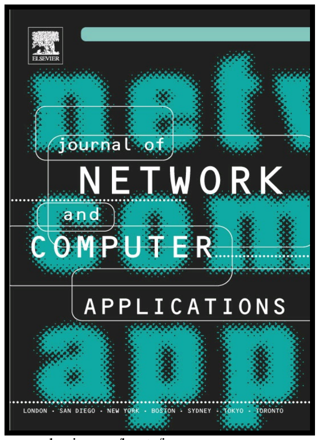


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# Epidemic Data Survivability in Unattended Wireless Sensor Networks: New Models and Results

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**Abstract**

Unattended Wireless Sensor Networks (UWSNs), characterized by the intermittent presence of the sink, are exposed to attacks aiming at tampering with the sensors and the data they store. In order to prevent an adversary from erasing any sensed data before the sink collects them, it is common practice to rely on data replication. However, identifying the most suitable replication rate is challenging: data should be redundant enough to avoid data loss, but not so much as to pose an excessive burden on the limited resources of the sensors. As noted before in the literature, this problem is similar to finding the minimum infection rate that makes a disease endemic in a population. Yet, unlike previous attempts to leverage on this parallelism, we argue that model and system parameters must be carefully bound according to conservative and realistic assumptions on the behavior of the network, further taking into account possible statistical fluctuations. In this paper, we therefore refine the connection between the Susceptible, Infected, Susceptible (SIS) epidemic model and the survivability of sensed data in UWSNs. In particular, based on probabilistic data replication and deletion rates, we identify proper conditions to guarantee that sensed information become endemic. In both the full visibility model (*i.e.* unlimited transmission range) and the geometric one (*i.e.* limited transmission range), the proposed approach achieves: *(i)* data survivability, *(ii)* optimal usage of sensors resources, and *(iii)* fast collecting time. Building on advanced probabilistic tools, we provide theoretically sound results, that are further supported by an extensive experimental campaign performed on synthetically generated networks. Obtained results show the quality of our model and viability of the proposed solution.

*Keywords:* Unattended Wireless Sensor Network, Epidemic Models, Data Survivability, Security



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