

Project 11
CECS277 Fall 2021
Due Monday December 6th 11:59 pm
Submit project11.zip folder before the deadline

Please make sure to follow the naming convention for your project. If your project does not run because of the naming issues, you won't receive any credit.

Project11.zip should include **project11 Package** and **project11.jar**

Project11 package will include:

- **Account.java**
- **AccountState.java**
- **RestrictedAccountState.java**
- **GoldAccountState.java**
- **NormalAccountState.java**
- **AccountStateDesignDemo.java** → has the client code (main method goes in here)

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[Academic Information and Regulations-Cheating and Plagiarism](#)

Project Description:

We are going to design our banking system to explore **State design pattern**.

Assume that we want to develop a banking system with these three kinds of different accounts.

Here are the scenarios

- If the balance in the account is greater than 0 and less than \$20000 the status of the account is normal(**NormalAccountState**). At this time, users can either deposit to the account or withdraw money from the account. There is no interest gain for this account.
- If the balance in the account is less than or equal to 0. Then the status of the account is Restricted(**RestrictedAccountState**). At this time, users can deposit but it can't withdraw money from the account. No interest for this account.
- If the balance in the account is equal or greater than \$20000.00. Then the status of the account is (**GoldAccountState**). At this time, the user can deposit into the account and can withdraw money from the account. The interest will be calculated.
- According to different balances, the above three states can be converted to each other.

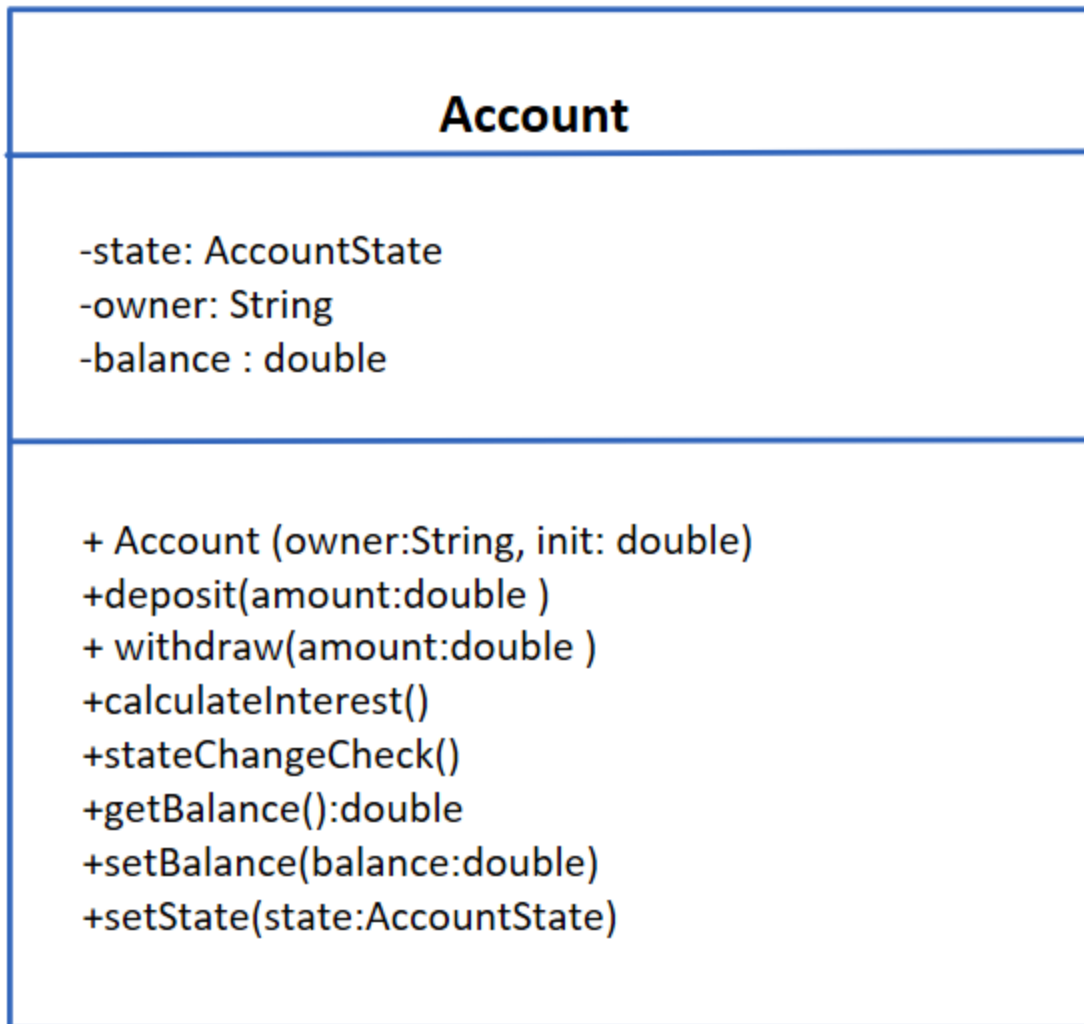
In these three states, **NormalAccountState**, **RestrictedAccountState**, and **GoldAccountState** account, objects have different behaviors.

Method **deposit()** is used to deposit, **withdraw()** is used to withdraw money, **calculateInterest()** is used to calculate interest, **stateChangeCheck()** is used to determine whether to make a deposit or withdrawal operation according to the balance after each deposit and withdrawal operation

The same method may have different implementations in different states.

Account.java

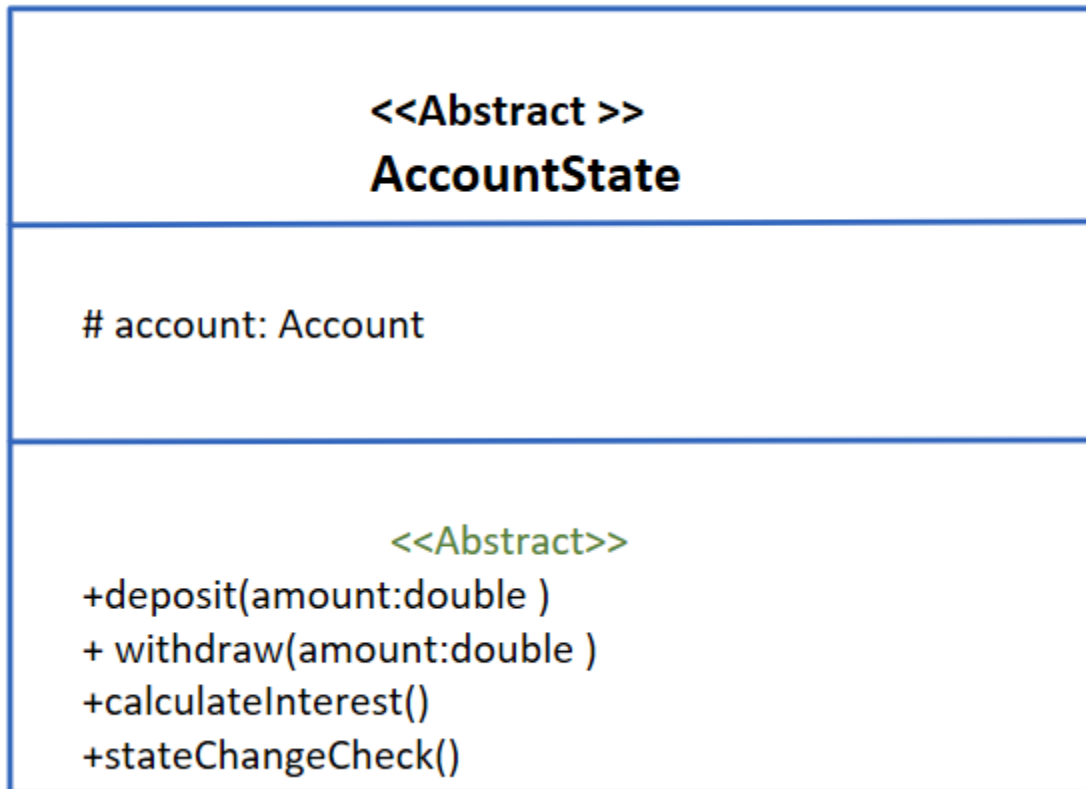
The account class combines an AccountState class, which is used to identify the status of the current account. At the same time, when an operation request is made to an account, the corresponding operation and permission restrictions are different according to different account states. The implementation principle of making different operations according to different states is polymorphism.



AccountState.java

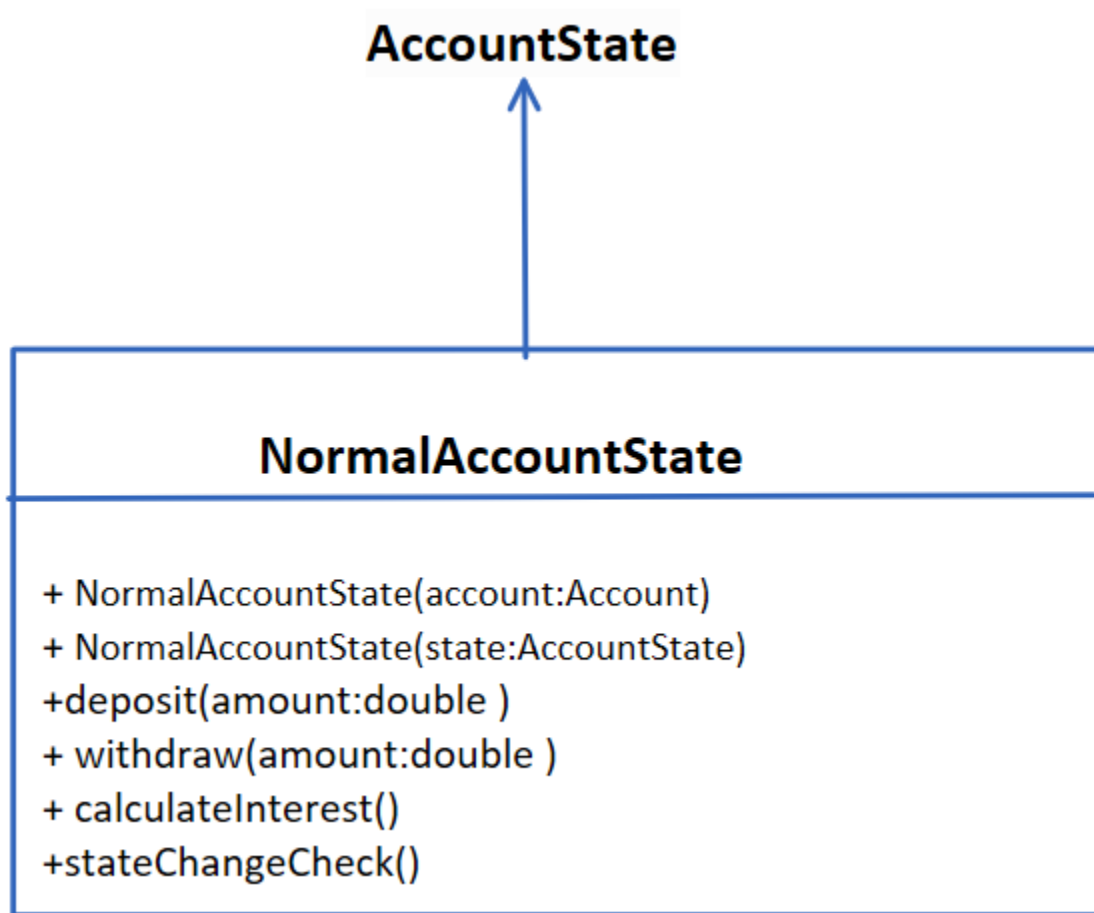
abstract class of account status

In order to make the system more flexible and extensible, and encapsulate the common behavior in each state, we need to abstract the state and introduce the role of abstract state class.



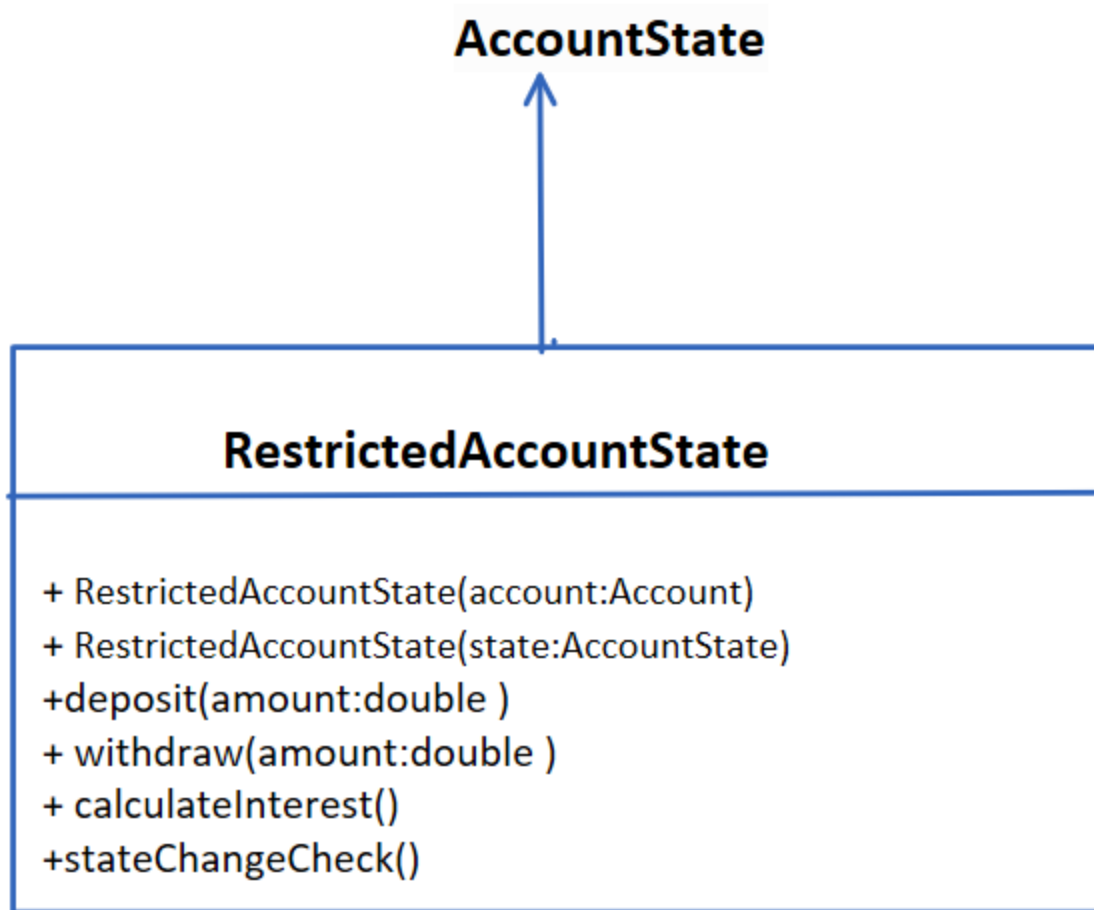
NormalAccountState.java

If the balance in the account is greater than 0 and less than \$20000 the status of the account is normal(NormalAccountState).



RestrictedAccountState.java

If the balance in the account is less than or equal to 0. Then the status of the account is Restricted(RestrictedAccountState). At this time, users can deposit but it can't withdraw money from the account. No interest for this account.



GoldAccountState.java

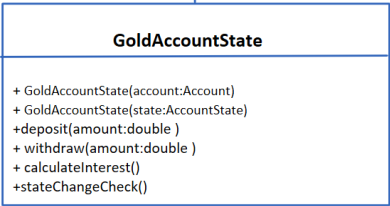
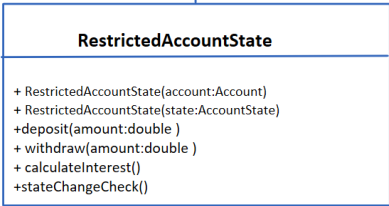
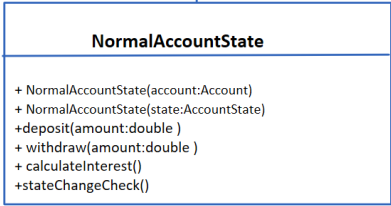
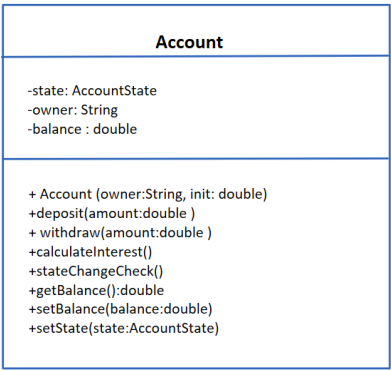
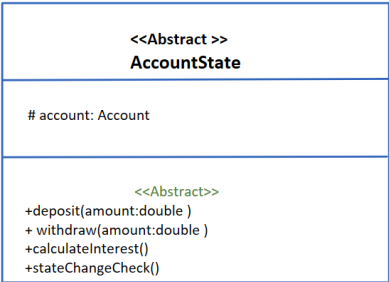
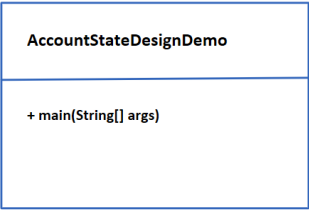
If the balance in the account is equal or greater than to \$20000.00. Then the status of the account is (GoldAccountState). At this time, the user can deposit into the account and can withdraw money from the account. The interest will be calculated by day. To calculate the interest, use hard coded value of 0.01 over one year. The display value in the sample output is the monthly interest.

AccountState



GoldAccountState

```
+ GoldAccountState(account:Account)
+ GoldAccountState(state:AccountState)
+deposit(amount:double )
+ withdraw(amount:double )
+ calculateInterest()
+stateChangeCheck()
```



Sample Output:

```
Tom zank: Open an account with an initial amount of 0.0
```

```
-----  
Tom zank deposited $ 3000.0
```

```
Now the balance is:$3000.00
```

```
The account status is now: NormalAccountState
```

```
-----  
Tom zank deposited $ 2000.0
```

```
Now the balance is:$5000.00
```

```
The account status is now: NormalAccountState
```

```
-----  
Tom zank deposited $ 5000.0
```

```
Now the balance is:$10000.00
```

```
The account status is now: NormalAccountState
```

```
-----  
Normal state, no interest applies!
```

```
Tom zank withdraw money :$10000.0
```

```
Limited operation!
```

```
Now the balance is:$0.00
```

```
The account status is now:RestrictedAccountState
```

```
-----  
Tom zank withdraw money :$1100.0
```

```
Account limit, withdrawal failed
```

```
Now the balance is:$0.00
```

```
The account status is now:RestrictedAccountState
```

```
-----  
Tom zank withdraw money :$1100.0
```

```
Account limit, withdrawal failed
```

```
Now the balance is:$0.00
```

```
The account status is now:RestrictedAccountState
```

```
-----  
Tom zank deposited $ 20000.0
```

```
Now the balance is:$20000.00
```

```
The account status is now: GoldAccountState
```

```
-----  
Gold Account, interest amount will be applied!
```

```
interest amount: $16.67
```

```
balance after interest: $20016.67
```

```
Tom zank deposited $ 1500.0
```

```
Now the balance is:$21516.67
```

```
The account status is now: GoldAccountState
```

```
-----
```