Automated Market Maker (AMM) is a pricing mechanism that allows digital assets traded automatically. It is an efficient replacement of a traditional limit order book, which suffers some flaws such as external manipulations, time-consuming process. AMMs are divided primarily into two types. One is the classic market makers, which is governed and set up by market maker experts. The other is algorithmic-based market makers, which is automatically operated by algorithms. For the algorithmically controlled AMMs, the ones who take part in the system would provide liquidity to the smart contract. Recently, there are three most popular AMMs which are deployed entirely by algorithms, one of those is Uniswap, which we will survey details in this article.

Uniswap was released in November 2019. It is the first decentralized AMM introduced to the market. Uniswap incentives any user to contribute liquidity to the liquidity pools and enables other traders to trade tokens on the exchange. A notable feature of Uniswap is that the trading price of tokens to be determined purely by reserves of pair of traded tokens in the pool. Roughly speaking, Uniswap AMMs would attempt to preserve the worth of the pool at some t times to be a constant. Concretely, the corresponding number of each reserve in a pool that will comply with the following formula:

For example, a pool initially has 100 tokens

When a user wishes to provide liquidity to the pool, he must deposit an amount of pair of tokens at proportion relative to the price in the reference market. If the being deposited proportion is away from the reference price, the pool ostensibly causes risky arbitrages. The benefit of being a liquidity provider is gaining returns from accumulating trading fees that are 0.3% on Uniswap. This fee is added to the pool and can collect at any time. It will be distributed to the liquidity providers responding to their relative percent proportion contribution at the time of depositing.

Besides, Uniswap also offers a special feature called flash swap. With flash swaps, users can withdraw up to full reserves of any token in Uniswap at no upfront cost. Obviating upfront capital requirements encourages users to trade on Uniswap for arbitrageurs. By the end of this type of transaction, obviously, users must either pay for the withdrawn tokens or return all of them along with a small fee.

Uniswap employs constant product formula as an AMM to pricing assets, then execute transactions. The most important property that this AMM possesses is convexity (readers can find more mathematical details in this paper). \Why is convexity?" you might ask, the trading set in Uniswap is

convex, which has been well-studied. The advantage of convexity is that we can solve optimization problems like risk modeling, or bounded loss in an efficient way.

In the aspect of the protocol, Uniswap has manipulation-resistant on-chain price oracles. The mechanism is that Uniswap measures the market price before the first trade of each block. This price is difficult to manipulate because it was set by the last transaction of the previous block. Attackers must make a bad trade at the end of the previous block, but there is no guarantee that they will be able to arbitrage it back at the next block. They may lose money to other arbitrageurs.

Another advantage of Uniswap is that it is difficult to find the best path to trade any pair of tokens. Trying to route transactions via some intermediate tokens may cause a proliferation of pairs of tokens in Uniswap

Uniswap has a decentralized protocol for automated liquidity provision on Ethereum. Therefore, it demands a gas fee for Uniswap deploying on Ethereum. In recent times, the Ethereum fee is getting higher, consequently, Uniswap-operating is more expensive. According to the article, the price of an ETH to DAI transaction on Uniswap is $55 compared to $33 on Curve, $44 on Aave, and over $80 on Mooniswap. The high gas fee obstacle is making Uniswap less attractive to both traders and liquidity providers.

Another drawback of Uniswap is that it is open for any new tokens. Listing new tokens without monitoring makes Uniswap easy to be scammed by fake tokens. It was reported that a fake Teller token and Uniswap pool had been created on August 19, 2020 (see article). Attackers could possibly create new tokens with a similar name to real tokens to deceive users to trade worthless tokens.