

## **Error Detection and Correction for Onboard Satellite Computers Using Hamming Code**

**Authors :** Rafsan Al Mamun, Md. Motaharul Islam, Rabana Tajrin, Nabiha Noor, Shafinaz Qader

**Abstract :** In an attempt to enrich the lives of billions of people by providing proper information, security and a way of communicating with others, the need for efficient and improved satellites is constantly growing. Thus, there is an increasing demand for better error detection and correction (EDAC) schemes, which are capable of protecting the data onboard the satellites. The paper is aimed towards detecting and correcting such errors using a special algorithm called the Hamming Code, which uses the concept of parity and parity bits to prevent single-bit errors onboard a satellite in Low Earth Orbit. This paper focuses on the study of Low Earth Orbit satellites and the process of generating the Hamming Code matrix to be used for EDAC using computer programs. The most effective version of Hamming Code generated was the Hamming (16, 11, 4) version using MATLAB, and the paper compares this particular scheme with other EDAC mechanisms, including other versions of Hamming Codes and Cyclic Redundancy Check (CRC), and the limitations of this scheme. This particular version of the Hamming Code guarantees single-bit error corrections as well as double-bit error detections. Furthermore, this version of Hamming Code has proved to be fast with a checking time of 5.669 nanoseconds, that has a relatively higher code rate and lower bit overhead compared to the other versions and can detect a greater percentage of errors per length of code than other EDAC schemes with similar capabilities. In conclusion, with the proper implementation of the system, it is quite possible to ensure a relatively uncorrupted satellite storage system.

**Keywords :** bit-flips, Hamming code, low earth orbit, parity bits, satellite, single error upset

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