

The NFT of Babel

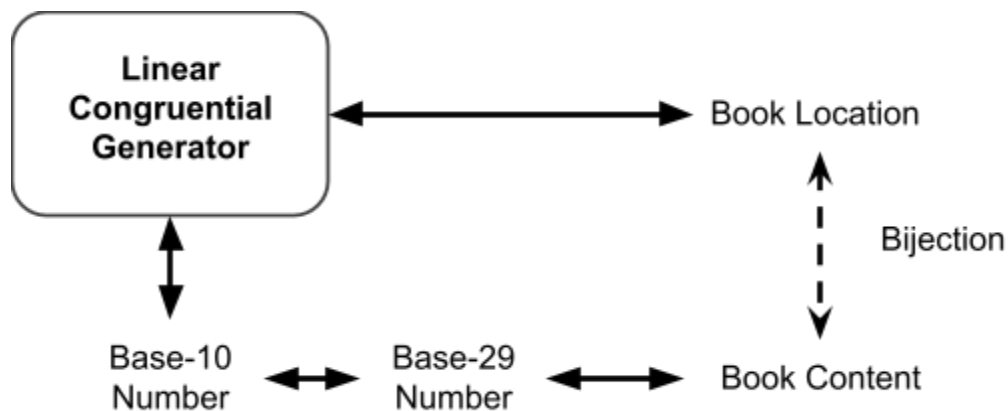
Research Project Proposal

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Our group is interested in implementing a smart contract that encompasses all possible pictures of a certain dimension. We are inspired by Jorge Luis Borges' short story *The Library of Babel*, an imaginative thought experiment where a heavenly library with infinite hexagonal rooms contains every possible book up to 410 pages. Instead of bringing about pious librarians seeking divine truths in infinity, our NFT of babel may present an interesting opportunity for us to explore the idea, the absurdity of digital ownership on blockchain.

Upon our preliminary research, there are some good references for the practicality of this idea.

The core theory of possible implementations is the reversible pseudo-random generating algorithms. *libraryofbabel.info*, a website that approximates Borges' idea, uses the linear congruential random number generator. Every book location in *libraryofbabel.info* is represented by its wall/shelf/volume numbers, corresponding to a unique coordinate. Such a coordinate will be used as the seed in the random number generator, which deterministically produces a larger unique number. That output will be further converted into a base-29 number so that it can be represented using alphabetical letters along with three punctuation characters, which corresponds to the content of that book at that location. Noticeably, *libraryofbabel.info* uses an reversible linear congruential generation algorithm, meaning that any block of text can be traced back to its unchangeable location in reverse order.



Besides, we came to be aware of some similar projects that try to approach this idea.

Library of Babel NFT (www.librarybabel.xyz) is directly derived from the *Library of Babel* idea. However, it only allows text length up to 32 unicode characters. Besides, its contract code only has a bare-bone implementation that irreversibly hashes 32-character sequence into 256-bit token IDs.

Punk Pixels (punkpixels.xyz) does use the reversible linear congruential generator in its smart contract. However, it is used for a different purpose as it tries to single out each pixel in the original CryptoPunks and sell them as separate NFTs.

Therefore, we aim to push the *Library of Babel* idea further in the NFT space. Our initial goal would be a more general collection of a longer text block. If possible, we would like to further implement a Babel canvas that contains all possible 24x24, CryptoPunks-style, pixel images using our own invertible linear congruential generator and storing algorithm and information on-chain.

Context

- An English translation of *The Library of Babel* by Jorge Luis Borges:
<https://sites.evergreen.edu/politicalshakespeares/wp-content/uploads/sites/226/2015/12/Borges-The-Library-of-Babel.pdf>

Reference

- Theoretical explanation of how the popular library of Babel website works:
<http://libraryofbabel.info/theory.html>
- Babel image archives, an imagery application of the principle:
<https://babelia.libraryofbabel.info/>
- One invertible multi-precision pseudo random number generator implementation:
<https://github.com/librarianofbabel/libraryofbabel.info-algo>

1. Browse: Let users browse existing NFT pictures. Since NFTs are indexed using a *uint32* integer, it is not feasible to show all of them on one page. Alternatively, we could showcase the first 1000 NFT based on their indices, showing that our algorithm does produce deterministic results.
2. Search: Let users inquire about a certain NFT picture based on a given index. The picture data is generated by the *punkImage* function in the smart contract, which takes an index and returns a block of memory that consists of 4-bytes RGBA pixels in a row-major format.
3. Customize: Let users configure the NFT based on their own preferences, demonstrating the configurability and the completeness in the coverage of all possible combinations in our algorithm. Available categories of customizable attributes include Hair, Beard, Eyes, Cheeks, Teeth, Mouth, Neck, Ear, Nose, and Mask.