**CSC 478/678 Principles of Wireless Networks**

Term Project

**Description:**

In this project, form teams of 2-3 members to research on how to improve slotted ALOHA when repeated transmissions need to be made before deadlines. Either use MATLAB, Python, or any other programming language that you and your teammate prefer.

**Note**: a lot of questions, clarifications, and discussions are expected. This is part of the project. Please use Canvas discussion for those.

1. The following MATLAB code simulates slotted ALOHA with retransmission.

N=20;

total\_sim\_time=3000; %simulation time

total\_success=zeros(1, N); %array to record number of packets successfully sent

p=0.1; %transmission threshold, as an example

%slotted operation

for time=1:total\_sim\_time

%nodes transmit based on a random number

trans1 = (rand(1,N)<p);

if (sum(trans1)==1) %only one node sending?

total\_success(find(trans1))=total\_success(find(trans1))+1;

end

end

Basically, it is just a loop of checking every time slot for random transmissions. And we have assumed that every node always has at least one data packet to send.

In Step 1, please simulate slotted ALOHA with retransmission for different number of nodes, N, and measure throughput. Plot a graph to show that.

2. The above code is based on the assumption of lots of packets and we never record any dropped packets. In any real system, these need to be maintained. Modify the above code to simulate packet arrival and transmissions. Assume that packets will arrive at each node every D unit times. An example of D is 50, 60 or 80, for N=20.

In Step 2, simulate and record throughput for the system. Plot a graph for the new throughput. [Hint: define a few array variables similar to total\_success[1:N] would help.]

3. In many applications, such as sensor monitoring applications, every of the N users would generate a new packet every D time slots. All those packets experiencing transmission delays longer than D time slots will be discarded and a new packet would be sent instead. However, if a packet is sent early from one node, the node would not have anything else to send until the next packet arrives.

In Step 3, modify the code in Step 2 to simulate slotted ALOHA with D=60 for N=20 with deadline consideration. Show a graph on how many packets got through before expiration.

4. Open question: how to improve throughput in this system? Propose your design and simulate it to show its performance. Some suggestions: can you adjust p based on D and N? Can you find the optimum p as a function of D and N?

**Project Report**

Your project report should be about 8-10 pages (12 fonts) and should include explanation of your approaches and your findings based on the results. All graphs should be inserted and clearly readable. Any unreadable graphs will be discarded during the grading process. The project report is expected to have the following components:

Title, team members, date

I. Introduction

II. System model

III. Approach and Program Modules

IV. Results and Discussions

V. Conclusion

VI. References if any is used

Appendix. Source code.

**Project Presentation**

Each team will get a 15-minute time to present their findings in the final lecture in front of the entire class. Prepare a powerpoint file with about 7-9 slides to mainly talk about your code and briefly talk about the results/figures.

Both presentation slides and project reports should be submitted on due date.

**Grading**

Final report – 60%

Presentation – 40%