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27-Sept-2020

Prototype of a Dental Appointment System in Golang

Dental Appointment System

1. Description of Features

The application is an appointment booking system for

(a) Patient to:

- Check appointment
- Make new appointment
- Edit appointment
- Check availability of time slots
- Check availability of doctor

(b) Admin to:

- Browse appointment for a doctor
- Browse appointment for a patient

The system allows booking up to 7 days before the visit.

2. Use of Data Structures

(a) A linked list is used to store all appointments of a doctor, and a map is used to store linked list of each doctor. The appointment in linked list is ordered based on the date of the appointments, allowing easy traversal for extraction of ordered data.

(b) A binary search tree is used to store information of users. A BST has log time complexity, O(log n) when performing a user search, allowing efficient searching of users' particular when logging in to the system.

3. Description of Data

(a) User information is stored in a struct joined together in a binary search tree:

```
type Patient struct {
    name       string
    hasBooking bool
    timeslot   *Timeslot
}
```

(b) Appointment information is stored in a struct joined together in a linked list:

```
type Timeslot struct {
    date    string
    slot    string
    doctor  string
    patient *Patient
    next    *Timeslot
}
```

Patient struct and Timeslot struct have pointer pointing to each other to facilitate searching.

(c) All appointments of a doctor are stored in a map where key is the doctor:

```
type appointment map[string]*linkedList
```

(d) Doctors are maintained in a slice. The map is created based on the number of doctors in the slice.

```
var doctorList = []string{"Dr.Andy", "Dr.Bob", "Dr.Chris", "Dr.Denny"}
```

In this prototype, the user BST and appointment linked list map are prefilled with data with the *init()* function when the program is initialized. Proper data management shall be implemented when the prototype is productionized.

4. Error Handling

(a) Panic is deployed when user login with invalid username (blank or username longer than 15 characters), forcing the program to terminate. Panic is also triggered when new users do not have an account and do not sign up, forcing the program to terminate too.
(b) Multiple helper functions that require input from user (e.g., *selectDoctor(), selectDate(), selectSlot()*) are designed to handle invalid input from users.
(c) Multiple helper functions that modify the map (e.g., *addAppointment(), removeAppointment()*) are designed to return errors if there is conflicting timeslots or invalid timeslot.

5. Concurrency

(a) Concurrency is utilized in function which checks doctor's availability, *checkDocAvail().* Linked lists of all doctors are searched concurrently to improve searching speed, and availability information is returned through a channel.

6. Instructions on running the application

Upon running the program, user will be asked to enter username to login or register (for username not found in user BST). Type “admin” if you wish to login as admin. In this prototype, no password required for login yet. In future version, password could be one of the fields in the user struct.

```
==========================================
Welcome to the Online Dental Appointment System.
Input your username to login/register.
Input "admin" to login as admin.
==========================================

Enter username:
```

Logging in as admin:

```
Enter username:
admin

Welcome admin. What do you want to do today:
1. Browse appointment for a doctor
2. Search appointment for a patient
3. Sign out
Select your choice:
```

Logging in as new user:

```
Enter username:
ben
User not found. Do you want to sign up? Press enter to sign up, input 'N' to quit.

Welcome ben. What do you want to do today:
1. List available time slots of a doctor
2. List available doctors of a timeslot
3. Show my appointment
4. Make appointment
5. Edit appointment
6. Sign out
Select your choice:
```

Logging in as existing user:

```
Enter username:
joe

Welcome ben. What do you want to do today:
1. List available time slots of a doctor
2. List available doctors of a timeslot
3. Show my appointment
4. Make appointment
5. Edit appointment
6. Sign out
Select your choice:
```

Note that once the user signs up, a new user struct will be created and remain in the BST even the user signs out (see option 6 above).

6.1. Instruction for patient

6.1.1. Check Availability of a doctor

```
Select your choice:
1

Select a doctor:
1. Dr.Andy
2. Dr.Bob
3. Dr.Chris
4. Dr.Denny
Select your choice:
1

Date        Available Slots
2020-09-27    1 2 3 4
2020-09-28    1   3 4
2020-09-29      2   4
2020-09-30    1 2 3 4
2020-10-01    1 2 3 4
2020-10-02    1 2 3 4
2020-10-03    1 2 3 4
```

6.1.2. Check Availability of a time slot

```
Select your choice:
2

Select a date:
1. 2020-09-27
2. 2020-09-28
3. 2020-09-29
4. 2020-09-30
5. 2020-10-01
6. 2020-10-02
7. 2020-10-03

Select your option:
2

Select a slot.
1. 9am-11am
2. 11am-1pm
3. 2pm-4pm
4. 4pm-6pm

Select your option.
2

Dr.Denny is available
Dr.Andy is NOT available
Dr.Bob is available
Dr.Chris is available
```

6.1.3. Show existing appointment

```
Select your choice:
3

You have an appointment with Dr.Andy on 2020-09-29, 9am-11am
```

6.1.4. Make an appointment

```
Select your choice:
4

Select a doctor:
1. Dr.Andy
2. Dr.Bob
3. Dr.Chris
4. Dr.Denny

Select your choice:
1

Select a date:
1. 2020-09-27
2. 2020-09-28
3. 2020-09-29
4. 2020-09-30
5. 2020-10-01
6. 2020-10-02
7. 2020-10-03

Select your option:
1

Select a slot.
1. 9am-11am
2. 11am-1pm
3. 2pm-4pm
4. 4pm-6pm

Select your option.
1

Are you sure you want to make an appointment with Dr.Andy on 2020-09-27 -- slot 1
Press enter to proceed with booking, press 'N' to cancel and return to menu.

Booking successful.
```

6.1.5. Edit existing appointment

```
Select your choice:
5

You have an appointment with Dr.Andy on 2020-09-27, 9am-11am

Are you sure you want to edit your appointment? Press enter to proceed with
booking, press 'N' to cancel and return to menu.

Select a doctor:
1. Dr.Andy
2. Dr.Bob
3. Dr.Chris
4. Dr.Denny

Select your choice:
2

Select a date:
1. 2020-09-27
2. 2020-09-28
3. 2020-09-29
4. 2020-09-30
5. 2020-10-01
6. 2020-10-02
7. 2020-10-03

Select your option:
1

Select a slot.
1. 9am-11am
2. 11am-1pm
3. 2pm-4pm
4. 4pm-6pm

Select your option.
1

Booking successful.
```

6.1.6. Sign out

```
Select your choice:
6

Signing out...


==========================================
Welcome to the Online Dental Appointment System.
Input your username to login/register.
Input "admin" to login as admin.
==========================================

Enter username:
```

6.2. Instruction for admin

6.2.1. Browse appointment for a doctor

```
Select your choice:
1

Select a doctor:
1. Dr.Andy
2. Dr.Bob
3. Dr.Chris
4. Dr.Denny

Select your choice:
1

Upcoming appointment of Dr.Andy:
2020-09-28 11am-1pm john
2020-09-29 9am-11am joe
2020-09-29 2pm-4pm  andrew
```

6.2.2. Browse appointment for a patient

```
Select your choice:
2

username   hasBooking date slot   doctor
andrew     true 2020-09-29 slot3 Dr.Andy
ben        false
emma       false
joe        true 2020-09-29 slot1 Dr.Andy
john       true 2020-09-28 slot2 Dr.Andy
kelvin     true 2020-09-29 slot1 Dr.Bob
stella     true 2020-09-29 slot1 Dr.Chris
zoey       true 2020-09-30 slot2 Dr.Chris
```

6.2.3. Sign out

```
Select your choice:
3

Signing out...


==========================================
Welcome to the Online Dental Appointment System.
Input your username to login/register.
Input "admin" to login as admin.
==========================================

Enter username:
```