL_CNF1 & ~GPIO_CRL_CNF0;

}

//uint16_t dipswitchRead()
//{
//
//  uint16_t sw_val;
//  //Sets the GPIOs needed for switches to be read. The final result for this equation will be a 4-bit number corresponding to the values on the switches.
//  sw_val= (((GPIOA-> IDR & (GPIO_IDR_IDR6|GPIO_IDR_IDR7))>>6 | ((GPIOC->IDR&(GPIO_IDR_IDR10|GPIO_IDR_IDR11))>>8)) & 0x000F);
//
//  return (sw_val);
//}

void LCD_INIT()
{
    delay(90000);
    CMD2LCD(LCD_8B2L);
    CMD2LCD(LCD_8B2L);
    CMD2LCD(LCD_8B2L);
```

```
69        CMD2LCD(LCD_8B2L);
70        CMD2LCD(LCD_DCB);
71        CMD2LCD(LCD_CLR);
72        CMD2LCD(LCD_MCR);
73    }
74
75    void StartLCD()
76    {
77        //char sw1, sw2, sw3, sw4;
78        char start[15] = "Start Procedure";
79        char condition[16] = "Coast Clear.....";
80        char space = ' ';
81        //uint16_t dipSwitch = dipswitchRead();
82
83        CMD2LCD(LCD_LN1);
84        for(int i = 0;i < 15; i++)
85        {
86          DAT2LCD(start[i]);
87        }
88
89        CMD2LCD(LCD_LN2);
90
91        for(int i = 0;i < 16; i++)
92        {
93          DAT2LCD(condition[i]);
94        }
95    }
96
97    void LeftSensorTriggered()
98    {
99        char start[16] = "Left Sensor Trig";
100       char condition[16] = "Turning Right...";
101
102       CMD2LCD(LCD_LN1);
103       for(int i = 0;i < 16; i++)
104       {
105         DAT2LCD(start[i]);
106       }
107
108       CMD2LCD(LCD_LN2);
109
110       for(int i = 0;i < 16; i++)
111       {
112         DAT2LCD(condition[i]);
113       }
114   }
115
116   void RightSensorTriggered()
117   {
118       char start[15] = "Right Snsr Trig";
119       char condition[16] = "Turning Left...";
120
121       CMD2LCD(LCD_LN1);
122       for(int i = 0;i < 15; i++)
123       {
124         DAT2LCD(start[i]);
125       }
126
127       CMD2LCD(LCD_LN2);
128
129       for(int i = 0;i < 16; i++)
130       {
131         DAT2LCD(condition[i]);
132       }
133   }
134
135   void BothSensorTriggered()
136   {
137       char start[15] = "Both Snsrs Trig";
138       char condition[16] = "Moving back.....";
139
140       CMD2LCD(LCD_LN1);
```

```
141       for(int i = 0;i < 15; i++)
142       {
143         DAT2LCD(start[i]);
144       }
145
146       CMD2LCD(LCD_LN2);
147
148       for(int i = 0;i < 16; i++)
149       {
150         DAT2LCD(condition[i]);
151       }
152   }
153
154   void FlameSensorTrig()
155   {
156       char start[15] = "FLAME DETECTED!";
157       char condition[16] = "EXTINGUISHING...";
158
159       CMD2LCD(LCD_LN1);
160       for(int i = 0;i < 15; i++)
161       {
162         DAT2LCD(start[i]);
163       }
164
165       CMD2LCD(LCD_LN2);
166
167       for(int i = 0;i < 16; i++)
168       {
169         DAT2LCD(condition[i]);
170       }
171   }
```