A Simple Randomized Construction

Given encoded symbols:
- $d(k)$ input symbols, i.i.d., $\sim \mathcal{U}[k]$
- $d(k)$ coefficients, i.i.d., $\sim \mathcal{U}[q]$

Randomly select $(1 + \epsilon)k$ columns.

We should be able to decode w.h.p.

**Theorem 1**

- Decoding w.h.p.
- $d(k) = \Omega(\ln(k))$
- Coupon Collector

**Theorem 2**

- $(1 + \epsilon)k$ random columns of $G$ are lin. indep. w.p. $k/q$ close to 1.

If parities depend on "few" input symbols, a systematic code, can have good locality.

- But not possible. Why?
- Drop $\epsilon$. Instead: $(1 + \epsilon)k$

Systematic + Fountain?

How to prove?

- Pr("Yes") $= 1 - o(1)$
- Pr("No") $\geq 1 - \frac{1}{2^2}$

MDS Systematic Form

Easy Access: Max Reliability

Easy: Our Focus

OR

Repairable Fountain Codes

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Simulations

Pr(decoding) vs $k (N = 0.5, \epsilon = 5)$

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