# Solution for Assignment #1

KJC (08/18/04)

**#1)** A good abstract (at 147 words) for the paper is:

> Building large-scale video surveillance systems is of importance to national security. To support economical installation of video cameras where cabling is a major cost, there is a need for new shared-medium protocols. This paper describes the new Spatial reuse FireWire Protocol (SFP). SFP is a bus arbitration protocol for an acyclic daisy-chained network topology. SFP is an extension of IEEE 1394b FireWire. SFP preserves the simple repeat path functionality of FireWire while offering two significant advantages: 1) SFP supports spatial reuse of bandwidth in order to increase effective throughput, and 2) SFP provides support for priority traffic to be able to support real-time applications (e.g., video) and data traffic. Simulation results show that for a uniform traffic pattern, SFP improves upon the throughput of IEEE 1394b by a factor of 1.7. For a traffic pattern typical of video surveillance applications, throughput increases by a factor of 6.8.

Note that this abstract follows the formula of 1) set the stage, 2) motivate the problem, 3) describe the method, 4) describe the evaluation, and 5) describe the results. This is a *summary* of the paper, not an introduction to the paper. Whenever possible, we are quantitative.

**#2)** The reviewed paper must be mapped into 1) Introduction (sets the stage, defines terms, motivates the problem), 2) Background (previous work, demonstration of the problem), 3) Problem (precise description of the problem), 4) Solution (the "method"), 5) "Proof" (analytical, simulation, or experimental evaluation), and 6) Summary and future work (identifying holes in this work).

**#3)** Just need a signature that this was indeed done.

**#4)** This is trivially done in Mathcad (and, yes, you really need to have a math package in your tool kit!). The solution is (sure, you could do this by hand too):

$x_1 := 0.25 \quad x_2 := 0.15 \quad x_3 := 0.05 \quad x_9 := 0.55$

$\text{Mean} := 0.25 \cdot 1 + 0.15 \cdot 2 + 0.05 \cdot 3 + 0.55 \cdot 9$

$\text{Mean} = 5.65$

$\text{Variance} := 0.25 \cdot (\text{Mean} - 1)^2 + 0.15 \cdot (\text{Mean} - 2)^2 + 0.05 \cdot (\text{Mean} - 3)^2 + 0.55 \cdot (\text{Mean} - 9)^2$

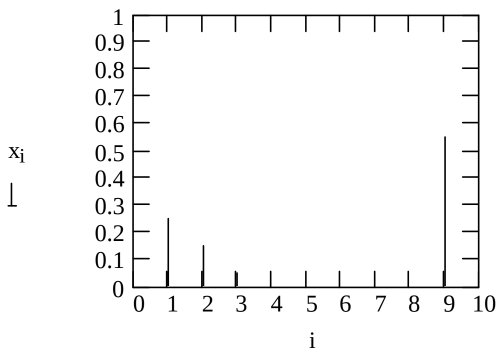
$\text{Variance} = 13.928$

$\text{Standard\_deviation} := \sqrt{\text{Variance}}$

$\text{Standard\_deviation} = 3.732$

**#4) <u>continued</u>**

$i := 1 .. 9$

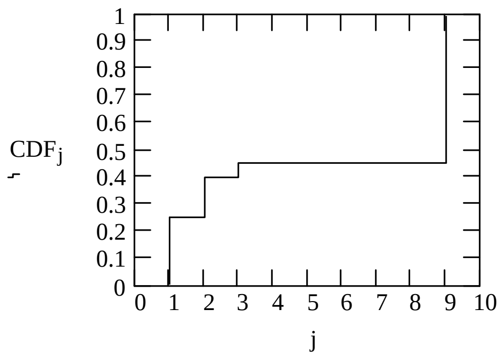



This is the denisty function

$CDF_0 := 0$

$CDF_i := CDF_{i-1} + x_i$

$j := 0 .. 10$




This is the cumulative functio

**#5)** For any packet tuple what is the probability that at least one packet gets through (i.e., at least one packet is not lost)? This is simply 1 minus the probability that all packets in the tuple were lost, which is:

$$\Pr[\text{At least one packet is not lost in a tuple of } N \text{ packets}] = 1 - (N \cdot p)^N$$

Note that the $N \cdot p$ is a result of the problem statement where the probability of a packet loss increases by $N$ as the overall rate also increases by $N$ (obviously, $N \cdot p < 1$ must hold for this to be interesting). Thus, the goodput is simply:

$$\text{goodput} = \left[1 - (N \cdot p)^N\right] \cdot R$$

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