ZHANG Youchi (张又驰)'s TA report for assignment06
SID: 12132603
Github: https://github.com/yzydlc/ESE5023_Assignments_12132603
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Good job!
Grade: 40

Assignment 6

1.1

Good for 1 (15/15)

代码：

```
use procedures
Implicit none
integer                                 :: u, i, l
!real(4) :: n
real(4), allocatable :: M(:,:)
real(4), allocatable :: N(:,:)
real(4), allocatable :: RES(:,:)

u = 50

open(unit=u, file='fortran_demo1/M.dat', status='old')

! lines of file
l = 5

allocate( M(l,3))

do i = 1,l
  read(u, *) M(i,1), M(i,2), M(i,3)
enddo

! print*,M(1,1)
! lines of file N
l = 3
close(u)
open(unit=u, file='fortran_demo1/N.dat', status='old')

allocate(N(l,5))

do i = 1,l
  read(u, *) N(i,1), N(i,2), N(i,3), N(i,4),N(i,5)
enddo
```

1.2

代码

Matrix_multip.f90

```
module procedures
  implicit none

contains
subroutine matrix_multip(a, b, c)

implicit none

 real(4), dimension(:,:), intent(in) :: a, b
 real(4), dimension(:,:), intent(out) :: c

integer :: i, j, n, m,k
real(4) :: tmp

i = size(a(:,1))
j = size(a(1,:))

do n=1,i

  do m=1,i
    !print*,a(n,m)
    tmp = 0.0
    do k=1,j
     !  print *, n
      ! print *, k
       tmp = tmp + a(n,k) * b(k,n)
    enddo
    !print *, n,m
    !print *,tmp
    c(n,m) = tmp
  enddo

enddo

end subroutine matrix_multip
end module

```

1.3

代码

```
program Main
use procedures
Implicit none
integer                              :: u, i, l
!real(4) :: n
real(4), allocatable :: M(:,:)
real(4), allocatable :: N(:,:)
real(4), allocatable :: RES(:,:)

u = 50

open(unit=u, file='fortran_demo1/M.dat', status='old')

! lines of file
l = 5

allocate( M(l,3))

do i = 1,l
  read(u, *) M(i,1), M(i,2), M(i,3)
enddo

! print*,M(1,1)
! lines of file N
l = 3
close(u)
open(unit=u, file='fortran_demo1/N.dat', status='old')

allocate(N(l,5))

do i = 1,l
  read(u, *) N(i,1), N(i,2), N(i,3), N(i,4),N(i,5)
enddo

close(u)
!problem 1.3
allocate(RES(5,5))
call matrix_multip(M,N,RES)

open(unit=u, file='MN.dat')

do i = 1,5
  write(u, '(f9.2,f9.2,f9.2,f9.2,f9.2)') RES(i,1), RES(i,2), RES(i,3), RES(i,4), RES(i,5)
enddo

deallocate(M,N,RES)
close(u)
end program Main
```

结果：

```
[ese-zhangych@login02 ~]$ cat MN.dat
   249.40   249.40   249.40   249.40   249.40
   277.34   277.34   277.34   277.34   277.34
   100.18   100.18   100.18   100.18   100.18
   208.97   208.97   208.97   208.97   208.97
   283.04   283.04   283.04   283.04   283.04
[ese-zhangych@login02 ~]$
```

2.1 Great. (25/25)

代码

```
module declination
  implicit none

contains
subroutine declination_angle(d,dt)

implicit none

 integer, intent(in) :: d
 real(4), intent(out) :: dt

real(4) :: pi

pi = 3.14159265359

dt = sin(-23.44*pi/180)*cos(pi/180*(360/365.24*(d+10)+360/pi*0.0167*sin(pi/180*360/365.24*(d-2))))
dt = asin(dt)

print *, 'Delta: ', dt * 180 / pi

end subroutine declination_angle
end module

```

2.2

代码

```
Program Solar_elevation_angle

use declination
use solar_hour
Implicit none

! lst is local solar time
integer  :: d
real(4) :: lat, lon, time_zone, lst, hour_angle, dt, SEA, pi

pi = 3.14159265
lat = 22.542883
lon = 114.062996
time_zone = 8
lst = 10.533
d = 364

call declination_angle(d, dt)

call solar_hour_angle(d, lon, time_zone, lst, hour_angle)

! calculate SEA

SEA = asin(sin(lat*pi/180)*sin(dt)+cos(lat*pi/180)*cos(dt)*cos(hour_angle*pi/180))*180/pi

print*, 'SEA: ', SEA

End Program Solar_elevation_angle

```

2.3

第一步：运行 gfortran -c Declination_angle.f90 对 declination 模块进行编译

第二步：运行 gfortran -c Solar_hour_angle.f90 对 solar_hour 模块进行编译
最后一步：运行 gfortran Solar_elevation_angle.f90 Declination_angle.o Solar_hour_angle.o -o Solar_elevation_angle.x
编译 Solar_elevation_angle，并且链接 Declination_angle.o Solar_hour_angle.o 最后输出 Solar_elevation_angle.x
结果：

```
[ese-zhangych@login02 ~]$ ./Solar_elevation_angle.x
 Delta:   -23.1656399
 hour angle:   -28.4348774
 SEA:    36.5746384
[ese-zhangych@login02 ~]$
```

2.4

1.创建 libsea.a 这个 library 文件

```
[ese-zhangych@login02 ~]$ ar rcvf libsea.a Declination_angle.o Solar_hour_angle.o
a - Declination_angle.o
a - Solar_hour_angle.o
[ese-zhangych@login02 ~]$
```

2.

```
[ese-zhangych@login02 ~]$ gfortran Solar_elevation_angle.f90 -o Solar_elevation_angle.x -L. -lsea
[ese-zhangych@login02 ~]$ ./Solar_elevation_angle.x
 Delta:   -23.1656399
 hour angle:   -28.4348774
 SEA:    36.5746384
[ese-zhangych@login02 ~]$
```

gfortran Solar_elevation_angle.f90 -o Solar_elevation_angle.x -L. -lsea 链接 libsea.o 并编译 Solar_elevation_angle.f90