VALIDATION REPORT

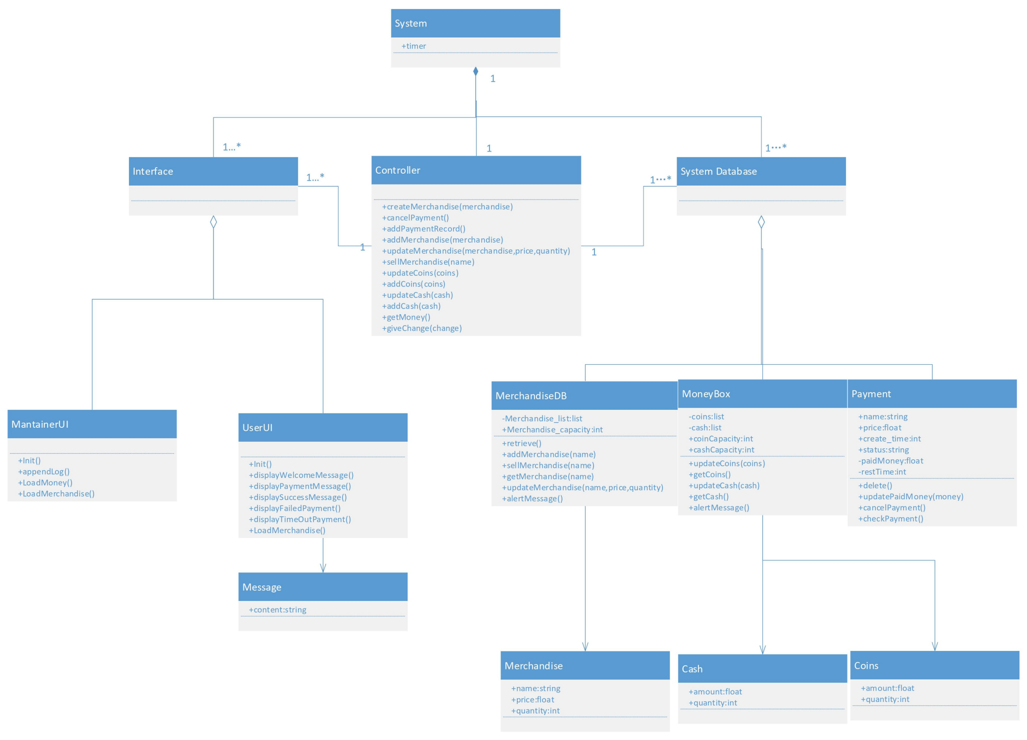
Vending

Author: Group 29 Yang Fuyi

Table of Contents

System Architecture

The system architecture is shown below:



T1: Unit Test

T1.1: Merchandise Unit Test

T1.1.1 Test obj=Merchandise(name, price, quantity)

```
function obj=Merchandise(name, price, quantity)
    obj.name = name;
    obj.price = price;
    obj.quantity = quantity;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.1.1
Coverage Item	Tcover1.1.1
Input	['coke',3,20]
State	Mer = Merchandise('coke',3,20)
Expected Output	testCase.Mer.name =='coke' testCase.Mer.price ==3 testCase.Mer.quantity ==20

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.2: MerchandiseDB Unit Test

T1.2.1 Test obj=MerchandiseDB()

```
function obj=MerchandiseDB()
  obj.merchandiseList = [Merchandise('Coke', 3.5, 10)         Merchandise('Fanta', 3, 10) Merchandise('Sprite', 3,
10)      Merchandise('WangMilk', 5.5, 0)];
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.2.1
Coverage Item	Tcover1.2.1
Input	------

State	testCase.MDB = MerchandiseDB;
	list = retrieve(testCase.MDB);

Expected Output	list(1).name == 'Coke' list(2).name == 'Fanta' list(3).name == 'Spirit' list(4).name == 'WangMilk' list(1).price == 3.5 list(2).price == 3 list(3).price == 3 list(4).price == 5.5 list(1).quantity == 10 list(2).quantity == 10 list(3).quantity == 10 list(4).quantity == 0

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.2.2 Test_addMerchandise()

```
function addMerchandise(obj, name)
    merchandise = Merchandise(name, 5, 0);
    obj.merchandiseList(end+1) = merchandise;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.2.2
Coverage Item	Tcover1.2.2
Input	'tea'

State	testCase.MDB = MerchandiseDB;
	testCase.MDB.addMerchandise('tea');
	list = retrieve(testCase.MDB);

Expected Output	testCase.verifyEqual(list(5).name , 'tea')== true;
	testCase.verifyEqual(list(5).price , 5== true);
	testCase.verifyEqual(list(5).quantity , 0)== true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.2.3 Test_updateMerchandise()

```
function updateMerchandise(obj, name, price, quantity)
    for i=1:length(obj.merchandiseList)
        if strcmp(name, obj.merchandiseList(i).name)
            obj.merchandiseList(i).price = price;
            obj.merchandiseList(i).quantity = quantity;
            break;
        end
    end
end
```

- Coverage Criteria: Branch Coverage
- Test case

	Test Case T1.2.3.1	**Test Case T1.2.3.1**
Coverage Item	Tcover1.2.3.1	Test Case T1.2.3.1
Input	('Coke',8,20);	('Tea',8,20);

State	testCase.MDB = MerchandiseDB;
	testCase.MDB.updateMerchandise('Coke',8,20);
	list = retrieve(testCase.MDB);
		testCase.MDB = MerchandiseDB;
		testCase.MDB.updateMerchandise('Tea',8,20);
		list = retrieve(testCase.MDB);

Expected Output	testCase.verifyEqual(list(1).price , 8)== true testCase.verifyEqual(list(1).quantity , 20)== true	No output

- Test coverage: 2/2=100%

- Test Result: 2 passed

T1.2.4 Test_sellMerchandise()

```
function sellMerchandise(obj, name)
    for i=1:length(obj.merchandiseList)
        if strcmp(name, obj.merchandiseList(i).name) && obj.merchandiseList(i).quantity > 0
            obj.merchandiseList(i).quantity = obj.merchandiseList(i).quantity - 1;
            break;
        end
    end
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.2.4
Coverage Item	Tcover1.2.4
Input	'Coke';

State	testCase.MDB = MerchandiseDB;
	testCase.MDB.sellMerchandise('Coke');
	list = retrieve(testCase.MDB);

Expected Output	testCase.verifyEqual(list(1).quantity, 9) == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.2.5 Test_getMerchandise()

```
function merchandise=getMerchandise(obj, name)
    merchandise = [];
    for i=1:length(obj.merchandiseList)
        if strcmp(name, obj.merchandiseList(i).name)
            merchandise = obj.merchandiseList(i);
            break;
        end
    end
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.2.5
Coverage Item	Tcover1.2.5
Input	'Coke';

State	testCase.MDB = MerchandiseDB;
	merchandise=testCase.MDB.getMerchandise('Coke');
	list = retrieve(testCase.MDB);

Expected Output	testCase.verifyEqual(list(1), merchandise)== true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.2.6 Test_alertMessage()

```
function merchandise=getMerchandise(obj, name)
    merchandise = [];
    for i=1:length(obj.merchandiseList)
        if strcmp(name, obj.merchandiseList(i).name)
            merchandise = obj.merchandiseList(i);
            break;
        end
    end
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.2.6
Coverage Item	Tcover1.2.6
Input	'Coke';

State	testCase.MDB = MerchandiseDB;
	testCase.MDB.updateMerchandise('Coke',8,0);
	testCase.MDB.updateMerchandise('WangMilk',8,3);
	msg = alertMessage(testCase.MDB);

Expected Output	testCase.verifyEqual(msg, '(+)Nearly out of WangMilk!(++)Out of Coke!') == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.3: MoneyBox Unit Test

T1.3.1 Test_struct()

```
properties(Access = private)
    coins = [50 50]; % [￥0.5, ￥1]
    cash = [30 30 30 0]; % [￥1, ￥5, ￥10, ￥20]
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.3.1
Coverage Item	Tcover1.3.1
Input	None
State	testCase.MB = MoneyBox;

Expected Output	testCase.verifyEqual(testCase.MB.getCoins , [50 50]) == true;
	testCase.verifyEqual(testCase.MB.getCash , [30 30 30 0]) == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.3.2 Test_updateCoins()

```
function updateCoins(obj, coins)
    obj.coins = coins;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.3.2
Coverage Item	Tcover1.3.2
Input	[40 40]
State	testCase.MB = MoneyBox;
Expected Output	testCase.verifyEqual(testCase.MB.getCoins , [40 40]) == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.3.3 Test_updateCash()

```
function coins=getCoins(obj)
    coins = obj.coins;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.3.3
Coverage Item	Tcover1.3.3
Input	[20 31 25 0]
State	testCase.MB = MoneyBox;
Expected Output	testCase.verifyEqual(testCase.MB.getCash , [20 31 25 0])== true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.3.4 Test_alertMessage()

```
function msg=alertMessage(obj)
    msg = '';
    if obj.coins(1)/obj.coinCapacity >= 0.8
        msg = [msg '(-)￥0.5 Coin nearly FULL!'];
    end
    if obj.coins(1)/obj.coinCapacity < 0.2
        msg = [msg '(+)Nearly out of ￥0.5 Coin!'];
    end
    if obj.coins(2)/obj.coinCapacity >= 0.8
        msg = [msg '(-)￥1 Coin nearly FULL!'];
    end
    if obj.coins(2)/obj.coinCapacity < 0.15
        msg = [msg '(+)Nearly out of￥1 Coin!'];
    end
    if obj.cash(1)/obj.cashCapacity >= 0.8
        msg = [msg '(-)￥1 Cash nearly FULL!'];
    end
    if obj.cash(1)/obj.cashCapacity < 0.15
        msg = [msg '(+)Nearly out of ￥1 Cash!'];
    end
    if obj.cash(2)/obj.cashCapacity >= 0.8
        msg = [msg '(-)￥5 Cash nearly FULL!'];
    end
    if obj.cash(2)/obj.cashCapacity < 0.1
        msg = [msg '(+)Nearly out of ￥5 Cash!'];
    end
    if obj.cash(3)/obj.cashCapacity >= 0.8
        msg = [msg '(-)￥10 Cash nearly FULL!'];
    end
    if obj.cash(3)/obj.cashCapacity < 0.1
        msg = [msg '(+)Nearly out of ￥10 Cash!'];
    end
    if obj.cash(4)/obj.cashCapacity >= 0.8
        msg = [msg '(-)￥20 Cash nearly FULL!'];
    end
end
```

- Coverage Criteria: Branch Coverage
- Test case

	Test Case T1.3.4.1	**Test Case T1.3.4.2**
Coverage Item	Tcover1.3.4.1	Tcover1.3.4.2
Input	testCase.MB.updateCoins([79 1])	testCase.MB.updateCash([60 55 5 0])
State	testCase.MB = MoneyBox;	testCase.MB = MoneyBox;
Expected Output	testCase.verifyEqual(msg , '(-)¥0.5 Coin nearly FULL!(+)Nearly out off ¥1 Coin!')== true;	testCase.verifyEqual(msg , '(-)¥1 Cash nearly FULL!(-)¥5 Cash nearly FULL!(+)Nearly out of ï¿¥10 Cash!') == true);

- Test coverage: 7/8=87.5%
- Test Result: 2 passed

T1.4: Payment Unit Test

T1.4.1 Test_struct()

```
function obj = Payment(controller)
    obj.controller = controller;
    obj.status = 'Created';
    obj.paidMoney = 0;
    obj.createdTime = datestr(now,'YYYY-mm-dd HH:MM:SS');
    obj.restTime = 30;
    obj.timer = timer;
    obj.timer.TimerFcn=@obj.checkPayment;
    obj.timer.ExecutionMode='fixedRate';
    obj.timer.Period=1;
    start(obj.timer);
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.4.1
Coverage Item	Tcover1.4.1
Input	None

State	testCase.ctrl = VenderController;
	testCase.pm = Payment(testCase.ctrl);
	testCase.pm.price = 3;

Expected Output	testCase.verifyEqual(testCase.pm.status , 'Created') == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5 VenderController Unit Test

T1.5.1 Test_createPayment()

```
function createPayment(ctrl, merchandise)
    ctrl.payment = Payment(ctrl);
    ctrl.payment.name = merchandise.name;
    ctrl.payment.price = merchandise.price;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.1
Coverage Item	Tcover1.1.1, 1.4.1, 1.5.1
Input	'Tea', 5, 10

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	mer = Merchandise('Tea', 5, 10);
	testCase.ctrl.createPayment(mer);

Expected Output	testCase.verifyEqual(testCase.ctrl.payment.name , 'Tea'); == true;
	testCase.verifyEqual(testCase.ctrl.payment.price , 5) == true;
	testCase.verifyEqual(testCase.ctrl.payment.status , 'Created') == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.2 Test_cancelPayment()

```
function cancelPayment(ctrl)
    if isempty(ctrl.payment)
        return;
    end
    if strcmp(ctrl.payment.status, 'Created')
        ctrl.payment.cancelPayment;
    end
end
```

- Coverage Criteria: Branch Coverage
- Test case

	Test Case T1.5.2.1	**Test Case T1.5.2.2**
Coverage Item	Tcover1.1.1, 1.5.1, 1.5.2.1	Tcover1.1.1, 1.5.1, 1.5.2.2
Input	None	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.cancelPayment;
		testCase.ctrl = VenderController;
		testCase.mb=MoneyBox;
		testCase.mdb=MerchandiseDB;
		testCase.uapp=UserUI;
		testCase.mapp=MaintainerUI;
		testCase.ctrl.userApp=testCase.uapp;
		testCase.ctrl.maintainerApp=testCase.mapp;
		testCase.ctrl.moneyBox=testCase.mb;
		testCase.ctrl.merchandiseDB=testCase.mdb;
		testCase.mb.controller=testCase.ctrl;
		testCase.mdb.controller=testCase.ctrl;
		testCase.uapp.Controller=testCase.ctrl;
		testCase.mapp.Controller=testCase.ctrl;
		mer = Merchandise('Tea', 5, 10);
		testCase.ctrl.createPayment(mer);
		testCase.ctrl.cancelPayment;

Expected Output	Return	None

- Test coverage: 2/2=100%
- Test Result: 1 passed

T1.5.3 Test_addPaymentRecord()

```
function addPaymentRecord(ctrl)
    date = ctrl.payment.createdTime;
    merchandise = ctrl.payment.name;
    price = sprintf('%.1f',ctrl.payment.price);
    status = ctrl.payment.status;
    tempdata = ctrl.maintainerApp.OrderRecordTable.Data;
    tempdata = [{date, merchandise, price, status}; tempdata];
    ctrl.maintainerApp.OrderRecordTable.Data = tempdata;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.3
Coverage Item	Tcover1.1.1, 1.4.1, 1.5.1,1.5.3
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	mer = Merchandise('Tea', 5, 10);
	testCase.ctrl.createPayment(mer);

Expected Output	'YYYY-mm-dd HH:MM:SS' testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(2), {'Tea'}) == true; testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(3), {'5.0'}) == true testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(4), {'Created'}) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.4 Test_addMerchandise()

```
function addMerchandise(ctrl, merchandise)
    if isempty(merchandise)
        return;
    end
    ctrl.merchandiseDB.addMerchandise(merchandise);
    ctrl.userApp.LoadMerchandise;
    ctrl.maintainerApp.LoadMerchandise;
end
```

- Coverage Criteria: Branch Coverage
- Test case

	Test Case T1.5.4.1	**Test Case T1.5.4.2**
Coverage Item	Tcover1.1.1, 1.2.2, 1.4.1, 1.5.1, 1.5.4.1	Tcover1.1.1, 1.2.2, 1.4.1, 1.5.1, 1.5.4.2
Input	''(can't found merchandise)	'Tea'

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	mer = '';
	testCase.ctrl.addMerchandise(mer);
		testCase.ctrl = VenderController;
		testCase.mb=MoneyBox;
		testCase.mdb=MerchandiseDB;
		testCase.uapp=UserUI;
		testCase.mapp=MaintainerUI;
		testCase.ctrl.userApp=testCase.uapp;
		testCase.ctrl.maintainerApp=testCase.mapp;
		testCase.ctrl.moneyBox=testCase.mb;
		testCase.ctrl.merchandiseDB=testCase.mdb;
		testCase.mb.controller=testCase.ctrl;
		testCase.mdb.controller=testCase.ctrl;
		testCase.uapp.Controller=testCase.ctrl;
		testCase.mapp.Controller=testCase.ctrl;
		mer = 'Tea';
		testCase.ctrl.addMerchandise(mer);
		list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	Return	testCase.verifyEqual(list(5).name,'Tea') == true

- Test coverage: 2/2=100%
- Test Result: 1 passed

T1.5.5 Test_updateMerchandise()

```
function updateMerchandise(ctrl, merchandise, price, quantity)
    ctrl.merchandiseDB.updateMerchandise(merchandise, price, quantity);
    ctrl.userApp.LoadMerchandise;
    ctrl.maintainerApp.LoadMerchandise;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.5
Coverage Item	Tcover1.1.1, 1.2.2, 1.2.3, 1.4.1, 1.5.1, 1.5.5
Input	'Tea' (mer,15,10)

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	mer = 'Tea';
	testCase.ctrl.addMerchandise(mer);
	testCase.ctrl.updateMerchandise(mer, 15, 10);
	list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	testCase.verifyEqual(list(5).name,'Tea')== true; testCase.verifyEqual(list(5).price,15)== true testCase.verifyEqual(list(5).quantity,10) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.6 Test_sellMerchandise()

```
function sellMerchandise(ctrl, merchandise)
    ctrl.merchandiseDB.sellMerchandise(merchandise);
    ctrl.userApp.LoadMerchandise;
    ctrl.maintainerApp.LoadMerchandise;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.6
Coverage Item	Tcover1.1.1, 1.2.2, 1.2.3, 1.2.4, 1.4.1, 1.5.1, 1.5.6
Input	'Tea'

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	mer = 'Tea';
	testCase.ctrl.addMerchandise(mer);
	testCase.ctrl.updateMerchandise(mer, 15, 10);
	testCase.ctrl.sellMerchandise(mer);
	list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	testCase.verifyEqual(list(5).name,'Tea')== true; testCase.verifyEqual(list(5).price,15)== true testCase.verifyEqual(list(5).quantity,10) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.7 Test_updateCoins()

```
function updateCoins(ctrl, coins)
    ctrl.moneyBox.updateCoins(coins);
    ctrl.maintainerApp.LoadMoney;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.7
Coverage Item	Tcover1.1.1, 1.3.2, 1.5.1, 1.5.7
Input	[10 30]

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.updateCoins([10 30]);

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[10 30]) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.8 Test_addCoins()

```
function res=addCoins(ctrl, coins)
    tempcoins = ctrl.moneyBox.getCoins;
    tempcoins = tempcoins + coins;
    for i=1:length(tempcoins)
        if tempcoins(i) > ctrl.moneyBox.coinCapacity
            res = 0;
            return;
        end
    end
    res = 1;
    ctrl.updateCoins(tempcoins);
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.8
Coverage Item	Tcover1.1.1, 1.3.2, 1.5.1, 1.5.7, 1.5.8
Input	[0 10]

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.addCoins([0 10]);

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[50 60]) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.9 Test_updateCash()

```
function updateCash(ctrl, cash)
    ctrl.moneyBox.updateCash(cash);
    ctrl.maintainerApp.LoadMoney;
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.9
Coverage Item	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.9
Input	[10 30 20 0]

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.updateCash([10 30 20 0])

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[10 30 20 0]) == true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.10 Test_addCash()

```
function res=addCash(ctrl, cash)
    tempcash = ctrl.moneyBox.getCash;
    tempcash = tempcash + cash;
    for i=1:length(tempcash)
        if tempcash(i) > ctrl.moneyBox.cashCapacity
            res = 0;
            return;
        end
    end
    res = 1;
    ctrl.updateCash(tempcash);
end
```

- Coverage Criteria: Statement Coverage
- Test case

	Test Case T1.5.10
Coverage Item	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.9, 1.5.10
Input	[10 10 5 5]

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.updateCash([10 30 20 0]);

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[10 30 20 0]) == true

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.5.11 Test_giveChange()

```
function changeMoney=giveChange(ctrl, change)
    tempMoney = ctrl.getMoney;
    tempCoins = tempMoney(1:2);
    tempCash = tempMoney(3:6);
    while change >= 10 && tempCash(3) > 0
        change = change - 10;
        tempCash(3) = tempCash(3) - 1;
    end
    while change >= 5 && tempCash(2) > 0
        change = change - 5;
        tempCash(2) = tempCash(2) - 1;
    end
    while tempCoins(2) >= tempCash(1) && change >= 1 && tempCoins(2) > 0
        change = change - 1;
        tempCoins(2) = tempCoins(2) - 1;
    end
    while change >= 1 && tempCash(1) > 0
        change = change - 1;
        tempCash(1) = tempCash(1) - 1;
    end
    while change >= 0.5 && tempCoins(1) > 0
        change = change - 0.5;
        tempCoins(1) = tempCoins(1) - 1;
    end
    changeMoney = tempMoney - [tempCoins tempCash];
    if change > 0
        changeMoney = [];
    else
        ctrl.moneyBox.updateCoins(tempCoins);
        ctrl.moneyBox.updateCash(tempCash);
        ctrl.maintainerApp.LoadMoney;
    end
end
```

- Coverage Criteria:Branch Coverage
- Test case

	Test Case T1.5.11.1	Test Case T1.5.11.2	Test Case T1.5.11.3	Test Case T1.5.11.4	Test Case T1.5.11.5
Coverage Item	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.7 ,1.5.8, 1.5.9, 1.5.10, 1.5.11.1	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.7 ,1.5.8, 1.5.9, 1.5.10, 1.5.11.2	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.7 ,1.5.8, 1.5.9, 1.5.10, 1.5.11.3	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.7 ,1.5.8, 1.5.9, 1.5.10, 1.5.11.4	Tcover1.1.1, 1.3.3, 1.5.1, 1.5.7 ,1 1.5.10, 1.5.11.5
Input	2	7.5	18.5	12.5	15

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	changeMoney = testCase.ctrl.giveChange(2);
		testCase.ctrl = VenderController;
		testCase.mb=MoneyBox;
		testCase.mdb=MerchandiseDB;
		testCase.uapp=UserUI;
		testCase.mapp=MaintainerUI;
		testCase.ctrl.userApp=testCase.uapp;
		testCase.ctrl.maintainerApp=testCase.mapp;
		testCase.ctrl.moneyBox=testCase.mb;
		testCase.ctrl.merchandiseDB=testCase.mdb;
		testCase.mb.controller=testCase.ctrl;
		testCase.mdb.controller=testCase.ctrl;
		testCase.uapp.Controller=testCase.ctrl;
		testCase.mapp.Controller=testCase.ctrl;
		changeMoney =
		testCase.ctrl.giveChange(7.5);
			testCase.ctrl = VenderController;
			testCase.mb=MoneyBox;
			testCase.mdb=MerchandiseDB;
			testCase.uapp=UserUI;
			testCase.mapp=MaintainerUI;
			testCase.ctrl.userApp=testCase.uapp;
			testCase.ctrl.maintainerApp=testCase.mapp;
			testCase.ctrl.moneyBox=testCase.mb;
			testCase.ctrl.merchandiseDB=testCase.mdb;
			testCase.mb.controller=testCase.ctrl;
			testCase.mdb.controller=testCase.ctrl;
			testCase.uapp.Controller=testCase.ctrl;
			testCase.mapp.Controller=testCase.ctrl;
			changeMoney =
			testCase.ctrl.giveChange(18.5);
				testCase.ctrl = VenderController;
				testCase.mb=MoneyBox;
				testCase.mdb=MerchandiseDB;
				testCase.uapp=UserUI;
				testCase.mapp=MaintainerUI;
				testCase.ctrl.userApp=testCase.uapp;
				testCase.ctrl.maintainerApp=testCase.mapp;
				testCase.ctrl.moneyBox=testCase.mb;
				testCase.ctrl.merchandiseDB=testCase.mdb;
				testCase.mb.controller=testCase.ctrl;
				testCase.mdb.controller=testCase.ctrl;
				testCase.uapp.Controller=testCase.ctrl;
				testCase.mapp.Controller=testCase.ctrl;
				changeMoney =
				testCase.ctrl.giveChange(12.5);
					testCase.ctrl = VenderControlle
					testCase.mb=MoneyBox;
					testCase.mdb=MerchandiseDB
					testCase.uapp=UserUI;
					testCase.mapp=MaintainerUI;
					testCase.ctrl.userApp=testCase
					testCase.ctrl.maintainerApp=te
					testCase.ctrl.moneyBox=testCa
					testCase.ctrl.merchandiseDB=t
					testCase.mb.controller=testCas
					testCase.mdb.controller=testCa
					testCase.uapp.Controller=testC
					testCase.mapp.Controller=test
					changeMoney =
					testCase.ctrl.giveChange(15);

Expected Output	testCase.verifyEqual(changeMoney,[0 2 0 0 0 0])==true;	testCase.verifyEqual(changeMoney,[1 2 0 1 0 0]);	testCase.verifyEqual(changeMoney,[1 3 0 1 1 0]) == true;	testCase.verifyEqual(changeMoney,[1 2 0 0 1 0]);	testCase.verifyEqual(changeMo 0])==true

- Test coverage: 6/6=100%
- Test Result: 6 passed

T1.6 User UI Unit Test

T1.6.1 Test_MerchandiseSelectionValueChanged()

```
function MerchandiseSelectionValueChanged(app, event)
            app.Controller.cancelPayment;
            app.ConfirmButton.Enable=1;
            app.CoinSelection.Enable=0;
            app.CoinInsertButton.Enable=0;
            app.CashSelection.Enable=0;
            app.CashInsertButton.Enable=0;
            merchandise =
 app.Controller.merchandiseDB.getMerchandise(app.MerchandiseSelection.Value);
            app.MerchandiseSelection.UserData = merchandise;
            app.displayMessage(sprintf('Merchandise:%s', merchandise.name));
            app.appendMessage(sprintf('Price:￥%.1f', merchandise.price));
            app.appendMessage('---------');
            app.appendMessage('Waiting for payment...');
end
```

- Coverage Criteria:Branch Coverage
- Test case

	Test Case T1.6.1
Coverage Item	Tcover1.2.5, 1.6.1
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
	testCase.press(testCase.ctrl.userApp.ConfirmButton);

Expected Output	testCase.verifyEqual(testCase.ctrl.payment.name,'Fanta')==true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.6.2 Test_ConfirmButtonPushed()

```
function ConfirmButtonPushed(app, event)

            app.paymentMessage = '';
            name = app.MerchandiseSelection.Value;
            merchandise = app.Controller.merchandiseDB.getMerchandise(name);
            app.Controller.createPayment(merchandise);
            app.Controller.payment.updatePaidMoney(sum([0.5 1 1 5 10 20].*[app.CoinInsertButton.UserData
app.CashInsertButton.UserData]));
            app.ConfirmButton.Enable=0;
            app.CoinSelection.Enable=1;
            app.CashSelection.Enable=1;
            app.CoinInsertButton.Enable=1;
            app.CashInsertButton.Enable=1;
end
```

- Coverage Criteria:Branch Coverage
- Test case

	Test Case T1.6.2
Coverage Item	Tcover1.2.5, 1.6.1, 1.6.2
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
	testCase.press(testCase.ctrl.userApp.ConfirmButton);

Expected Output	testCase.verifyEqual(testCase.ctrl.payment.name,'Fanta')==true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.6.3 Test_CoinInsertButtonPushed()

```
function CoinInsertButtonPushed(app, event)
           app.ReturnButton.Enable=1;
           if strcmp(app.CoinSelection.Value,'Fake Coin')
               app.ReturnButton.UserData(7) = app.ReturnButton.UserData(7) + 1;
               return;
           end
           insertedCoins = zeros(1, 2);
           switch app.CoinSelection.Value
               case '0.5¥'
                   insertedCoins(1) = 1;
               case '1¥'
                   insertedCoins(2) = 1;
           end
           res = app.Controller.addCoins(insertedCoins);
           if res
               app.CoinInsertButton.UserData = app.CoinInsertButton.UserData + insertedCoins;
               app.Controller.payment.updatePaidMoney(sum([0.5 1].*insertedCoins));
           else
               app.ReturnButton.UserData(1:2) = app.ReturnButton.UserData(1:2) + insertedCoins;
               app.paymentMessage='! Money box full, please contact maintainer';
           end
end
```

- Coverage Criteria:Branch Coverage
- Test case

	Test Case T1.6.3.1	**Test Case T1.6.3.2**	**Test Case T1.6.3.3**
Coverage Item	Tcover1.2.5, 1.5.7, 1.5.8, 1.6.1, 1.6.3.1	Tcover1.2.5, 1.5.7, 1.5.8, 1.6.1, 1.6.3.2	Tcover1.2.5, 1.6.1, 1.6.3.3
Input	Insert 0.5¥	Insert 1¥	insert Fake coin

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
	testCase.press(testCase.ctrl.userApp.ConfirmButton);
	testCase.choose(testCase.ctrl.userApp.CoinSelection,'0.5¥');
	testCase.press(testCase.ctrl.userApp.CoinInsertButton);
		testCase.ctrl = VenderController;
		testCase.mb=MoneyBox;
		testCase.mdb=MerchandiseDB;
		testCase.uapp=UserUI;
		testCase.mapp=MaintainerUI;
		testCase.ctrl.userApp=testCase.uapp;
		testCase.ctrl.maintainerApp=testCase.mapp;
		testCase.ctrl.moneyBox=testCase.mb;
		testCase.ctrl.merchandiseDB=testCase.mdb;
		testCase.mb.controller=testCase.ctrl;
		testCase.mdb.controller=testCase.ctrl;
		testCase.uapp.Controller=testCase.ctrl;
		testCase.mapp.Controller=testCase.ctrl;
		testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
		testCase.press(testCase.ctrl.userApp.ConfirmButton);
		testCase.choose(testCase.ctrl.userApp.CoinSelection,'1¥');
		testCase.press(testCase.ctrl.userApp.CoinInsertButton);
			testCase.ctrl = VenderController;
			testCase.mb=MoneyBox;
			testCase.mdb=MerchandiseDB;
			testCase.uapp=UserUI;
			testCase.mapp=MaintainerUI;
			testCase.ctrl.userApp=testCase.uapp;
			testCase.ctrl.maintainerApp=testCase.mapp;
			testCase.ctrl.moneyBox=testCase.mb;
			testCase.ctrl.merchandiseDB=testCase.mdb;
			testCase.mb.controller=testCase.ctrl;
			testCase.mdb.controller=testCase.ctrl;
			testCase.uapp.Controller=testCase.ctrl;
			testCase.mapp.Controller=testCase.ctrl;
			testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
			testCase.press(testCase.ctrl.userApp.ConfirmButton);
			testCase.choose(testCase.ctrl.userApp.CoinSelection,'Fake coin');
			testCase.press(testCase.ctrl.userApp.CoinInsertButton);

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[51 50])==true;	testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[50 51])==true;	testCase.verifyEqual(testCase.ctrl.userApp.ReturnButton.UserData(7),1) == true

- Test coverage: 3/3=100%
- Test Result: 3 passed

T1.6.4 Test_CashInsertButtonPushed()

```
function CashInsertButtonPushed(app, event)
           app.ReturnButton.Enable=1;
           if strcmp(app.CashSelection.Value,'Fake Cash')
               app.ReturnButton.UserData(7) = app.ReturnButton.UserData(7) + 1;
               return;
           end
           insertedCash = zeros(1, 4);
           switch app.CashSelection.Value
               case '1¥'
                   insertedCash(1) = 1;
               case '5¥'
                   insertedCash(2) = 1;
               case '10¥'
                   insertedCash(3) = 1;
               case '20¥'
                   insertedCash(4) = 1;
           end
           res = app.Controller.addCash(insertedCash);
           if res
               app.CashInsertButton.UserData = app.CashInsertButton.UserData + insertedCash;
               app.Controller.payment.updatePaidMoney(sum([1 5 10 20].*insertedCash));
           else
               app.ReturnButton.UserData(3:6) = app.ReturnButton.UserData(3:6) + insertedCash;
               app.paymentMessage='!Money box full, please contact maintainer.';
           end
end
```

- Coverage Criteria:Branch Coverage
- Test case

	Test Case T1.6.4.1	**Test Case T1.6.4.2**	**Test Case T1.6.4.3**	**Test**
Coverage Item	Tcover1.2.5, 1.5.9, 1.5.10,1.6.1, 1.6.4.1	Tcover1.2.5, 1.5.9, 1.5.10, 1.6.1, 1.6.4.2	Tcover1.2.5, 1.5.9, 1.5.10, 1.6.1, 1.6.4.3	Tcov
Input	Insert 0.5¥	Insert 1¥		

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
	testCase.press(testCase.ctrl.userApp.ConfirmButton);
	testCase.choose(testCase.ctrl.userApp.CashSelection,'1¥');
	testCase.press(testCase.ctrl.userApp.CashInsertButton);
		testCase.ctrl = VenderController;
		testCase.mb=MoneyBox;
		testCase.mdb=MerchandiseDB;
		testCase.uapp=UserUI;
		testCase.mapp=MaintainerUI;
		testCase.ctrl.userApp=testCase.uapp;
		testCase.ctrl.maintainerApp=testCase.mapp;
		testCase.ctrl.moneyBox=testCase.mb;
		testCase.ctrl.merchandiseDB=testCase.mdb;
		testCase.mb.controller=testCase.ctrl;
		testCase.mdb.controller=testCase.ctrl;
		testCase.uapp.Controller=testCase.ctrl;
		testCase.mapp.Controller=testCase.ctrl;
		testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
		testCase.press(testCase.ctrl.userApp.ConfirmButton);
		testCase.choose(testCase.ctrl.userApp.CoinSelection,'5¥');
		testCase.press(testCase.ctrl.userApp.CoinInsertButton);
			testCase.ctrl = VenderController;
			testCase.mb=MoneyBox;
			testCase.mdb=MerchandiseDB;
			testCase.uapp=UserUI;
			testCase.mapp=MaintainerUI;
			testCase.ctrl.userApp=testCase.uapp;
			testCase.ctrl.maintainerApp=testCase.mapp;
			testCase.ctrl.moneyBox=testCase.mb;
			testCase.ctrl.merchandiseDB=testCase.mdb;
			testCase.mb.controller=testCase.ctrl;
			testCase.mdb.controller=testCase.ctrl;
			testCase.uapp.Controller=testCase.ctrl;
			testCase.mapp.Controller=testCase.ctrl;
			testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
			testCase.press(testCase.ctrl.userApp.ConfirmButton);
			testCase.choose(testCase.ctrl.userApp.CashSelection,'10¥');
			testCase.press(testCase.ctrl.userApp.CashInsertButton);
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC
				testC

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[31 30 30 0])==true;	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 31 30 0])==true;	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 29 31 0]) == true	testC true

- Test coverage: 5/5=100%
- Test Result: 6 passed

T1.6.5 Test_ReturnButtonPushed()

```
function ReturnButtonPushed(app, event)
            app.ReturnButton.Enable = 0;
            app.CoinSelection.Enable=0;
            app.CoinInsertButton.Enable=0;
            app.CashSelection.Enable=0;
            app.CashInsertButton.Enable=0;
            insertedCoins = app.CoinInsertButton.UserData;
            insertedCash = app.CashInsertButton.UserData;
            returnMoney = [insertedCoins insertedCash 0];
            returnMoney = returnMoney + app.ReturnButton.UserData;
            returnAmount=sum([0.5, 1, 1, 5, 10, 20, 0].*returnMoney);
            app.Controller.cancelPayment;
            if returnMoney(7) > 0
                app.displayMessage(sprintf('Get your %.1f￥ and %d unrecognizable money below ↓', returnAmount,
returnMoney(7)));
            else
                app.displayMessage(sprintf('Get your %.1f￥ below ↓', returnAmount));
            end
            app.appendMessage('---------');
            moneyName = {'0.5￥Coin', '1￥Coin', '1￥Cash', '5￥Cash', '10￥Cash', '20￥Cash', 'Unrecognizable'};
            for i=1:length(moneyName)
                if returnMoney(i) > 0
                    app.appendMessage(sprintf('%s*%d', moneyName{i}, returnMoney(i)));
                end
            end
            app.Controller.addCoins(-insertedCoins);
            app.Controller.addCash(-insertedCash);
            app.CoinInsertButton.UserData = zeros(1,2);
            app.CashInsertButton.UserData = zeros(1,4);
            app.ReturnButton.UserData = zeros(1,7);
            app.displayWelcomeMessage(3);
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T1.6.5
Coverage Item	Tcover1.2.5, 1.6.1, 1.6.5
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
	testCase.press(testCase.ctrl.userApp.ConfirmButton);
	testCase.choose(testCase.ctrl.userApp.CashSelection,'1¥');
	testCase.press(testCase.ctrl.userApp.CashInsertButton);
	testCase.press(testCase.ctrl.userApp.ReturnButton);

Expected Output	testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 30 30 0])==true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.7 Maintainer UI Unit Test

T1.7.1 Test_AddButtonPushed()

```
function AddButtonPushed(app, event)
            name = app.AddEditField.Value;
            if isempty(name)
                app.appendLog('Please input merchandise name.');
                return;
            end
            merchandise = app.Controller.merchandiseDB.getMerchandise(name);
            if ~isempty(merchandise)
                app.appendLog('Merchandise name already exists!');
                return;
            end
            app.appendLog(sprintf('%s has been added successfully!', name));
            app.Controller.addMerchandise(name);
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T1.7.1
Coverage Item	Tcover1.2.2, 1.2.3, 1.5.4, 1.5.5,1.7.1
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.type(testCase.ctrl.maintainerApp.AddEditField,'Tea');
	testCase.press(testCase.ctrl.maintainerApp.AddButton);
	list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	testCase.verifyEqual(list(5).name,'Tea')==true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T1.7.2 Test_MerchandiseTableCellEdit()

```
function MerchandiseTableCellEdit(app, event)
            indices = event.Indices;
            [newData, res] = str2num(event.NewData);
            if res == 0
                app.appendLog('Input illegal!(should be numeric)');
                app.LoadMerchandise;
                return;
            end
            merchandise = app.MerchandiseTable.Data{indices(:, 1), 1};
            price = str2num(app.MerchandiseTable.Data{indices(:, 1), 2});
            quantity = str2num(app.MerchandiseTable.Data{indices(:, 1), 3});
            switch indices(:, 2)
                % Edit Price
                case 2
                    if (rem(price, 0.5) ~= 0 || price < 0.5)
                        app.appendLog('Input price illegal!(should be able to pay)');
                        app.LoadMerchandise;
                        return;
                    end
                    app.Controller.updateMerchandise(merchandise, newData, quantity);

                % Edit Quantity
                case 3
                    if (rem(quantity, 1) ~= 0 || quantity < 0)
                        app.appendLog('Input quantity illegal!(should be integer>=0)');
                        app.LoadMerchandise;
                        return;
                    end
                    if newData > app.Controller.merchandiseDB.merchandiseCapacity
                        app.appendLog('Exceed maximum capacity!');
                        app.LoadMerchandise;
                        return;
                    end
                    app.Controller.updateMerchandise(merchandise, price, newData);
            end
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T1.7.2
Coverage Item	Tcover1.2.2, 1.2.3, 1.5.4, 1.5.5,1.7.2
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.updateMerchandise('Fanta',4,18);
	list =retrieve(testCase.ctrl.merchandiseDB);
	list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	testCase.verifyEqual(list(2).quantity,18)==true;
	testCase.verifyEqual(list(2).price,4) ==true;

- Test coverage: 1/1=100%
- Test Result: 1 passed

T2: Integration Test

Since the vending is contains UserUI and MaintainerUI, so we have two Intergration Tests.

T2.1 UserUI + VenderController + MerchandiseDB + Merchandise + Payment

```
function test_Integration_1(testCase)%testcase 2.1
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
            pause(2);
            testCase.press(testCase.ctrl.userApp.ConfirmButton);% testcase2.1
            pause(2);
            testCase.verifyEqual(testCase.ctrl.payment.name,'Fanta');
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Coke');
            testCase.press(testCase.ctrl.userApp.ConfirmButton);
            testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(2),{'Fanta'});
            testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(4),{'Canceled'});
            pause(2);
            testCase.choose(testCase.ctrl.userApp.CashSelection,'5￥');
            testCase.press(testCase.ctrl.userApp.CashInsertButton);
            pause(2);
            testCase.press(testCase.ctrl.userApp.ReturnButton);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[49 49]);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 31 30 0]);
            pause(2);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T2.1
Coverage Item	Tcover1.2.5, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.6.1, 1.6.2, 1.6.4, 1.6.5, 2.1

Input	choose('Fanta')
	press('Confirm')
	choose('Coke')
	press('Confirm')
	choose('5 ¥')
	press('cashInsert')
	press('Return')

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;

Expected Output	Coke and Return 1¥ and 0.5¥

- Test coverage: 5/5=100%
- Test Result: 1 passed

T2.2 MaintianerUI + VenderController + MerchandiseDB + Merchandise + Payment

```
function test_Integration_2(testCase)%testcase 2.2
            pause(2);
            testCase.type(testCase.ctrl.maintainerApp.AddEditField,'Tea');
            pause(2);
            testCase.press(testCase.ctrl.maintainerApp.AddButton);
            list =retrieve(testCase.ctrl.merchandiseDB);
            testCase.verifyEqual(list(5).name,'Tea');
            pause(2);
            testCase.ctrl.updateMerchandise('Tea',4.5,30);
            list =retrieve(testCase.ctrl.merchandiseDB);
            testCase.verifyEqual(list(5).price,4.5);
            testCase.verifyEqual(list(5).quantity,30);
            pause(2);
            testCase.ctrl.addCoins([20 0]);
            pause(2)
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[70 50]);
            testCase.ctrl.addCash([0 10 0 5] );
            pause(2);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 40 30 5]);
            pause(2);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T2.2
Coverage Item	Tcover1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.3.2, 1.3.3, 1.3.4,1.5.5,1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.7.1,1.7.2, 2.2
Input	None

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;
	testCase.ctrl.updateMerchandise('Fanta',4,18);
	list =retrieve(testCase.ctrl.merchandiseDB);
	list =retrieve(testCase.ctrl.merchandiseDB);

Expected Output	Tea has been added; Tea has been updated; Cash added; Coins added; alerted.

- Test coverage: 10/10=100%
- Test Result: 1 passed

T3: Functional Test

T3.1 Use Case "Select merchandise"

```
function test_Functional_1(testCase)%testcase 3.1
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Fanta');
            pause(2);
            testCase.press(testCase.ctrl.userApp.ConfirmButton);% testcase2.1
            pause(2);
            testCase.verifyEqual(testCase.ctrl.payment.name,'Fanta');
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Coke');
            testCase.press(testCase.ctrl.userApp.ConfirmButton);
            testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(2),{'Fanta'});
            testCase.verifyEqual(testCase.ctrl.maintainerApp.OrderRecordTable.Data(4),{'Canceled'});
            pause(2);
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Coke');
            testCase.press(testCase.ctrl.userApp.ConfirmButton);
            pause(31);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T3.1
Coverage Item	Tcover1.2.5, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.6.1, 1.6.2, 1.6.4, 1.6.5, 2.1, 3.1

Input	choose('Fanta')
	press('Confirm')
	choose('Coke')
	press('Confirm')

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;

Expected Output	Fanta "Canceled" Coke Payment created Coke Payment canceled.

- Test coverage: 5/5=100%
- Test Result: 5 passed

T3.2 Use Case "Pay money and Return change"

```
function test_Functional_2(testCase)%testcase 3.2
            testCase.choose(testCase.ctrl.userApp.MerchandiseSelection,'Coke');
            testCase.press(testCase.ctrl.userApp.ConfirmButton);
            pause(2);
            testCase.choose(testCase.ctrl.userApp.CashSelection,'5￥');
            testCase.press(testCase.ctrl.userApp.CashInsertButton);
            pause(2);
            testCase.press(testCase.ctrl.userApp.ReturnButton);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[49 49]);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[30 31 30 0]);
            pause(2);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T3.2
Coverage Item	Tcover1.2.5, 1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.6.1, 1.6.2, 1.6.4, 1.6.5, 2.1, 3.2

Input	choose('Fanta')
	press('Confirm')
	choose('Coke')
	press('Confirm')

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;

Expected Output	Coke Payment created need 3.5¥ 1¥ coin added need 2.5¥ 5¥ cash added return 2.5¥, reduce 2 * 1¥ coins & 1 * 0.5 coin.

- Test coverage: 6/6=100%
- Test Result: 6 passed

T3.3 Use Case "check merchandise"

```
function test_Functional_3(testCase)%testcase 3.3
            pause(2);
            testCase.type(testCase.ctrl.maintainerApp.AddEditField,'Tea');
            pause(2);
            testCase.press(testCase.ctrl.maintainerApp.AddButton);
            list =retrieve(testCase.ctrl.merchandiseDB);
            testCase.verifyEqual(list(5).name,'Tea');
            pause(2);
            testCase.ctrl.updateMerchandise('Tea',4.5,30);
            list =retrieve(testCase.ctrl.merchandiseDB);
            testCase.verifyEqual(list(5).price,4.5);
            testCase.verifyEqual(list(5).quantity,30);
            pause(2);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T3.3
Coverage Item	Tcover1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.3.2, 1.3.3, 1.3.4,1.5.5,1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.7.1,1.7.2, 2.2, 3,3.
Input	add 'Tea'; Tea 4.5¥, 31 Tea 4.5¥, 30

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;

Expected Output	Out of WangMilk Tea added; can't add more than 30 Tea update with 4.5¥ and 30quantity.

- Test coverage: 4/4=100%
- Test Result: 4 passed

T3.4 Use Case "check moneybox"

```
function test_Functional_4(testCase)%testcase 3.4

            testCase.ctrl.addCoins([20 -40]);
            pause(2)
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCoins,[70 10]);
            testCase.ctrl.addCash([20 10 -20 5] );
            pause(2);
            testCase.verifyEqual(testCase.ctrl.moneyBox.getCash,[50 40 10 5]);
            pause(2);
            close all force;
end
```

- Coverage Criteria:Statement Coverage
- Test case

	Test Case T3.4
Coverage Item	Tcover1.2.2, 1.2.3, 1.2.4, 1.2.5, 1.3.2, 1.3.3, 1.3.4,1.5.5,1.5.7, 1.5.8, 1.5.9, 1.5.10, 1.7.1,1.7.2, 2.2, 3,4.
Input	add 20 0.5¥ coins reduce 40 1¥ coins add 20 1¥ cash add 10 5¥ cash reduce -20 10¥ cash add 5¥ 20¥ cash

State	testCase.ctrl = VenderController;
	testCase.mb=MoneyBox;
	testCase.mdb=MerchandiseDB;
	testCase.uapp=UserUI;
	testCase.mapp=MaintainerUI;
	testCase.ctrl.userApp=testCase.uapp;
	testCase.ctrl.maintainerApp=testCase.mapp;
	testCase.ctrl.moneyBox=testCase.mb;
	testCase.ctrl.merchandiseDB=testCase.mdb;
	testCase.mb.controller=testCase.ctrl;
	testCase.mdb.controller=testCase.ctrl;
	testCase.uapp.Controller=testCase.ctrl;
	testCase.mapp.Controller=testCase.ctrl;

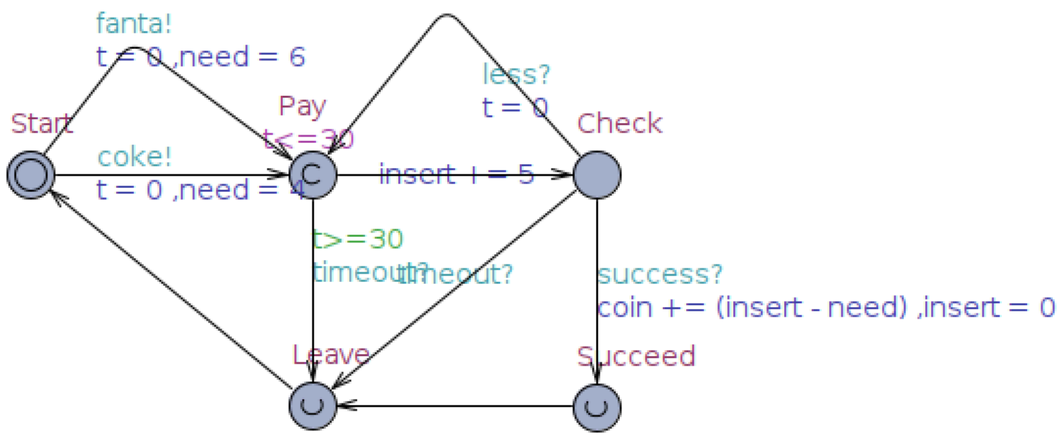
Expected Output	coins and cash are added and reduced (+)Nearly out of 1¥coin (+)Nearly out of 10¥ cash (-)0.5¥ coins nearly full coins and cash only can be postive

- Test coverage: 7/7=100%
- Test Result: 7 passed

Model Checking

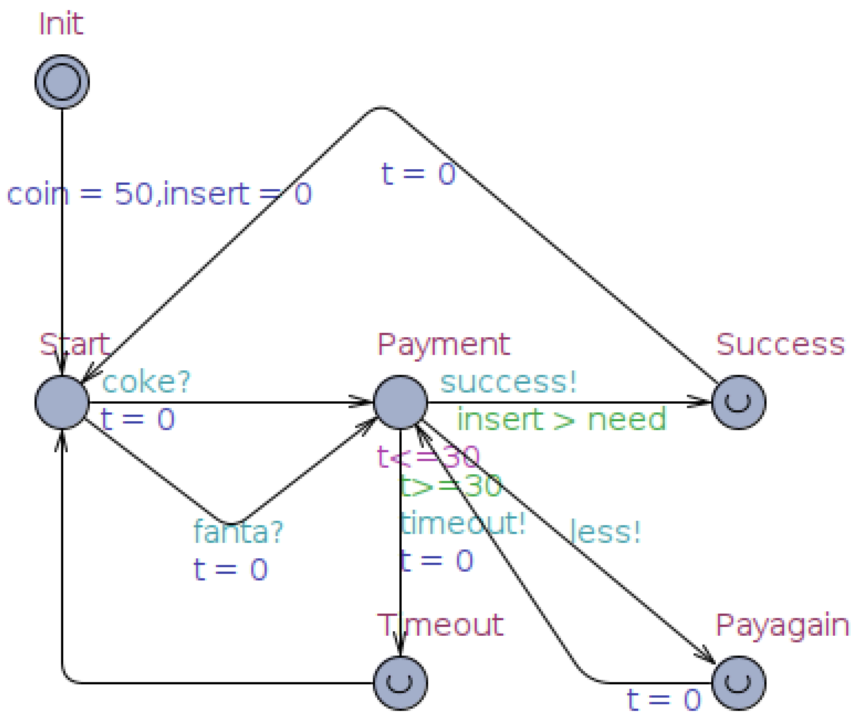
A UPPAL model of vending system is built for checking.

Customer Model



This model shows a customer has selection of purchasing different merchandise.

Purchasing Checking Model



This model shows the vending has the ability of judging if customer has inserted enough money and prepare for return.