CSC9006 Real-Time Systems (Spring 2021) Critique 3

** **Submission deadline: 9PM, June 20th, 2021.** **

In this assignment, we will study the following paper:

> C. Lu, A. Saifullah, B. Li, M. Sha, H. Gonzalez, D. Gunatilaka, C. Wu, L. Nie and Y. Chen, *Real-Time Wireless Sensor-Actuator Networks for Industrial Cyber-Physical Systems*, Special Issue on Industrial Cyber-Physical Systems, Proceedings of the IEEE, 104(5): 1013-1024, May 2016.

As you read the paper, try to reflect on the subjects that we've covered in this semester. The content of the paper gives you real-world samples for the those subjects. **Study the whole paper**, and answer the following questions. These questions are designed to give you some ideas of how we may take notes when reading a research paper. Also, when reading a research paper, sometimes we may need to consult some related articles to learn the concepts that the authors did not speak out in the paper. This is common practice, and you will need to do that here, too.

There are 15 questions in total, seven points per question:

- Q1: What is *cyber-physical codesign*, and what things motivate the cyber-physical codesign?
- Q2: What is *industrial process control*?
- Q3: Summarize the features that make WirelessHART suitable for industrial process control.
- Q4: Summarize in your own words for *source routing* and *graph routing* in WirelessHART.
- Q5: Give the definition of *packet delivery rate* in this paper.
- Q6: Compare and contrast the *fixed priority scheduling* and the *dynamic priority scheduling* in real-time WirelessHART networks.
- Q7: Describe what is a *control loop* and what are some typical components in a control loop?
- Q8: What is the goal of rate selection in control (in the scope of this paper)?
- Q9: Give the definition of a convex function.
- Q10: Following Q9, when formulating an optimization problem, why is it critical to have the target function to be convex?
- Q11: What is lacking in the related wireless control simulator as listed in this paper?
- Q12: Define *regular flows* and *emergency flows* in WirelessHART control networks.
- Q13: Following Q12, describe why the proposed *slot stealing (SS)* method may outperform the baseline *periodic scheduling (PS)* ?
- Q14: Use your own words to summarize the research direction in exploring white spaces.
- Q15: Give your comments for this paper; in particular, what are some key lessons you learned from studying this paper?

Write your answer into one single plain text file. Name it as `critique3.txt` and submit it to Moodle before the deadline. Remember, this critique will account for 15% of your final grade for this semester.