

ME 391-04 Wireless Mechatronics Systems

HW3 WIRELESS COMMUNICATION - BATTERY OPERATION – SENSOR FUSION

DUE DATE 11/04/2014

This homework requires you to develop a wireless mechatronic system consisting of the following hardware

WIRELESS ROBOTIC SYSTEM (WRS)

1. 1 pressure sensor used as an altimeter
2. Wireless MCU board (wireless microcontroller, Voltage Regulator, basic external components)
3. 1 battery

TRANSCEIVER (TxRx)

4. Wireless MCU board
5. UM232R

PC

The programming architecture consists of 3 parts: C++ PC application, embedded code on the TxRx (using an UM232 for USB powering and serial data transmission to the PC), embedded code on the wireless microcontroller on the WRS. Details about how to drive the pressure sensor will be given in class, as well as a generic schematic of all the systems.

The homework requires you to accomplish both individual and team assignments.

TEAM ASSIGNMENTS

As a team, you will be asked to present a working system with all the hardware mounted on it. The WRS is intended to have 2 PWM outputs to drive 2 brushed motors. PC arrows keys UP and DOWN on the keyboard increase/decrease the PWM duty cycle ($f = 800$ Hz) of an I/O port. PC arrows keys LEFT and RIGHT on the keyboard increase/decrease the PWM duty cycle ($f = 800$ Hz) of the other I/O port.

A voltage divider controls the voltage level of the battery and is monitored by an ADC input.

A potentiometer is plugged to the regulated output of the Voltage Regulator. The potentiometer voltage is monitored by a second ADC input.

A third analog input has to be used to measure the output voltage of pin 2 of the pressure sensor (instructions provided in class – this pin provides a reference voltage).

Data from the 3 analog inputs have to be collected in a sequence using the ADC and being triggered by Timer 1 every 200 ms. Every 5 seconds, these data have to be transmitted separately to the PC interface.

Data from the pressure sensor have to be collected every loop and transmitted, while data from the 3 analog inputs have to be transmitted separately – as stated above – every 5 seconds on a separate package.

Each team will be responsible for the robustness of the system. Handshaking in every loop between the two wireless microcontrollers is mandatory as well as error handling. The wireless package that is transmitted by the WRS has a fixed size of 105 bites including

- 1 byte header of package
- 2 bytes with the package number
- 100 DATA bytes
- 1 byte RSSI Indicator
- 1 byte end of package

SINGLE ASSIGNMENTS

Present a 3-page (max) report including:

Description of all the code (include graph or state machine chart showing the interactions between the WRS, TxRx and the PC)

Calibration graph of the pressure sensor output to determine the altitude of Olin Hall (6th floor to basement) http://www.engineeringtoolbox.com/air-altitude-pressure-d_462.html