

Bar graphs and state machine

Exercise 1

In the attached file you'll find a class for drawing a bar graph on the character lcd.

Update lab 5 exercise 2 (Tuner) to display a bar graph on the lcd in addition to blinking the tuning leds. The upper row of the display must display a bar graph that shows the trimmer value. The maximum size of the bar must be 50 pixels long and the actual values must be displayed on the left hand side of the graph with four digits and leading spaces if less digits are needed. The bar graph must be scaled so that full trimmer range can be displayed. (0 = no pixels visible, 4095 = full bar).

Exercise 2

Derive a new class from BarGraph class. The new class must have the same functionality as the base class but with a new constructor that takes two additional parameters: the coordinates of the bar. The new class remember the location of the graph and when draw() member function is called the cursor is moved to the coordinates position before graph is drawn.

Update lab 2 exercise 2 (Tuner) to display two bar graphs on the lcd. The upper row displays the temperature sensor value and the lower displays the trimmer value. Each bar must be 50 pixels long (max size of graph) and the actual values must be displayed on the left hand side of the graph.

Trimmer bar graph must be scaled so that full trimmer range can be displayed on the lcd. Temperature bar graph must be scaled so that the range is nominal value in room temperature ± 50 . Test the what the value is when the sensor in room temperature and use that as the nominal value.

Exercise 3

Implement a state machine that controls traffic lights. The traffic lights have two sensors: a car sensor that indicates that a car is approaching the traffic lights (simulated with button D7) and a pedestrian button (button D6). Draw UML diagram of the state machine.

The state machine works in the following way:

- Initially cars have green light and pedestrians have red.
- Pedestrian button needs to be pressed once to register pedestrian presence (like in real traffic lights).
- If no cars are present and pedestrian button is pressed the lights change to display green to pedestrians and red to cars for 15 seconds. Then lights change back to green for cars and red for pedestrians.
- If a car is present and pedestrian button is pressed the lights don't change immediately. The pedestrian button light is switched on (use LPCXpresso led for button light). The lights change after the car has left the intersection (car button is released) or after 60 seconds whichever occurs first.

- If no car is present for 60 seconds when cars have green then traffic lights switch to display red both for pedestrians and cars. Normal operation is resumed when a car enters the intersection or pedestrian button is pressed. The one who is first gets green and then we proceed as ruled above.



Traffic light shield:

- Buttons: D1 – D7
- Outputs:
 - B0 = D8 (pedestrian red)
 - B1 = D9 (pedestrian green)
 - B2 = D10 (cars red)
 - B3 = D11 (cars yellow)
 - B4 = D12 (cars green)
 - LPCXpresso led (pedestrian button light)

Traffic lights change sequence for cars:

- RED – RED+YELLOW – GREEN – YELLOW – RED