In order to facilitate the analysis of the efficiency of the two proposed approaches, Fig 11 presents the energy consumption for both approaches over the communication scenario in Fig 4. Moreover, we also compared the proposed approaches with an unreliable transmission (without any error recovery mechanism) and an ARQ hop-by-hop retransmission mechanism where all corrupted packets are retransmitted if corrupted. For this last option, we considered two different PER for each link: 10% and 20%.

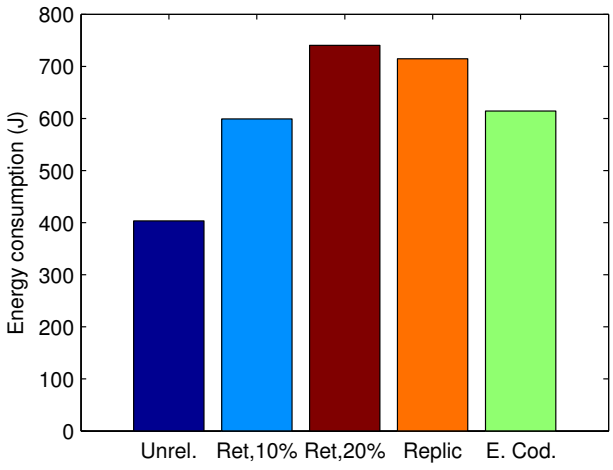


Figure 11. Results for different error recovery mechanisms.

The proposed approaches present equivalent performance when compared with hop-by-hop packet retransmission, but with lower complexity. When a corruption occurs, the packet is retransmitted by the previous hop, which may add undesired delay for the communication. Moreover, intermediate nodes must acknowledge each transmitted packet. In such way, the average end-to-end delay of the communication is expected to be lower when employing packet-level redundancy [21, 26].

Although retransmission will assure that all transmitted packets will reach the sink, transmissions from low-relevant sources may tolerate some quality loss since the overall transmission delay does not increase, especially for time-critical applications. We then believe that the proposed packet-level semi-reliable redundancy approaches can benefit wireless visual sensor networks.

As a final comment, packet-level redundancy can be implemented employing different algorithms, since respecting the relation between SR and *R* and *N-M* presented in Table 2 and Table 3, respectively. Whatever the case, we are mainly concerned in this work in how redundancy can be implemented according to the sensing relevancies of source nodes, potentially reducing energy consumption while assures high level of monitoring quality.

# 5 Conclusions

We have proposed two different semi-reliable transmission approaches based on packet-level redundancy for error-resilience in wireless visual sensor networks, where the sensing relevancies of source nodes are exploited to achieve energy-efficient reliability. The initial numerical verifications showed promising results that can benefit time-critical applications, assuring timeliness communications with low impact to the overall monitoring quality.

As future works, new associations between the expected level of reliability and the sensing relevance will be proposed. Moreover, new validations of the proposed approaches will be performed, considering discrete-event simulations and real-world experiments.

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