Correction to “Structured Network Coding and Cooperative Wireless Ad-hoc Peer-to-Peer Repair for WWAN Video Broadcast”

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We identified simulation errors in [1]. This errata outlines a corrected derivation and presents updated simulation results. In Eq. (13) of [1] we rewrite $Q(n, x)$ as:

$$Q(n, x) \approx \sum_{k=|\sum_{i \in \Theta_x} B_i|}^{R} \binom{R}{k} \left( \sum_{i=1}^{x} \beta_n(i) \right) \left( \sum_{i=x+1}^{X} \beta_n(i) \right)^{R-k} \times A(x, k)$$

(1)

where $R = \frac{R_n P_{SNC} - \beta_n}{S}$ is the total number of innovative CPR packets. $A(x, k)$ is the SNC group allocation ratio, i.e., given there are $k$ received CPR packets in SNC group $\Theta_x$, the fraction of possible allocations of $k$ packets to SNC groups $\leq x$ such that they are innovative and hence are useful for the recovery of SNC group $\Theta_x$. As an example, suppose there are two SNC groups with two frames $F_1$ and $F_2$ of sizes $B_1 = 2$ and $B_2 = 2$, respectively. Assume in addition that there are 3 packet losses. Then $\Theta_1$ can lose at most 2 packets via WWAN and thus can consume at most 2 SNC packets; the third packet loss must be in $\Theta_2$ and one SNC packet must be in $\Theta_2$. $A(x, k)$ can be written as follows:

$$A(x, k) = \min \{ A_1(x, k), ..., A_{k-1}(x, k) \},$$

(2)

where each term $A_i(x, k)$ is the probability of assigning extra CPR packets that SNC group $\Theta_i$ cannot consume to SNC groups greater than $i$. $A_i(x, k)$, in turn, can be written as:

$$A_i(x, k) = \frac{k-|\sum_{j \in \Theta_x} B_j|}{\sum_{i=1}^{j} \beta_n(j)} \left( \sum_{j=1}^{i} \beta_n(j) \right)^{k-|\sum_{j \in \Theta_i} B_j|} \times A_i(x, k),$$

(3)

where $g_i$ is the minimum number of CPR packets that must be in SNC group $\Theta_x$, but not SNC group $\Theta_i$. $g_i$ is written as

$$g_i = l \sum_{F \in \Theta_x} B_l - l \sum_{F \in \Theta_i} B_l.$$

(4)

We replace Fig. 5-9 of [1] with Fig. 1-5.

![Fig. 1. Receiving CPR packet Innovative probability.](image1)

![Fig. 2. CDF of number of peers repaired during one epoch time.](image2)

![Fig. 3. PSNR for the news and foreman sequences under various CPR transmission rates and number of streams.](image3)

![Fig. 4. PSNR for the news and foreman sequences under various CPR transmission rates and SNC scheme settings.](image4)

![Fig. 5. PSNR for the foreman sequence under various multi-stream scenarios](image5)

REFERENCES