MIAE 215 Arduino Project

This project is a follow up on Arduino lab #3. Please finish that lab and then answer the questions given below. The following items should be submitted as a Moodle assignment no later than one week after the final lecture (ie Thursday after the final week of the term):

a) The *.ino files for each question (eg Q1.ino, Q2.ino, etc.)

b) High quality photos (1-2 in number for each question) of your apparatus for each question (eg. Q1.jpg, Q2_a.jpg, Q2_b.jpg, etc.).

c) A brief video demonstrating your answer for the final question.

No report is required. However, your programs should include C++ comments that briefly explain how the program works (roughly one comment every 5 lines of the program).

Each student should do the project separately. Collaboration is not allowed.

Each question is worth equal marks and will be graded out of 10. The main grading criteria are:

a) Technical merit -- how correct and general is your solution.

b) Originality -- how original and innovative is your solution including the program and its organization. Collaborating or copying will definitely have a negative impact on this aspect. Innovation and novel / more difficult approaches will have a positive effect.

Project Questions

1) Organize your solutions for Arduino lab #3 (only questions #1 and #3) into appropriate functions (eg float read_voltage(int channel), etc.). Each question should define 2-4 functions in addition to setup() and loop(). Ideally your functions should be as general and recyclable as possible so that your functions could readily be used by other programs for different purposes (eg don't just write one function and call it from setup()). Functions should also normally take care of unit conversions from Arduino functions to standard units (eg float read_voltage(int channel) returns a value in Volts, etc.). For each function indicate which parameters are call-by-value and which parameters are call-by-reference and why you made that choice.

2) Add a new sensor to your apparatus from Arduino lab #3. You can select any sensor from the Arduino kit. Possible sensors include:

a) Joystick
b) Temperature sensor
c) Ultrasonic sensor

Additional sensor suggestions along with references are included in the file Arduino_kit_info.rar. Don't cut and paste the included examples in your solution though -- write your own version / modify the examples.

Write a program that uses the new sensor combined with the servo motor actuator from Arduino lab #3. The servo should respond to the new sensor input, ideally to perform some useful / interesting task. For example, controlling the servo position / velocity using the joystick or moving the servo like a dial in response to temperature changes. The program should also be organized in terms of functions (if possible, time permitting) in a similar manner to Question #1.

Note that you can add an extra sensor to your program if you want to including the light sensor from Arduino Lab #3. However, it's not required. You can also add mechanical design components (cardboard or wood is fine) to your apparatus to make the project more interesting, but it's not strictly required. Keep in mind the grade is mainly for the Arduino program, so don't spend too much time on mechanical design unless it makes for a more interesting / original Arduino program (that you have time to finish).

If you want to add another actuator (including a LED or LCD screen) or a have a different project then you can add a separate project topic as a small bonus (also include videos and pictures to document your work). However, you still have to complete the original project question and that would be worth most of the marks.

Finally, the amount of work you put in for the project shouldn't be much more than a long assignment or lab. Keep in mind the percentage weighting for the project in the course. However, there will be a problem on the exam (worth about 10% of the exam) based on the Arduino labs and the project, so make sure you understand the related material.