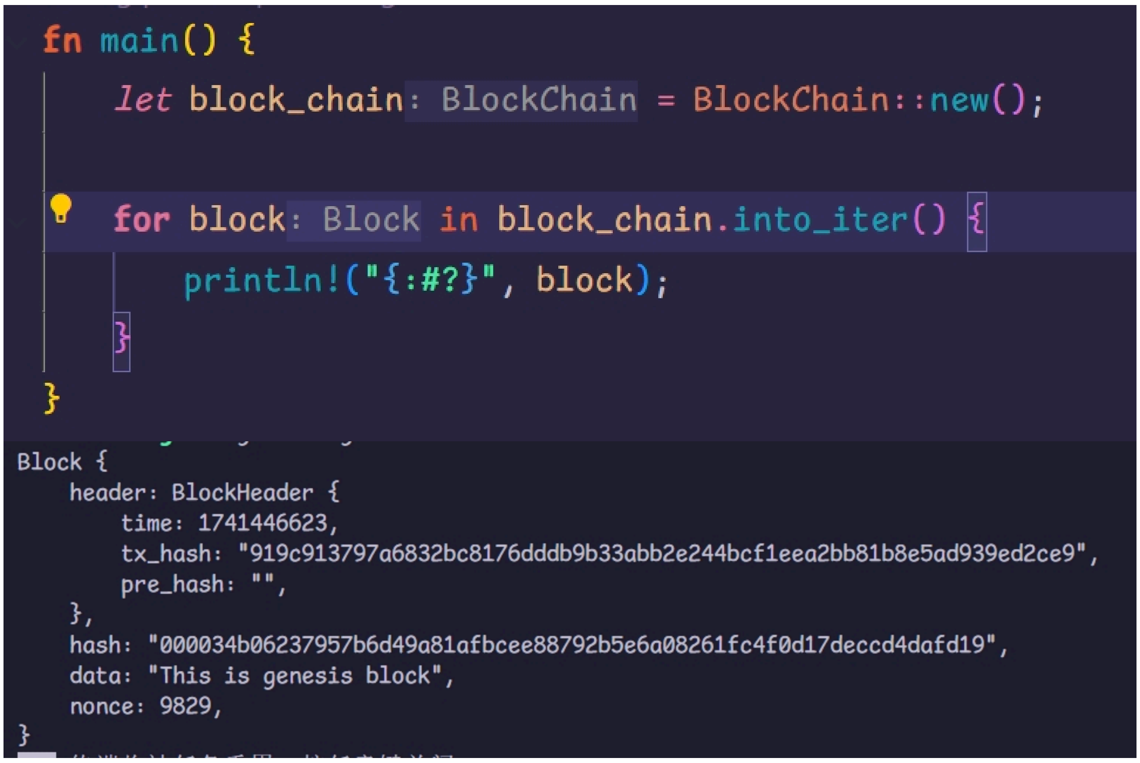
基于Rust的简易区块链项目说明

项目运行演示

- main函数中创建区块链并打印，打印出来的内容只有创世区块

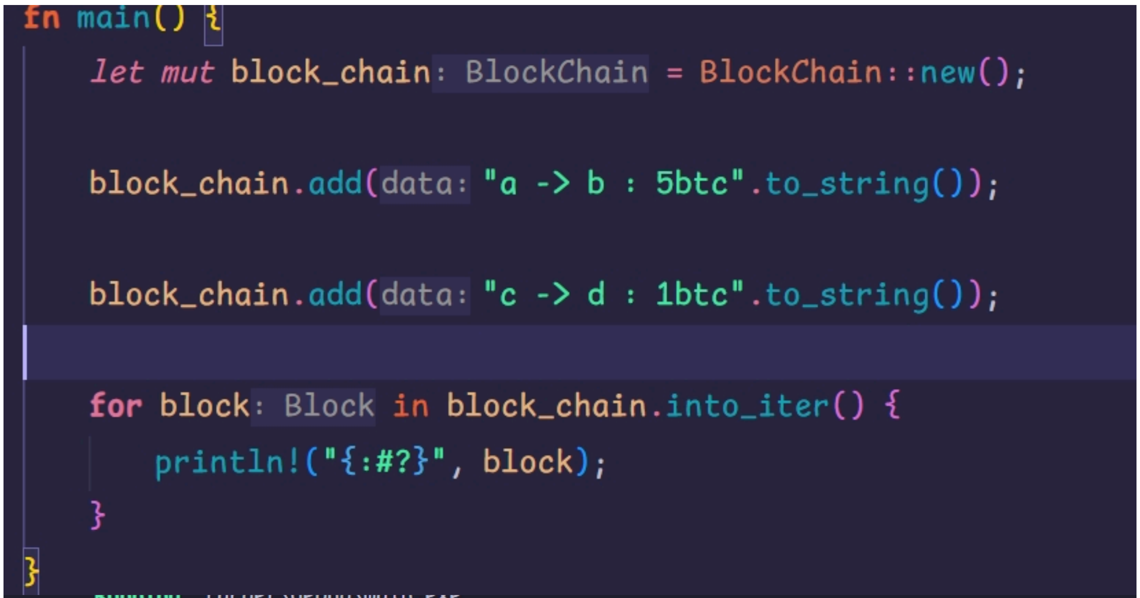


```rust
fn main() {
    let block_chain: BlockChain = BlockChain::new();

    for block: Block in block_chain.into_iter() {
        println!("{:#?}", block);
    }
}
```

```
Block {
    header: BlockHeader {
        time: 1741446623,
        tx_hash: "919c913797a6832bc8176dddb9b33abb2e244bcf1eea2bb81b8e5ad939ed2ce9",
        pre_hash: "",
    },
    hash: "000034b06237957b6d49a81afbcee88792b5e6a08261fc4f0d17deccd4dafd19",
    data: "This is genesis block",
    nonce: 9829,
}
```

- 添加数据，同时打印整个区块链

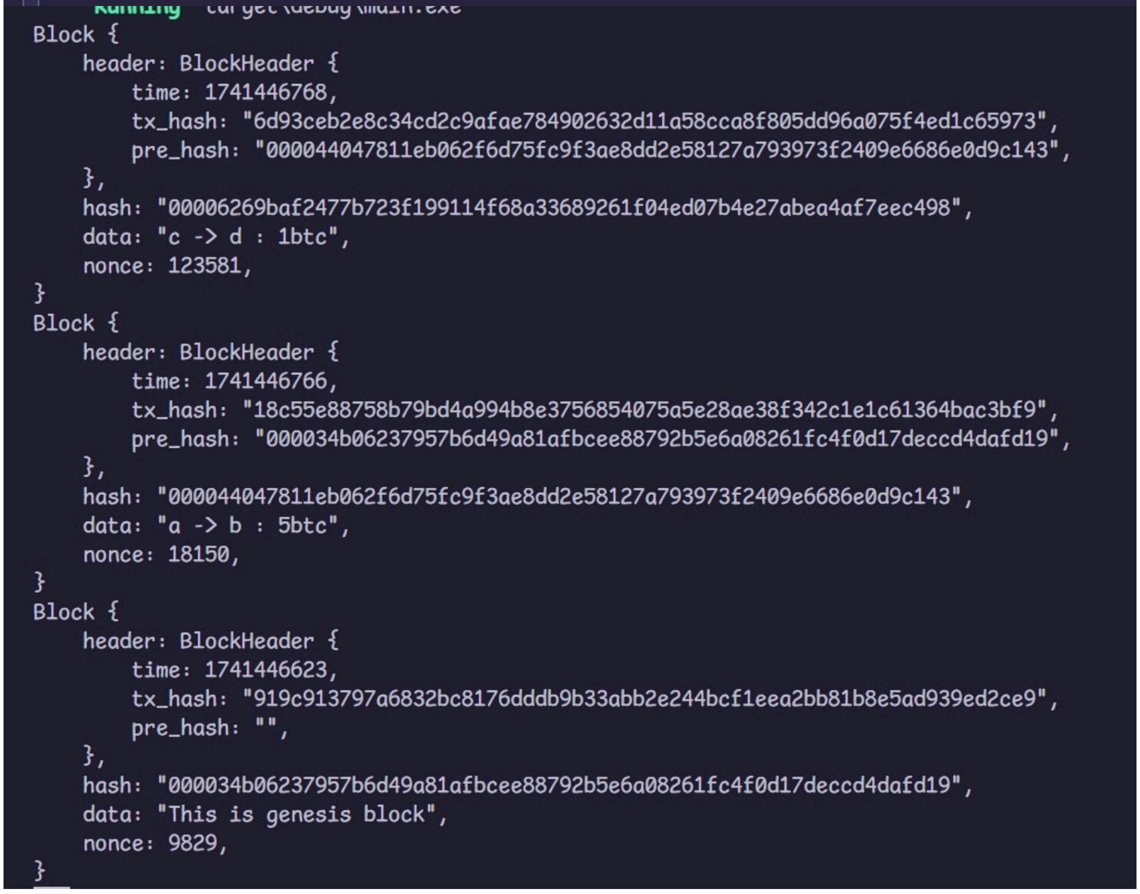


```rust
fn main() {
    let mut block_chain: BlockChain = BlockChain::new();

    block_chain.add(data: "a -> b : 5btc".to_string());

    block_chain.add(data: "c -> d : 1btc".to_string());

    for block: Block in block_chain.into_iter() {
        println!("{:#?}", block);
    }
}
```



```
Block {
    header: BlockHeader {
        time: 1741446768,
        tx_hash: "6d93ceb2e8c34cd2c9afae784902632d11a58cca8f805dd96a075f4ed1c65973",
        pre_hash: "000044047811eb062f6d75fc9f3ae8dd2e58127a793973f2409e6686e0d9c143",
    },
    hash: "00006269baf2477b723f199114f68a33689261f04ed07b4e27abea4af7eec498",
    data: "c -> d : 1btc",
    nonce: 123581,
}
Block {
    header: BlockHeader {
        time: 1741446766,
        tx_hash: "18c55e88758b79bd4a994b8e3756854075a5e28ae38f342c1e1c61364bac3bf9",
        pre_hash: "000034b06237957b6d49a81afbcee88792b5e6a08261fc4f0d17deccd4dafd19",
    },
    hash: "000044047811eb062f6d75fc9f3ae8dd2e58127a793973f2409e6686e0d9c143",
    data: "a -> b : 5btc",
    nonce: 18150,
}
Block {
    header: BlockHeader {
        time: 1741446623,
        tx_hash: "919c913797a6832bc8176dddb9b33abb2e244bcf1eea2bb81b8e5ad939ed2ce9",
        pre_hash: "",
    },
    hash: "000034b06237957b6d49a81afbcee88792b5e6a08261fc4f0d17deccd4dafd19",
    data: "This is genesis block",
    nonce: 9829,
}
```

这里可以清晰的看出，创世区块并没有发生变化，两次运行输出的创世区块是相同的，并且都完成了工作量证明，生成的hash的前16位都是0.并且有效的数字也都存在了区块的nonce字段中。

完成的工作

- 区块的定义与生成，创世区块的生成
- 区块链的定义与生成，创世区块的添加
- 区块链的持久化
- 区块链的工作量证明，基本原理就是找到一个数字，这个数字可以拼接整个区块内容并hash，得到的hash值前多少位为0