Syddansk Universitet
Det Tekniske Fakultet

Portfolio Assignment 2.

With Portfolio 2 we will create a controller for a petrol pump.

A petrol stand has a pump, a flow meter and a trunk with a valve in the handle. If the pump is running and the handle is activated, the gasoline will flow and fuel the car. The stand has a switch, which shows if the trunk is hooked on or hooked off its holder. The hook signal is used to start the pump, when a customer takes the trunk. When fueling, the stand will supply 0.2 liters of gasoline a second. 1 liter of gasoline produces 1125 pulses from the flow meter. The stand also has a shunt. When activated, the shunt will return 9/10 of the gasoline to the source tank. This operation will reduce the flow to 0.02 liter a second. The shunt is used to limit the flow when fueling is started or when a prepaid amount of gasoline is almost delivered. The petrol stand is able to supply 3 different products: 92 octane, 95 octane and E10 (2nd generation bio fuel with 10% ethanol).

Make a software model of a petrol stand, using 1 or more task(s). Draw the necessary task diagram and state machines.

Make a program for the EMP-board that implements the petrol stand. Let <SW2> toggle the hook for the trunk and <SW1> be the valve in the handle, so gasoline will flow as long as it is pushed. The red LED is the pump and the yellow LED is the shunt. Implement a software interface (an API, a protocol ea.) to read the flow meter, select the product, start the pump and activate the shunt.

Det Tekniske Fakultet

Now, use your petrol stand in a gas station system, including a customer interface.

A customer should be able to pay for gasoline with cash (50-kroner and 100-kroner banknotes) or on account.

Cash payment is made through a banknote reader that provides a signal when it has recognized a 50-kroner note and another signal when it has recognized a 100-kroner note. The customer may insert a number of banknotes in succession, in order to obtain a larger amount. When refueling has begun, it is no longer possible to insert additional banknotes. In case of cash purchase, the filling will stop automatically when the prepaid amount of gasoline has been refueled.

If the customer wants to pay from an account, he presses a button <Account>, after which he must enter his 6-digit account number at the keypad. Before refueling can commence, he must also enter a 4-digit pin code.

Before refueling can start, the customer must select which product he wants to obtain. At our petrol pump, he may choose between 92 octane, 95 octane and E10.

Refueling is initiated by the customer when he hooks off the trunk. The pump is started, and when the handle is activated, the fuel flows out of the trunk. The first 0.1 liter must be pumped out with the shunt activated. The gasoline will flow as long as the handle is activated. Each time the handle is released and re-activated, a new shunt period must be started.

During refueling pulses from a flow meter are detected. These pulses are the basis for calculating the price of the refueled amount of gasoline.

When refueling a certain amount (cash purchase) the shunt is activated before reaching the wanted amount, in order to avoid overshooting the supply of gasoline, and because of that, giving away gasoline, which is not paid for.

Any refueling session may be terminated at any time by leaving the handle released for 15 seconds.

Morten

Det Tekniske Fakultet

After refueling all relevant data of the purchase are logged (time of day, product, quantity, the total price and the account number or "CASH"). The shop owner should be able to set the price of each product from a PC. Also from his PC, he must be able to query a report containing the total sales of gasoline sorted by product, the sum of all cash purchases, sum of all account purchases and the total operating time for the pump.

At the EMP board, we simulate the bank note reader with the digiswitch. A clock wise click is a 50-kronersignal, and a counter clock wise click is a 100-kroner signal.

Account number, PIN number and the choice of product is entered by the matrix keyboard guided by text messages at the LCD display.

During refueling the LCD-display must show the current quantity, the current price and the price/liter of the selected product.

All logging and communication with the PC is done through the UART.

This assignment must be solved in the EMP groups. The solution must be based on FreeRTOS, and it must utilize FreeRTOS objects for inter-task communication, synchronization and protection of shared resources.

The solution must be documented on a poster in A1 format. The poster is presented at a poster session, May the 22nd, 2017. The poster could show a sketch of the system, the task diagram of the total application, relevant state machine diagrams, a list of modules, interesting examples of the code, a screen dump of the PC terminal dialog, etc. Remember to add the date, the course, your group number and all your names.

Enjoy,
Morten