Public Verifiable Randomness Beacon for Random Sample Elections

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Random Sample Elections (RSE)

http://rs-elections.com/

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Progress on Six Pillars

RSE implementation	🟩	Statistical analysis and simulations	🟨
Audit software implementations	🟩	*Trustworthy public randomness*	🟨
Cryptographic models (UCF)	🟧	Vote selling game theoretic analysis	🟧
🟥 0% 🟧 25% 🟨 50% 🟩 75% 🟦 100%			

Goal and Motivation

Provide a source of bits that are

- uniformly distributed
- forward unpredictable
- end-to-end auditable

Why trust the beacon? Why not check it yourself?

Applies to any system/protocol requiring trustworthy public random bits. (e.g., random challenges)

In RSE, random sample selection and audit challenges. Requires randomness from entropy sources of varying quality, latency, and throughput.

Fine Print: Not appropriate for secret values. (e.g., crypto keys)

Bits that are done

Identified candidate entropy sources:

- ○ Financial data (stocks)
- ○ Scientific data (weather)
- ○ Information archives (web archives)

Note: Incorporation of different sources allows us to meet varying requirements on quality, latency, and throughput.

Built scrapers for US stocks and weather. Web archive scraper under development.

Have a voter-palatable explanation of how we use this randomness in Random Sample Elections.

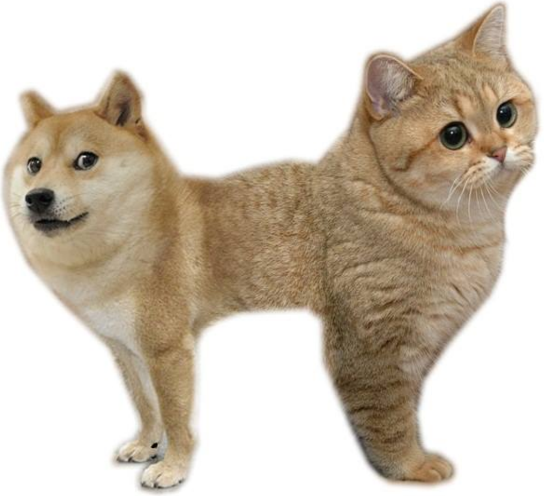
Bits that are done

Identified candidate entropy sources:

- Financial data (stocks)
- Scientific data (weather)
- Information archives (web archives)

Note: Incorporation of different sources allows us to meet varying requirements on quality, latency, and throughput.

Facebook is a lot like ancient Egypt:
people writing on walls;
worshipping cats.



(Source: Unknown)

Bits in progress

- Prototype → Production
  - Expand beacon from stocks to other entropy sources.
  - Rework data formats to handle multiple sources and provide better linking between random bits and the source data.

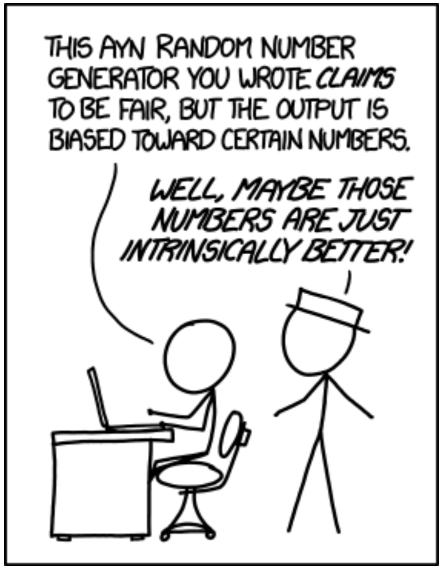
- Mathematical and adversarial models
- Entropy estimation
- Extractor algorithms development

Challenging bits

Our entropy sources are not independent.

They have correlation and even self-correlation.

- How do we estimate entropy and build extractors?


THIS AYN RANDOM NUMBER GENERATOR YOU WROTE *CLAIMS* TO BE FAIR, BUT THE OUTPUT IS BIASED TOWARD CERTAIN NUMBERS.
WELL, MAYBE THOSE NUMBERS ARE JUST INTRINSICALLY BETTER!

(Source: xkcd.com)

Challenging bits

Our entropy sources are not independent.

They have correlation and even self-correlation.

- How do we estimate entropy and build extractors?

The extractor and verifiers may disagree.

- Entropy quantity vs. measurement consistency
- Measurement synchronization.
    - Ex: website changes while the extractor and verifiers are archiving it.
- How do we reconcile these inconsistencies?

We welcome you to join!

For information about the RSE project contact

David Chaum <david@chaum.com> or

Deborah Hurley <dhurley@well.com>

Possible major scholarships for BS, MS, and PhD students via UMBC:

NSF Scholarship for Service (SFS)

UMBC Cyber Scholars

Contact Alan Sherman <sherman@umbc.edu>

Also accepting new customers to use our entropy!