图书管理系统报告

本次实验主要使用 golang 下操纵 mysql 实现一个完整的图书管理系统。
完整实现仓库：https://github.com/mirackk/librarysystem_idbs2020

一、系统数据库结构
主要分为四个表
Type(user_type,updatebook,adduser,borrowbook)
User(user_id,user_type,name)
Book(book_id,title,author,ISBN,amount,explanation)
Record(record_id,book_id,user_id,return_date,borrow_date,ddl,etdtimes)
1）Type 表决定用户类型，每次进入数据库需要输入用户名登录，int 类决定类型，1 为管理员，2 为普通学生，3 为逾期不还学生。
实际使用时发现后面几项内容实际上是不需要的，只要类型知道就能判断权限了。于是实际使用的时候没有用到 123 类来判断，也没有把学生从 2 移到 3。但是通过后面的小限权判断以及更新，仍可以保证功能实现。问题是有点重复冗余
2）User 是账户。初始有三类用户各几个。没有采用密码登录，输入 user_id 即可登录。
3）书目列表，书的 id，基本信息，数量，备注
4）学生的借书记录。return_date 由于未归还可以暂时为空值，别的都是 not null。
etdtimes 用来记录延迟还书 ddl 的次数，>=3 后不再可延期

后续待实现优化：把 type 直接并入 user

二、后端功能
基本上按照 ass3 的要求实现了所有功能。具体的函数不是与功能一一对应的，在 main 里面重新组织了函数并进行了功能对应。

此部分包括实验测试过程和如何使用该系统

1. 首先运行程序，通过 ConnectDB 函数实现了对数据库的连接，将返回值赋给全局变量 db，此 db 可以在后面进行各种 Exec 或 Query 的操作

2. 程序会自动加载初始化，如果没有创建数据库“library”和四张表的时候会操作 mysql 进行初始化。初始化操作写在另一个文件夹 sqlfile 里，使用时请把 gofile 和 sqlfiles 放在同一文件夹否则无法打开。

注意：初次使用时表中全是空的，需要加载初始数据要手动进入 sqlfiles 文件夹并使用 source initial.sql 执行初始数据导入（有时还需先输入 use library 进入相应数据库）

3. 初始化结束后，会出现前端引导。详见 3.前端

4. 函数解析和测试

1）Usertypejudge；此函数通过输入 user_id 返回对应 user_type 的 authority。我们可以利用该权限 struct（详见代码）里判断用户是否能 update（增加或减少）书本，adduser（添加新账户），borrow（借书）。简单的 query+scan 实现。

测试数据和结果：

```
userid:=[]struct{
    id int
    err error
}{
    { id: 1, err: nil},
    { id: 2, err: nil},
    { id: 3, err: nil},
    { id: 100, err: errnouser},
}
```

```
Tests passed: 1 of 1 test – 180 ms
<4 go setup calls>
=== RUN   TestUsertypejudge
--- PASS: TestUsertypejudge (0.18s)
PASS

Process finished with exit code 0
```

2）Checkbook；输入一本书的 ISBN，返回此书是否在图书馆内

```
isbns:=[]struct{
    s string
    flg bool
}{
    { s: "9787544657624", flg: true},
    { s: "9787508539270", flg: true},
    { s: "123", flg: false},
    { s: "1234567891011", flg: false},
}
```

```
Tests passed: 1 of 1 test – 70 ms
<4 go setup calls>
=== RUN   TestCheckbook
here1
here1
--- PASS: TestCheckbook (0.07s)
PASS

Process finished with exit code 0
```

3）AddBook；输入书的 title、author、ISBN 来在图书馆内增加新书。main 控制只有 type1 的用户能使用此功能。确定限权后由 Checkbook 函数确定书是否在图书馆内，若在原书 amount+1，不在则新增条目

（主要功能附两种测试的图片）

```
nfo:=[]struct{
   book Bookinfo
   err error
{
   { book: Bookinfo{ title: "Number theory. Volume I", author: "Cohen, Henri", ISBN: "9787519255299"}, err: nil},
   { book: Bookinfo{ title: "Topological invariants of plane curves and caustics", author: "Arnold, V. I. (Vladimir Igorev
   { book: Bookinfo{ title: "The art of translation", author: "Liu, Xiaodong", ISBN: "9787544657624"}, err: nil},
   { book: Bookinfo{ title: "Speaking for ourselves", author: "Nikolajeva, Maria", ISBN: "9787544656511"}, err: nil},
```

```
Tests passed: 1 of 1 test – 190 ms
<4 go setup calls>
=== RUN   TestAddBook
here1
it is new book
here1
it is new book
it is old book
it is old book
--- PASS: TestAddBook (0.19s)
PASS
```

```
mysql> select* from Book;
+---------+-----------------------------------------------------------------+-----------------------+---------------+--------+-------------+
| book_id | title                                                           | author                | ISBN          | amount | explanation |
+---------+-----------------------------------------------------------------+-----------------------+---------------+--------+-------------+
|       1 | The art of translation                                          | Liu, Xiaodong         | 9787544657624 |      2 | NULL        |
|       2 | Speaking for ourselves                                          | Nikolajeva, Maria     | 9787544656511 |      3 | NULL        |
|       3 | Chinese literature                                              | Epiphanius Wilson     | 9787508539270 |      4 | NULL        |
|       4 | Toward a network theory of acculturation                        | Chi, Ruobing          | 9787313186430 |      1 | NULL        |
|       5 | Anti-mimesis from Plato to Hitchcock                            | Cohen, Tom            | 9787521301083 |      0 | NULL        |
|       6 | On deconstruction : theory and criticism after structuralism    | Culler, Jonathan      | 9787521301045 |      5 | NULL        |
|       7 | American dream, American nightmare : fiction since 1960         | Hume, Kathryn         | 9787521301106 |      8 | NULL        |
|       8 | The antinomies of realism                                       | Jameson, Fredric      | 9787521301137 |      3 | NULL        |
|       9 | Fictions of authority : women writers and narrative voice       | Lanser, Susan Sniader | 9787521301090 |      1 | NULL        |
|      10 | Madame Bovary                                                   | FLaubert, Gustave     | 9787506297455 |      2 | NULL        |
|      11 | Key concepts in contemporary literature                         | Padley, Steve         | 9787544646086 |      4 | NULL        |
|      12 | Key concepts in postcolonial literature                         | Wisker, Gina          | 9787544646062 |      5 | NULL        |
+---------+-----------------------------------------------------------------+-----------------------+---------------+--------+-------------+
```

```
mysql> select* from Book;
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
| book_id | title                                                           | author                      | ISBN          | amount | explanation             |
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
|       1 | The art of translation                                          | Liu, Xiaodong               | 9787544657624 |      3 | NULL                    |
|       2 | Speaking for ourselves                                          | Nikolajeva, Maria           | 9787544656511 |      4 | NULL                    |
|       3 | Chinese literature                                              | Epiphanius Wilson           | 9787508539270 |      4 | NULL                    |
|       4 | Toward a network theory of acculturation                        | Chi, Ruobing                | 9787313186430 |      1 | NULL                    |
|       5 | Anti-mimesis from Plato to Hitchcock                            | Cohen, Tom                  | 9787521301083 |      0 | NULL                    |
|       6 | On deconstruction : theory and criticism after structuralism    | Culler, Jonathan            | 9787521301045 |      5 | NULL                    |
|       7 | American dream, American nightmare : fiction since 1960         | Hume, Kathryn               | 9787521301106 |      8 | NULL                    |
|       8 | The antinomies of realism                                       | Jameson, Fredric            | 9787521301137 |      2 | one of the book is lost |
|       9 | Fictions of authority : women writers and narrative voice       | Lanser, Susan Sniader       | 9787521301090 |      0 | one of the book is lost |
|      10 | Madame Bovary                                                   | FLaubert, Gustave           | 9787506297455 |      2 | NULL                    |
|      11 | Key concepts in contemporary literature                         | Padley, Steve               | 9787544646086 |      4 | NULL                    |
|      12 | Key concepts in postcolonial literature                         | Wisker, Gina                | 9787544646062 |      5 | NULL                    |
|      13 | Number theory. Volume I                                         | Cohen, Henri                | 9787519255299 |      1 | NULL                    |
|      14 | Topological invariants of plane curves and caustics             | Arnold, V. I. (Vladimir Igorevich) | 9787040517057 |      1 | NULL                    |
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
```

（前后的表内容，图 2 主要是顺便把 remove 也测了没来得及截图）

4）Remove；输入 ISBN 减少图书馆里的一本书。实现是让 amount-1 并给书增加备注

```
sbns:=[]struct{
    isbn string
    err error
{
    { isbn: "9787521301137", err: nil},
    { isbn: "9787521301090", err: nil},
    { isbn: "1234567891011", err: errnosuchbook},
```

```
✔ Tests passed: 1 of 1 test – 3 s 620 ms
<4 go setup calls>
=== RUN   TestRemove
here1
--- PASS: TestRemove (3.62s)
PASS

Process finished with exit code 0
```

```
mysql> select* from Book;
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
| book_id | title                                                           | author                      | ISBN          | amount | explanation             |
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
|       1 | The art of translation                                          | Liu, Xiaodong               | 9787544657624 |      3 | NULL                    |
|       2 | Speaking for ourselves                                          | Nikolajeva, Maria           | 9787544656511 |      4 | NULL                    |
|       3 | Chinese literature                                              | Epiphanius Wilson           | 9787508539270 |      4 | NULL                    |
|       4 | Toward a network theory of acculturation                        | Chi, Ruobing                | 9787313186430 |      1 | NULL                    |
|       5 | Anti-mimesis from Plato to Hitchcock                            | Cohen, Tom                  | 9787521301083 |      0 | NULL                    |
|       6 | On deconstruction : theory and criticism after structuralism    | Culler, Jonathan            | 9787521301045 |      5 | NULL                    |
|       7 | American dream, American nightmare : fiction since 1960         | Hume, Kathryn               | 9787521301106 |      8 | NULL                    |
|       8 | The antinomies of realism                                       | Jameson, Fredric            | 9787521301137 |      2 | one of the book is lost |
|       9 | Fictions of authority : women writers and narrative voice       | Lanser, Susan Sniader       | 9787521301090 |      0 | one of the book is lost |
|      10 | Madame Bovary                                                   | FLaubert, Gustave           | 9787506297455 |      2 | NULL                    |
|      11 | Key concepts in contemporary literature                         | Padley, Steve               | 9787544646086 |      4 | NULL                    |
|      12 | Key concepts in postcolonial literature                         | Wisker, Gina                | 9787544646062 |      5 | NULL                    |
|      13 | Number theory. Volume I                                         | Cohen, Henri                | 9787519255299 |      1 | NULL                    |
|      14 | Topological invariants of plane curves and caustics             | Arnold, V. I. (Vladimir Igorevich) | 9787040517057 |      1 | NULL                    |
+---------+-----------------------------------------------------------------+-----------------------------+---------------+--------+-------------------------+
```

5）Searchbookbytitle/author/ISBN；这三个函数实现功能类似，输入所需的内容，返回是否存在书。若存在会放到一个类型为 bookinfo（见代码）的数组中，在 main 里输出。这里有个**难点**就是书可能有多本所以必须用 Query 而不是 QueryRow。这样返回的 err 并不能判断有没有查询到。我认为比较好的解决办法是在 rows.Next（）里面加个 flag，如果 rows 有内容的话 flag 置 1，否则置 0，就能得到结果。

代码类似，具体都有测试，只贴其中一个

```
s:= []struct {
    title string
    isbn string
    err error
{
    { title: "The art of translation", isbn: "9787544657624", err: nil},
    { title: "Speaking for ourselves", isbn: "9787544656511", err: nil},
    { title: "whatever", isbn: "1234567891011", err: errnothisbook},
```

```
Tests passed: 1 of 1 test – 140 ms
<4 go setup calls>
=== RUN   TestSearchbytitle
here2
here2
no this book
--- PASS: TestSearchbytitle (0.14s)
PASS

Process finished with exit code 0
```

6）Adduser；先判断是否管理员，是则可以使用。输入新用户的类型、姓名可创建。返回用户 id。

```
cs:=[]struct{
    usertype int
    name string
}{
    { usertype: 1, name: "aadmin"},
    { usertype: 2, name: "cjy"},
    { usertype: 3, name: "zsk"},
}
```

```
Tests passed: 1 of 1 test – 300 ms
<4 go setup calls>
=== RUN   TestAdduser
--- PASS: TestAdduser (0.30s)
PASS

Process finished with exit code 0
```

```
+---------+-----------+------------+
| user_id | user_type | name       |
+---------+-----------+------------+
|       1 |         1 | adminone   |
|       2 |         1 | admintwo   |
|       3 |         1 | adminthree |
|       4 |         2 | mirack     |
|       5 |         2 | meow       |
|       6 |         2 | rabbit     |
|       7 |         3 | badguy     |
+---------+-----------+------------+
7 rows in set (0.00 sec)

mysql> select* from User;
+---------+-----------+------------+
| user_id | user_type | name       |
+---------+-----------+------------+
|       1 |         1 | adminone   |
|       2 |         1 | admintwo   |
|       3 |         1 | adminthree |
|       4 |         2 | mirack     |
|       5 |         2 | meow       |
|       6 |         2 | rabbit     |
|       7 |         3 | badguy     |
|       8 |         1 | aadmin     |
|       9 |         2 | cjy        |
|      10 |         3 | zsk        |
+---------+-----------+------------+
```

7）Borrow；借书功能。输入 user_id 和要借的 book_id 则可以借书。函数依次判断：是否存在这本书→当前是否有三本书以及上 overdue 的记录→书是否有余量；判断结束后可以借书，并增加一条新的 record。给用户返回 record_id

```
cs:=[]struct{
    user_id int
    book_id int
    err error
}{
    { user_id: 4, book_id: 6, err: nil},
    { user_id: 5, book_id: 6, err: nil},
    { user_id: 6, book_id: 15, err: errcantfind},
    { user_id: 4, book_id: 5, err: errbooknoamount},
}
```

```
o build gofile
Tests passed: 1 of 1 test – 160 ms
<4 go setup calls>
=== RUN   TestBorrow
--- PASS: TestBorrow (0.16s)
PASS

Process finished with exit code 0
```

book_id	user_id	record_id	return_date	borrow_date	ddl	etdtimes
1	4	1	NULL	2020-05-06	2020-06-13	1
2	4	2	NULL	2020-04-06	2020-05-13	1
3	4	3	NULL	2020-03-23	2020-05-14	3
6	6	4	NULL	2020-03-30	2020-05-06	1
10	5	5	NULL	2020-05-06	2020-06-06	0
5	4	6	2020-03-01	2020-02-06	2020-03-13	1
12	4	7	2019-09-01	2020-08-06	2020-09-06	0
7	6	8	2020-03-15	2020-02-06	2020-03-20	2
4	6	9	NULL	2020-05-08	2020-06-07	0
5	6	10	NULL	2020-05-08	2020-06-07	0

这个是数据测完后的记录，后面的两条是我在 05-08 实际测试操作的时候增添的

8）ReturnBook；还书功能。输入借书时候获得的 record_id 就可以还书了。依次判断：是否存在此借阅记录（id）→是否已还书；操作：Book 表中该书 amount+1→此 record 中写入归还日期

难点：我这里用 time.Time 类型实现时间操作，因此 return_date 也是该类型。但是 mysql 中的 date 类型实际上是一个整形数组，所以不能传到 return_date 中。这里就用 ISNULL 判断是否空值，不是空值就已归还。

```
cs:=[]struct{
    record_id int
    err error
}{
    { record_id: 2, err: nil},
    { record_id: 5, err: nil},
    { record_id: 100, err: errnothisrecord},
    { record_id: 7, err: erralready},
}
```

```
Tests passed: 1 of 1 test – 550 ms
<4 go setup calls>
=== RUN   TestReturnbook
0001-01-01 00:00:00 +0000 UTC
0001-01-01 00:00:00 +0000 UTC
0001-01-01 00:00:00 +0000 UTC
--- PASS: TestReturnbook (0.55s)
PASS

Process finished with exit code 0
```

（解释一下图二是因为我之前想搞一个 zerotime 来判断实际是不是空值，打印出来忘记删除了。不过后面也没有用时间对比，而是用了 ISNULL）

```
mysql> select* from Record;
+---------+---------+-----------+-------------+-------------+------------+----------+
| book_id | user_id | record_id | return_date | borrow_date | ddl        | etdtimes |
+---------+---------+-----------+-------------+-------------+------------+----------+
|       1 |       4 |         1 | NULL        | 2020-05-06  | 2020-06-13 |        1 |
|       2 |       4 |         2 | 2020-05-08  | 2020-04-06  | 2020-05-13 |        1 |
|       3 |       4 |         3 | NULL        | 2020-03-23  | 2020-05-14 |        3 |
|       6 |       6 |         4 | NULL        | 2020-03-30  | 2020-05-06 |        1 |
|      10 |       5 |         5 | 2020-05-08  | 2020-05-06  | 2020-06-06 |        0 |
|       5 |       4 |         6 | 2020-05-08  | 2020-02-06  | 2020-03-13 |        1 |
|      12 |       4 |         7 | 2020-05-08  | 2020-08-06  | 2020-09-06 |        0 |
|       7 |       6 |         8 | 2020-03-15  | 2020-02-06  | 2020-03-20 |        2 |
|       4 |       6 |         9 | NULL        | 2020-05-08  | 2020-06-07 |        0 |
|       5 |       6 |        10 | NULL        | 2020-05-08  | 2020-06-07 |        0 |
+---------+---------+-----------+-------------+-------------+------------+----------+
10 rows in set (0.00 sec)
```

9）Extenddl：还书日期延迟。输入 record_id 请求延期。依次判断：是否有此纪录→是否已归还→是否超过三次延期→是否已经 overdue。符合判断条件即可延期。操作：直接 update Record 里面的对应记录的 ddl，并领 etdtimes+1

难点：仍然是时间。因为 time.Time 类型不能接时间，但我这里必须拿到时间才能进行判断。

解决办法：先创建一个 string 变量，在 scan 的时候把结果放入 string 中，利用 time.parse 转换成时间

var getdue string

var due time.Time

due,_=time.Parse("2006-01-02 15:04:05", getdue+" 00:00:00")

当然这里还有个细节问题，就是数据库里存的只是到天，没有精确到时分秒

```
cs:=[]struct{
    record_id int
    err error
}{
    { record_id: 1, err: nil},
    { record_id: 2, err: nil},
    { record_id: 100, err: errnothisrec
    { record_id: 7, err: erralready},
    { record_id: 3, err: errextd3},
    { record_id: 4, err: erroverdue},
```

```
✔ Tests passed: 1 of 1 test – 160 ms
<4 go setup calls>
=== RUN   TestExtendddl
--- PASS: TestExtendddl (0.16s)
PASS

Process finished with exit code 0
```

```
+---------+---------+-----------+-------------+-------------+------------+----------+
| book_id | user_id | record_id | return_date | borrow_date | ddl        | etdtimes |
+---------+---------+-----------+-------------+-------------+------------+----------+
|       1 |       4 |         1 | NULL        | 2020-05-06  | 2020-06-20 |        2 |
|       2 |       4 |         2 | 2020-05-08  | 2020-04-06  | 2020-05-13 |        1 |
|       3 |       4 |         3 | NULL        | 2020-03-23  | 2020-05-21 |        3 |
|       6 |       6 |         4 | NULL        | 2020-03-30  | 2020-05-06 |        1 |
|      10 |       5 |         5 | 2020-05-08  | 2020-05-06  | 2020-06-06 |        0 |
|       5 |       4 |         6 | 2020-05-08  | 2020-02-06  | 2020-03-13 |        1 |
|      12 |       4 |         7 | 2020-05-08  | 2020-08-06  | 2020-09-06 |        0 |
|       7 |       6 |         8 | 2020-03-15  | 2020-02-06  | 2020-03-20 |        2 |
|       4 |       6 |         9 | NULL        | 2020-05-08  | 2020-06-07 |        0 |
|       5 |       6 |        10 | NULL        | 2020-05-08  | 2020-06-07 |        0 |
+---------+---------+-----------+-------------+-------------+------------+----------+
```

（成功延期后的图，可以参考对比上面）

待优化：更为人性化的借书，比如输入书名借书（现在是用 user_id）；更为人性化的还书，比如输入书名还书（现在用 record_id）；存取书精确到时分秒

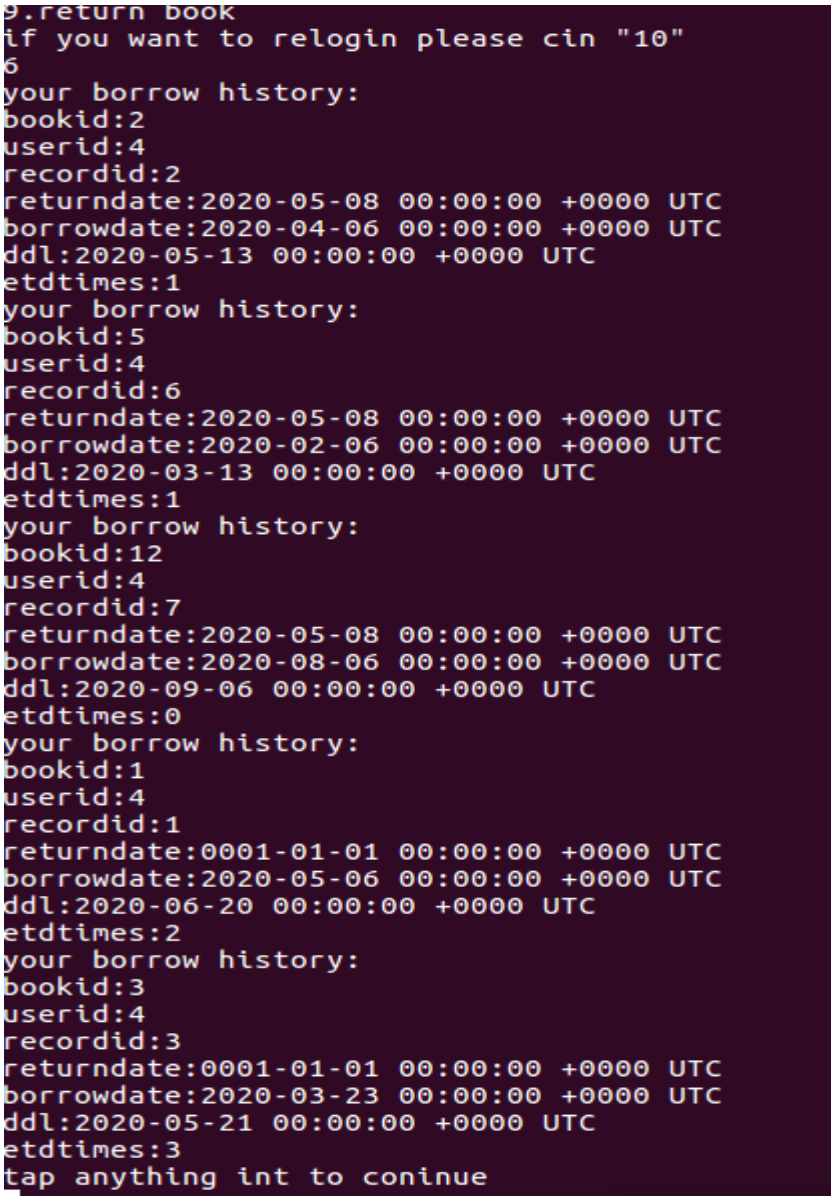
10）Showhistory；展示用户借书记录。只要输入用户 id 就可以放对应用户的借书记录。本质上也是一通操作+判断。

最难的地方：return_date 中有的记录还书了，有的没还。于是数据库的该条目实际上有两种数据类型。我之前用了 string 来处理有日期的情况。但是记录为 NULL 的时候 string 也是不能接收的。

解决办法：想了很久，使用了分治，把 date is NULL 和 date is not NULL 分开查询，再一起装入结果数组中。这样为 NULL 的时候就不接收 return_date 就可以了

（直接放前端操作的结果，这里后面的两条 return date 是 0001 表示还没换书

```
9.return book
if you want to relogin please cin "10"
6
your borrow history:
bookid:2
userid:4
recordid:2
returndate:2020-05-08 00:00:00 +0000 UTC
borrowdate:2020-04-06 00:00:00 +0000 UTC
ddl:2020-05-13 00:00:00 +0000 UTC
etdtimes:1
your borrow history:
bookid:5
userid:4
recordid:6
returndate:2020-05-08 00:00:00 +0000 UTC
borrowdate:2020-02-06 00:00:00 +0000 UTC
ddl:2020-03-13 00:00:00 +0000 UTC
etdtimes:1
your borrow history:
bookid:12
userid:4
recordid:7
returndate:2020-05-08 00:00:00 +0000 UTC
borrowdate:2020-08-06 00:00:00 +0000 UTC
ddl:2020-09-06 00:00:00 +0000 UTC
etdtimes:0
your borrow history:
bookid:1
userid:4
recordid:1
returndate:0001-01-01 00:00:00 +0000 UTC
borrowdate:2020-05-06 00:00:00 +0000 UTC
ddl:2020-06-20 00:00:00 +0000 UTC
etdtimes:2
your borrow history:
bookid:3
userid:4
recordid:3
returndate:0001-01-01 00:00:00 +0000 UTC
borrowdate:2020-03-23 00:00:00 +0000 UTC
ddl:2020-05-21 00:00:00 +0000 UTC
etdtimes:3
tap anything int to coninue
```
)



三、前端

前端使用简单的两个 for 循环，在命令行反复问询用户，设置有容易阅读的提示语。在命令行键入 go run main.go 即可运行。如图示。

后端通过 main_test.go 已保证功能实现。

有一个尚未解决的 bug：使用三种方式 searchbook 的时候，有时候找到书后 main 会一直循环大概 20 次然后才能再次输入。属实头疼，日后再改。

```
mirack@mirack-virtual-machine:~/ass3/librarysystem_idbs2020/gofile$ go run main.
go
succeed in connect
Welcome to the Library Management System!

if you want to quit please cin "quit"
if you don't;cin anything to continue
1
please cin your user_id to login
4


hello mirack. welcome back
update:false,adduser:false,borrow:true
please cin a number to choose what you want to do
1.add book
2.remove book
3.add account
4.query book
5.borrow book
6.show history
7.check return deadline
8.extend ddl
9.return book
if you want to relogin please cin "10"
```