

## 1. Screenshots

### (1) Deposit and withdraw

```
Windows PowerShell
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:3

Enter account number: 6
Account number: 6
Name on account: test_ac
Balance: 200.000000
Account opened date: 2019-11-14 08:12:14

Enter deposit amount: 100

New balance: 300.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:4

Enter account number: 6
Account number: 6
Name on account: test_ac
Balance: 300.000000
Account opened date: 2019-11-14 08:12:14
Enter withdrawal amount: 400
lack of balance!

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
25 Enter your choice:4
11/14 Enter account number: 6
Account number: 6
Name on account: test_ac
Balance: 300.000000
Account opened date: 2019-11-14 08:12:14
Enter withdrawal amount: 150

New balance: 150.000000
```

### (2) Transfer

```

Windows PowerShell
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 150.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 5
Enter transfer amount: 50
Are you sure? (1 is Yes/0 is No): 1
Transfer completed.

New balance: 100.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 100.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 5
Enter transfer amount: 50
Are you sure? (1 is Yes/0 is No): 0
Transfer cancel.

New balance: 100.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:0

Goodbye
PS F:\0Deliverable\20191111\21\银行系统\part2> _

```

```

def withdraw(self):
    no = int(input("Enter account number: "))
    self.__accountDao.begin()
    acc = self.__accountDao.find_by_id_lock(no)
    if acc is not None:
        self.display_account(acc)
        wit = int(input("Enter withdrawal amount: "))
        if wit > acc.get_balance():
            print("lack of balance!")
            self.__accountDao.rollback()
        else:
            self.__accountDao.reduce_balance(no, wit)
            self.__accountDao.commit()
            acc = self.__accountDao.find_by_id(no)
            if acc is not None:
                print("\nNew balance: %f" % acc.get_balance())
            else:
                print("\nFailed to withdraw")
    else:
        print("There is no account with account_no %d" % no)
        self.__accountDao.rollback()
    return

```

query and update operations are both in a same transaction.

## 2. Atomicity

```
Windows PowerShell
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 300.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 5
Enter transfer amount: 50
Traceback (most recent call last):
  File ".\application.py", line 158, in <module>
    app.run()
  File ".\application.py", line 149, in run
    self.transfer()
  File ".\application.py", line 108, in transfer
    time.sleep(10)
KeyboardInterrupt
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:2

Enter account number: 6
---Checking account balance---
Account number: 6
Name on account: test_ac
Balance: 300.000000
Account opened date: 2019-11-14 08:12:14
-----

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:0

Goodbye
PS F:\0Deliverable\20191111\21\银行系统\part2> _
```

## 3. Consistency

```
Windows PowerShell
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:2

Enter account number: 5
---Checking account balance---
Account number: 5
Name on account: acc2
Balance: 200.000000
Account opened date: 2019-11-14 08:03:07
-----

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 250.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 5
Enter transfer amount: 50
Are you sure? (1 is Yes/0 is No): 1
Transfer completed.

New balance: 200.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:2

Enter account number: 5
---Checking account balance---
Account number: 5
Name on account: acc2
Balance: 250.000000
Account opened date: 2019-11-14 08:03:07
-----
```

Your balance and target balance have both changed.

#### 4. Isolation

```
Windows PowerShell
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 190.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 1
Enter transfer amount: 20
Are you sure? (1 is Yes/0 is No): 1
Transfer completed.

New balance: 160.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:

Windows PowerShell
PS F:\0Deliverable\20191111\21\银行系统\part2> python .\application.py
Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:5

Enter your account number: 6
Account number: 6
Name on account: test_ac
Balance: 190.000000
Account opened date: 2019-11-14 08:12:14
Enter target account number: 5
Enter transfer amount: 10
Are you sure? (1 is Yes/0 is No): 1
Transfer completed.

New balance: 180.000000

Main Menu
1 - Create Account
2 - Check Balance
3 - Deposit
4 - Withdraw
5 - Transfer
0 - Quit
Enter your choice:.
```

Row lock: The small window is waiting for the big one releasing the lock.