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Srilakshmi Pattabiraman, Ryan Gabrys and Olgica Milenkovic*

(milenkov@illinois.edu), Coordinated Science Lab, Department of Electrical and Computer Engineer, Urbana, IL 61801. *Reconstruction and Error-Correction Codes for Polymer-Based Data Storage.*

Motivated by polymer-based data-storage platforms that use chains of binary synthetic polymers as the recording media and read the content via tandem mass spectrometers, we propose a new family of codes that allows for unique string reconstruction and correction of one mass error. Our approach is based on introducing redundancy that scales logarithmically with the length of the string and allows for the string to be uniquely reconstructed based only on its erroneous substring composition multiset. The key idea behind our unique reconstruction approach is to interleave Catalan-type paths with arbitrary binary strings and "reflect" them so as to allow prefixes and suffixes of the same length to have different weights. For error correction, we add a constant number of bits that provides information about the weights of reflected pairs of bits and hence enable recovery from a single mass error. The asymptotic code rate of the scheme is one, and decoding is accomplished via a simplified version of the backtracking algorithm used for the Turnpike problem. (Received August 16, 2020)