IMPLEMENTATION OF HASHLIPS ART ENGINE TO EARN IMAGE VARIATIONS ON NFT

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Abstract—*Non-Fungible Token (NFT) is a blockchain-based token that securely maps copyright ownership to digital assets, these digital assets exist on the blockchain network which have identification codes and metadata that are unique and different from each other (one-of-the-kind). . It can also be interpreted as a digital asset that represents a variety of assets that are considered unique. NFTs can be traded for digital assets (images, music, videos, virtual creations) where ownership is recorded in a smart contract on the blockchain. One of the difficulties faced is that it takes a very long time for NFT creators to create a large number of works of art in a short time. To make it easier for creators to create NFT images, Daniel Eugene Botha, or better known as Hashlips, created a Hashlips Art Engine algorithm that can be used to create many different NFT images based on the layers provided using the canvas API and node.js. The hashlips algorithm also generates metadata as an important role in the mechanism for searching and exchanging NFT data and measuring the percentage of rarity in the resulting image. In addition, this study also shows the time required to create NFT images.*

Keywords: *Non Fungible Token, Hashlips Art Engine, Blockchain.*

Abstrak—*Non Fungible Token (NFT) adalah token berbasis blockchain yang secara aman memetakan hak cipta kepemilikan ke asset digital, asset digital ini terdapat pada jaringan blockchain yang memiliki kode identifikasi serta metadata yang unik dan berbeda satu sama lain (one-of-the-kind). Dapat diartikan juga sebagai asset digital yang mempresentasikan beragam asset yang dianggap unik. NFT dapat diperdagangkan untuk asset digital (gambar, music, video, kreasi virtual) di mana kepemilikan dicatat dalam smart contract di blockchain. Salah satu kesulitan yang dihadapi adalah membutuhkan waktu yang sangat lama bagi creator NFT dalam membuat karya seni yang banyak dalam waktu yang singkat. Guna memudahkan para creator dalam membuat gambar NFT, Daniel Eugene Botha atau yang lebih dikenal sebagai Hashlips, membuat satu alghoritma Hashlips Art Engine yang dapat digunakan untuk membuat banyak gambar NFT berbeda berdasarkan lapisan yang disediakan dengan menggunakan canvas API dan node.js. Dengan alghoritma hashlips ini juga menghasilkan metadata sebagai peran penting di dalam mekanisme pencarian maupun pertukaran suatu data NFT dan mengukur persentase rarity pada gambar yang dihasilkan. Selain itu penelitian ini juga menunjukkan pengujian waktu yang diperlukan dalam membuat gambar NFT.*

Kata Kunci: *Non Fungible Token, Hashlips Art Engine, Blockchain.*

INTRODUCTION

The application of Blockchain technology is still not widely applied, apart from the fact that this technology is still very new, also the initial pull from this field of applied blockchain that is emerging is related to providing solutions to economic and business problems.(Nugraha, 2020) NFT or what can be called a non-fungible token, in Indonesian a token that cannot be exchanged, is a method of financial security consisting of digital data and stored in the blockchain. The blockchain in question is a form of ledger that is distributed and used as a transaction tool in virtual worlds such as bitcoin, ethereum, and solana. NFT ownership is recorded in the blockchain, and can be transferred by the owner, which allows NFTs to be sold and traded.(Angelo & Dananjaya, 2022) Blockchain technology links blocks of data sequentially in a distributed ledger. Each block stores various contents, including a "hash", which is the block's own unique identifier. The hash identifies and links this block to all blocks, both the previous block and the block after it. So it can be concluded that Blockchain is a collection of blocks (blocks) that contain transaction data that are linked/connected (chain = chain) and are sorted

from one another. Blockchain can be thought of as a digital data storage system in which each block that is the most recent or most recently connected block must have the hash information (hash = alphanumeric code that represents a word, message, or data) of the previous block. Each block will refer to the previous block and so on to form a chain.(Utomo & Indonesia, 2022) These various data blocks are secured and also bound to each other using cryptographic principles.(Torbeni et al., 2022) Blockchain technology is superior to other conventional technologies because it can be implemented in various types of industrial sectors, such as Supply Chain and financial services. Blockchain is a revolutionary system that connects computer networks in a decentralized and distributed manner.(Lukita, 2020) Crypto Art is a recent artistic movement in which artists produce works of art, usually stills or animations, and distribute them via crypto art galleries or their own digital channels using blockchain technology. The phenomenon of Crypto Art is closely related to the values of blockchain technology itself. This is related to the characteristics of decentralized blockchain, democratization, and individual control that comes from artists, and collectors or owners.(Franceschet et al., 2022) The CryptoArt movement operates at the intersection of technology, art and (eventually) the market. Artists produce limited edition digital works, and upload them to the blockchain, creating a non-fungible token (NFT) associated with them (a process known as printing).(Mcavoy & Kidd, 2022) Crypto art is a recent artistic movement in which the artist produces works of art, typically still or animated images, and distributes them via a crypto art gallery or their own digital channel using blockchain technology.(Franceschet et al., 2022)

Blockhain-Smart Contract NFT Crypto Asset is a derivative of crypto asset technology currency (cryptocurrency) which of course has a different technological approach so that new knowledge is needed to understand the procedures for doing it business transactions in it so that they can understand the legitimacy of NFT BlockchainSmart Contract transactions.(Fajarianto et al., 2022) NFTs can only have one owner at a time. Ownership is managed via a uniqueID and metadata that cannot be replicated by other tokens.(Ethereum.org, 2022) The presence of this NFT has existed since 2014 which was introduced on a platform called Counterparty and Quantum's work is the first NFT work which is now worth 7 million US dollars. Widely known by the public in 2017 until now and will become increasingly popular in the long term because it is considered an easy way to sell and buy artwork in digital form.(Sulistianingsih & Khomsa Kinanti, 2022) In late 2017, the popularity of

collectible CryptoKittes led to the first significant growth of NFTs, with the total weekly sales increasing from 100 to an average of 15,000 to 50,000. This occurred after around 22 November 2017, when a rare cat was sold for an extremely high price, and since CryptoKitties have so many attributes, it is difficult to put an actual value on them, but due to their rarity and Gen 0 status, they were worth over 200 Ether, and many people started looking for their own rare cats. Within the next few years, the sales went from 30,000 to 80,000 per week. The most popular NFT collection currently is Axie infinity, which has been sold for $4.07 billion worldwide. Axie INFINITY is an Ethereum-based video game where the player collects and mints NFTs using an electronic pet called Axie. Axie Infinity has a total of 1,758,089 buyers and 2,421,759 owners. Following them are CryptoPunks with $2.27 billion and Bored Ape Yacht club with $2.22 billion.(Bhujel & Rahulamathavan, 2022) In recent years, NFTs have garnered remarkable attention from both the industrial and scientific communities. It was reported that the 24-hour trading volume on average of the NFT market is 4, 592, 146, 914 USD while the 24-hour trad- ing volume of the entire cryptocurrency market is 341, 017, 001, 809 USD. The liquidity of NFT-related solutions has accounted for 1.3% of the entire cryp- tocurrency market in such a short period (5 months). Early investors obtain thousandfold returns by selling unique digital collectibles.(Wang et al., 2021)

The popularity and number of NFT transactions continues to increase drastically to create a new trend because many record transactions at fantastic prices, for example the video "Charlie Bit My Finger" which received more than 885 million views on the Youtube platform which was converted to NFT and sold for USD 760,999 or around 11 Billion Rupiah, Jack Dorsey who is the former CEO of Twitter sold his first tweet as well as the first tweet on Twitter in the form of NFT for USD 2.5 million.(Mayana et al., 2022). Not long ago, we in Indonesia were also shocked by the success of Ghozali, who was able to earn billions of rupiah by selling hundreds of his selfies in the form of NFTs on the OpenSea marketplace, a digital trading place with around 300 users and millions of digital goods transacted.(Kuntjoro, 2021)

This study uses alghoritma from HashLips Art Engine. HashLips Art Engine is a tool used to create multiple different instances of artworks based on provided layers.(Botha, 2021) Works that are in the NFT when they are traded will cause confusion for the general public regarding the distribution of rights that occur when works are transacted in the NFT. Parties who own copyrights and those who own property rights are sometimes

misunderstood by the public, or some are even confused about which party owns copyrights and property rights.

Copyright is a special right for creators and recipients of rights to publish or reproduce their creations or to give permission for it without reducing the limitations according to statutory regulations. With special rights from the creator, it means that no other person may exercise those rights other than the person concerned or except with the permission of the creator, either the right to sell, the right to reproduce, the right to benefit from the work of the creator or other rights as long as the creator does not give permission. and or limitations. NFTs have the potential to enforce copyright on the basis of transparent blockchain mechanisms. NFT can be connected with digital text if it includes a legal contract that contains the types of rights and ownership of certain works when viewed in theory.

The property rights to the works in the NFT are determined by the specific platform that is used to issue the NFT. The function of the NFT is as a deed that explains a right to a certain object or is useful for indicating that proof of ownership can be used as a contribution to the development of financial activities in modern times in the realm of ownership.(Sulistianingsih & Khomsa Kinanti, 2022) The Copyright Law and the ITE Law have not yet regulated clear and comprehensive protection. In the Twisted Vacancy case, Kendra Ahimsa's artwork is closest to violating Article 5 paragraph (1) letter e and Article 9 paragraph (1) letter d of the Copyright Law and Article 32 paragraph (1) of the ITE Law. However, regarding the act of infringing on a physical artwork that is made into an NFT artwork, it creates confusion as to the use of the article that best describes the actions of the offender. At this time the existence of the Copyright Law and the ITE Law regulates too general without clear boundaries of various kinds of events in digital media. (Gidete et al., 2022)

MATERIALS AND METHODS

1. HashLips Art Engine

The method in this study uses the HashLips Art Engine Algorithm, HashLips Art Engine is a system used to create several different works of art based on the layers provided, using the JavaScript programming language which is executed with the help of node.js and made easy with the node package manager to manage packages automatically. This program uses the canvas API and node.js. Node.js is a runtime environment for JavaScript that is open-source and cross-platform.

Figure 1 Package.Json

Figure 1 above describes the package files used in HashLips and stored in the node module folder. In the dependencies section, the canvas is responsible for producing art in the form of images, the gif-encoder-2 package is responsible for generating GIFs, while the sha1 package is responsible for encrypting art's DNA metadata.
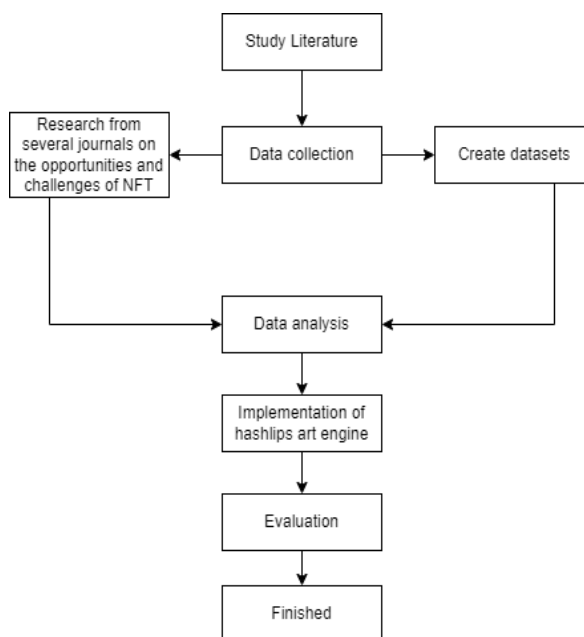

Figure 2 Research flow

Figure 2 above explains the stages of the research flow:

2. Research Flow

a. Literature Study

The literature study in this study was conducted to obtain references related to the research theme so that it can help solve the research problems being carried out. Literature studies were obtained from scientific journals, e-books and articles on the implementation of the HashLips Art Engine.

b. Data Collection

In this study, researchers obtained data from several journals, books and articles related to the research theme. Then the dataset in this study uses its own dataset created in the IbisPainX application, IbisPaint X is a drawing application using smartphones, tablets and other devices. A total of 25 image layer designs consisting of 5 background designs, 5 head designs, 5 mouth designs, 5 eyes designs, and 5 shirt designs.

c. Data analysis

The dataset is in the form of layers of background images, heads, mouths, eyes, and shirts are grouped into a folder to minimize errors occurring in the program when it is run and each layer image file name is given a hashtag # and a number which is useful as a rarity delimiter.

d. Implementation of HashLips

Art Engine at the implementation stage, the author installs the node package manager program, where the node package manager is installed via the visual studio code terminal which is useful for downloading dependencies in the package.json file. The next stage is the testing phase of the HashLips Art Engine program to create different variations of images on NFTs along with their metadata.

e. Evaluation

This stage is carried out if the program in the implementation used has an error.

RESULTS AND DISCUSSION

The results of this study are in the form of NFT images, from the 25 provided image layers in the form of background, head, mounth, eyes, and shirts can be used to create 500 different variations of NFT images based on the layers provided which can help NFT creators to create NFT image variations on the fly. The HashLips Art Engine algorithm is also used by researchers to perform rarity delimiters, rarity delimiters are restrictions that aim to prevent each layer of the design from being too dominant and to make each NFT image produced have its own variation.


```javascript
const basePath = process.cwd();
const { MODE } = require(`${basePath}/constants/blend_mode.js`);
const { NETWORK } = require(`${basePath}/constants/network.js`);

const network = NETWORK.eth;

const namePrefix = "Badak NFT";
const description = "Badak is one of animals from indonesia";
const baseUri = "ipfs://NewUriToReplace";

const solanaMetadata = {
  symbol: "YC",
  seller_fee_basis_points: 1000, //
};

const layerConfigurations = [
  {
    growEditionSizeTo: 2500,
    layersOrder: [
      { name: "Background" },
      { name: "Head" },
      { name: "Shirt" },
      { name: "eyes" },
      { name: "mouth" },
    ],
  },
];
```

Figure 3 Program of Hashlips art engine

Figure 3 above shows the HashLips Art Engine program in creating 500 variations of images on the NFT.

1. NFT image creation


```
PS E:\Collaborasi Riset\hashlips_art_engine-1.1.2> npm run build

> hashlips_art_engine@1.1.1 build
> node index.js

(Use `node --trace-deprecation ...` to show where the warning was created)
Created edition: 1, with DNA: 4703b4baea426f28afe15526bed969ba7e28390a
Created edition: 2, with DNA: 3e4d505f231e5eac6054e36ccee820769f4ac80a
Created edition: 3, with DNA: c782044d98a1e2d82fa42074c73e47efa4375212
Created edition: 4, with DNA: 34603d6f5feb45ef70fce4be957862e1b63b1522
Created edition: 5, with DNA: 1bdd91200ad266e552e7b2ecb500c620f1a95f55
Created edition: 6, with DNA: 5e86f76f8971230d6f671852df3c9821d7e8ddea
Created edition: 7, with DNA: 29a3598ddaebdcc669f68c1042741c1086aec334
Created edition: 8, with DNA: 79a176054a7c36d0a4485a75bd452bde8da49a21
Created edition: 9, with DNA: c79ee598612230b3185aa4163f23664cacdfc21e
Created edition: 10, with DNA: 495738d2632efd3b3ee8f4369700a875eafebab2
Created edition: 496, with DNA: efc5ff84091ddc708cd8f508e11b70c3c0c769b3
Created edition: 497, with DNA: 34bb29d7cdead246cfbb052ec5f9b156aa91cbcc
Created edition: 498, with DNA: 1af5dca79a98105cc0da21c77a8e832d23c7309c
Created edition: 499, with DNA: 8009b754f8c24541f9a35b1a6b0f19cff545df7f
Created edition: 500, with DNA: a090e36352f36ea375874a9f8452396b88f8bef5
```

Figure 4 The process of generating NFT images and Metadata

Figure 4 above shows the npm run build command to perform specific script commands on package.json. This generate process demonstrates the creation of NFT images by displaying the created edition from start to finish and also displays the process of creating DNA which is used as metadata as a feature or differentiator in each NFT image which visually can be seen in the build-image directory.

2. The resulting NFT image

Figure 5 The resulting NFT image

Figure 5 shows the results of creating an NFT using the HashLips Art Engine system by utilizing as many as 25 image layers to create 500 different image variations and have their own metadata that can make these images marketable on the opensea.io platform.

3. Rarity Delimiters

In this study, tests were carried out on the rarity delimiter that had been determined by adding the hashtag # and numbers to the layer file.

```
PS E:\Collaborasi Riset\hashlips_art_engine-1.1.2> npm run rarity

> hashlips_art_engine@1.1.1 rarity
> node utils/rarity.js
```

Figure 6 Rarity Delimiter

Figure 6 above shows the command to see the percentage of each attribute in the entire collection that occurs in the 500 NFTs that have been created, the rarity delimiter is used to create rare attributes and also as a boundary for the character layers to be generated.

Tabel 1. Rarity Delimiter Test Results

No	Trait type	Trait	Weight	Occurence	
1	Background	Blue	20%	93 from 500	(18.60 %)
		Blueold	20%	98 from 500	(19.60 %)
		Green	20%	118 from 500	(23.60 %)
		Red	20%	86 from 500	(17.20 %)
		Yellow	20%	105 from 500	(21.00 %)
2	Shirt	Dr.strange	20%	104 from 500	(20.80 %)
		Hoodie	20%	89 from 500	(17.80 %)
		Jacket	20%	98 from 500	(19.60 %)
		Partai	20%	105 from 500	(19.60 %)
		Penyihir	20%	104 from 500	(20.80 %)
3	Head	Head abu	20%	87 from 500	(17.40 %)
		Hrad blue	20%	89 from 500	(17.80 %)
		Head green	20%	110 from 500	(22.00 %)
		Head greenold	20%	110 from 500	(22.00 %)
		Head yellow	20%	104 from 500	(20.80 %)
4	Eyes	Mata ayam	20%	104 from 500	(20.80 %)
		Mata badak	20%	117 from 500	(23.40 %)
		Mata elang	20%	96 from 500	(19.20 %)
		Mata harimau	20%	91 from 500	(18.20 %)
		Mata singa	20%	92 from 500	(18.40 %)
5	Mouth	Mulut ayam	20%	100 from 500	(20.00 %)
		Mulut harimau	20%	99 from 500	(19.80 %)
		Mulut seram	20%	118 from 500	(23.60 %)
		Mulut sering	20%	99 from 500	(19.80 %)
		Mulut singa	20%	84 from 500	(16.80 %)

It can be seen in table 1 above that the rarity delimiter test for each type used with an average weight of 20% produces image variations that are not too dominant and succeeds in creating 500 NFT images where it is impossible for the same image to occur with another image, each image has layers different picture.

4. Testing the time needed to create NFT images

This study also tested the amount of time needed to create NFT images using the HashLips Art Engine algorithm.

Tabel 2. Testing Time Required

Time required	The resulting NFT image
4 minutes 29 seconds	500 NFT image
8 minutes 24 seconds	1000 NFT image
13 minutes 08 seconds	1500 NFT image
17 minutes 14 seconds	2000 NFT image
21 minutes 26 seconds	2500 NFT image

Can be seen in the table 2 above the results of the test were carried out 5 times. The first test is carried out to create 500 NFT program images takes 4 minutes 29 seconds, the second test to create 1000 NFT program images takes 8 minutes 24 seconds, there is a span of about 4 minutes to create 500 NFT images and so on plus 500 NFT images there is a range almost the same time.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the HashLips Art Engine Algorithm can be used to create image variations on NFT based on the number of layers provided with its own uniqueness and can help NFT makers to make NFT Images quickly and don't need to make them one by one. can take a while and the HashLips Algorithm also generates metadata which plays an important role in the search and exchange mechanism of data in NFTs. The test results on the rarity delimiter show that of the 500 NFT images produced, no layer is too dominant in the NFT images. Test results on the time needed to create 500 NFT images takes about 4 minutes and similarly adding 500 image weights to the HashLips algorithm takes about 4 minutes. For further research regarding the subsequent HashLips Art Engine algorithm code, it can be developed to create a GIF (Graphics Interchangeable Format) in the form of a short looping animation without sound.

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