Guan, Nathan 3954393
Truong, Adil 3951795

Final Project Report

Integrity Constraints

Accounts

There are 4 types of accounts with different interest rates which we will specify by integers:

- 1) Interest checking accounts have a variable rate that starts at 5.5%
- 2) Student checking accounts have a variable rate that starts at 0.0%
- 3) Savings accounts have a fixed rate of 7.5%
- 4) Pocket accounts rates have a fixed rate of 0.0%.

When a checkings or savings account is created, it must have a positive balance.
When a pocket account is made, it must have a checkings or savings account with positive balance linked to it as its source account

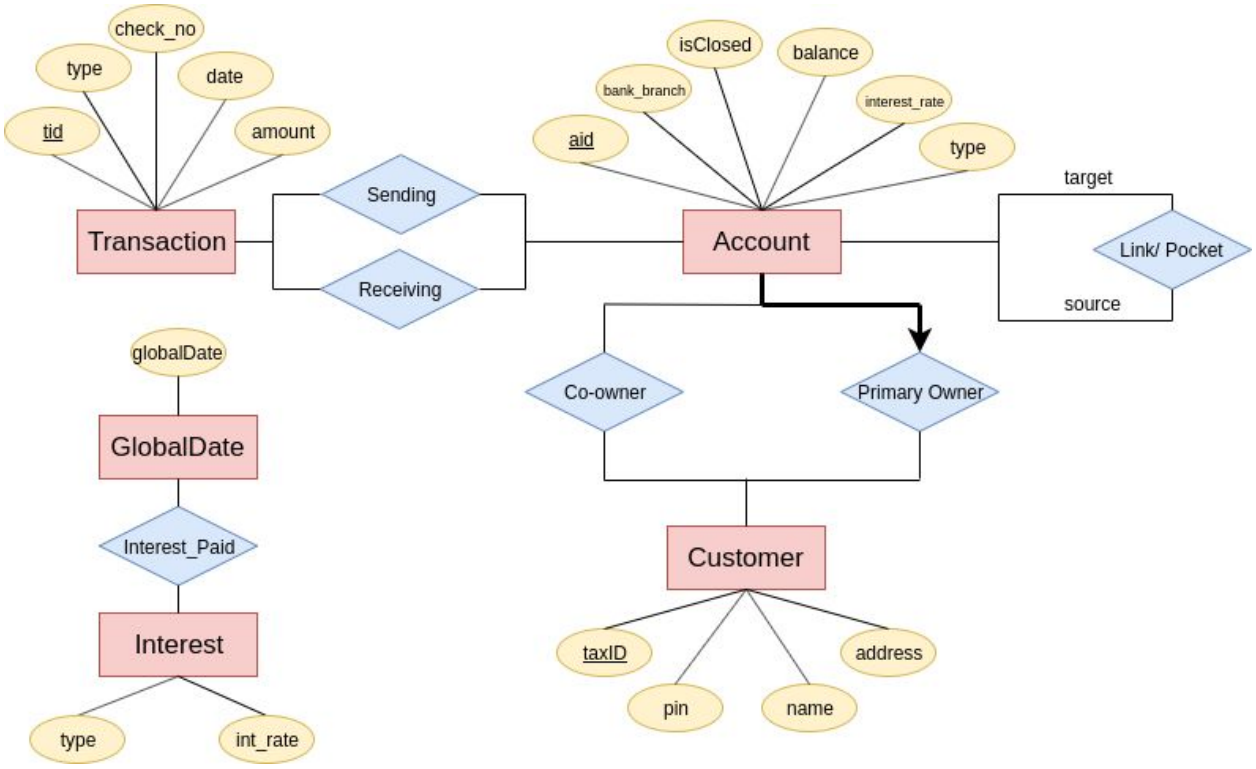
Transactions

Each account also has a list of transactions that references that account.
No transaction can allow the balance to go below 0.
Any transaction that makes a checkings or savings account's balance go to $0.01 or below automatically closes the account. When an account closes, it is not removed from the database until after a final statement is generated. No transactions are allowed on a closed account.
All open accounts accrue interest at the end of the month.

Customers

Every customer must own at least one account and have a unique tax id.
Their PIN is a 4 digit string. PIN is initialized to 1717.

2. ER design



3. Translate the ER diagram into relation schemas and do not forget the integrity constraints you have identified.

```
CREATE TABLE GlobalDate (
        globalDate DATE
        );

CREATE TABLE Customer (
        name CHAR(64),
        taxID CHAR(11),
        address CHAR(64),
        pin CHAR(4) DEFAULT '1717',
        PRIMARY KEY (taxID)
        );

CREATE TABLE Account (
        a_id CHAR(10),
        a_type CHAR(32),
        bank_branch CHAR(64),
        primaryOwner CHAR(11),
```

```
        isClosed INTEGER,
        linked_id CHAR(10),
        balance REAL,
        PRIMARY KEY (a_id),
        FOREIGN KEY (primaryOwner) REFERENCES Customer(taxID)
                ON DELETE CASCADE,
        FOREIGN KEY (linked_id) REFERENCES Account(a_id)
                ON DELETE CASCADE,
        CONSTRAINT CHK_Balance CHECK (balance >= 0.01),
        CONSTRAINT CHK_Link CHECK (
                (a_type = 'POCKET' AND linked_id IS NOT NULL)
                        OR (a_type != 'POCKET' AND linked_id IS NULL))
        );

CREATE TABLE Owns (
        taxID CHAR(11),
        a_id CHAR(10),
        PRIMARY KEY (taxID, a_id),
        FOREIGN KEY (taxID) REFERENCES Customer
                ON DELETE CASCADE,
        FOREIGN KEY (a_id) REFERENCES Account
                ON DELETE CASCADE
        );



CREATE TABLE Interest (
        type CHAR(32),
        int_rate REAL
        );

CREATE TABLE Transaction (
        amount REAL,
        t_date DATE,
        type CHAR(32),
        t_id CHAR(11),
        rec_id CHAR(10),
        send_id CHAR(10),
        check_no CHAR(20),
```

```
        PRIMARY KEY (t_id),
        FOREIGN KEY (rec_id) REFERENCES Account(a_id)
                ON DELETE CASCADE,
        FOREIGN KEY (send_id) REFERENCES Account(a_id)
                ON DELETE CASCADE
        );

CREATE TABLE Interest_Paid (
        paid INTEGER
        );
```

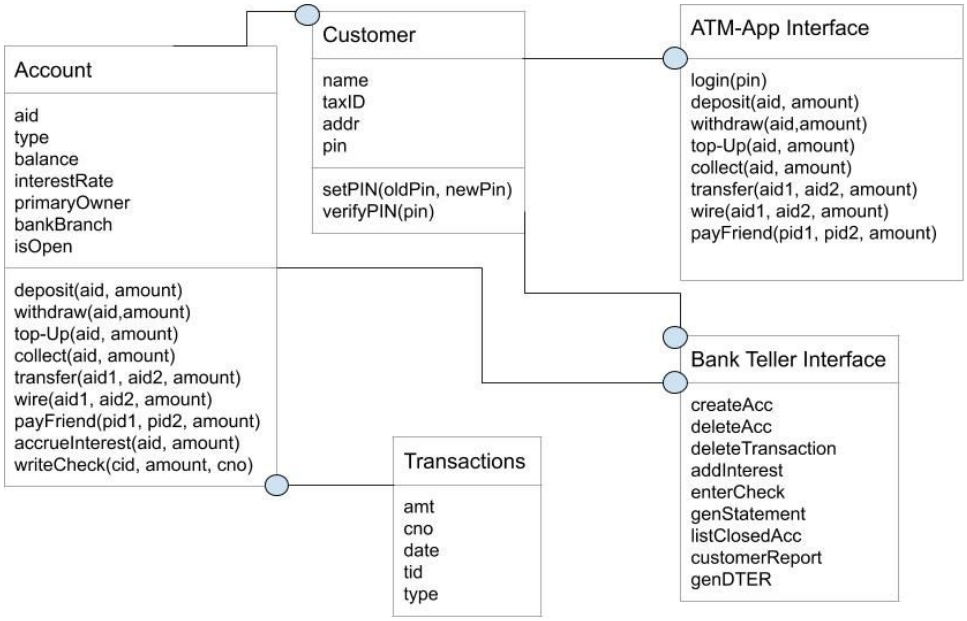
4. Relation Database Schema Integrity Constraints

The relational database can handle the domain constraints of when the balance and interest rate goes below zero. The database schema can also handle the primary key constraints for the customer's pin number and each customer's unique account ID.

5. How to deal with violation of Integrity Constraints

For each account, the aid and tid will not be null and will be unique. In addition, we will check the balances and the rates to see if they are negative. If they are, they will be closed.

6. System Design



7. List the task divisions and list each member's responsibility.

Adil Truong - Setup SQL, classes, Transaction, ATM Interface, testing
Nathan Guan - Accounts, Bank Teller Interface, Customers, SQL, Testing