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Iterative Gray Codes

Gray codes are typically defined recursively. For example, the binary reflected Gray code for n -bit binary strings is typically expressed as $\text{BRGC}(n) = 0 \cdot \text{BRGC}(n-1), 1 \cdot \text{reflect}(\text{BRGC}(n-1))$.

We instead consider iterative definitions, where objects are created one at a time. We give a simple greedy algorithm that recreates well-known Gray codes for binary strings, permutations, combinations, binary trees, and set partitions. We also discuss successor rules, including a memoryless rule that visits vertices in the directed Cayley graph for S_n generated by $\sigma = (1\ 2\ \dots\ n)$ and $\tau = (1\ 2)$.