C Programming

Class- BCA IInd Semester

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Outline

unit 4: Structure

- Array of Structures
- Additional Features of Structures
- Structures and functions
- Use of Typedef with Structures

Array of Structures

A better approach would be to use an array of structures. Following program shows how to use an array of structures.

```
 int main( )
{
struct book
{
char name[20] ;
float price ;
int pages ;
} ;
struct book b[3] ;
int i ;
for ( i = 0 ; i <= 2 ; i++ )
{
printf ( "\nEnter name, price and pages " ) ;
scanf ( "%s %f %d", b[i].name, &b[i].price, &b[i].pages ) ;
}
for ( i = 0 ; i <= 2 ; i++ )
printf ( "\n%s%f %d", b[i].name, b[i].price, b[i].pages ) ;
return 0;
}
```

Note:-The above C program is written and compiled in Turbo C. When this program is executed, the compiler displays the following error, *Scanf(): floating point formats not linked* and the program gets terminated abnormally. The solution is to call a floating-point (f-p)function or just add link of a file, which contains at least one floating-point (f-p) function.

➢It doesn't have to be in the module with the main program, as long as it's in a module that will be included in the link. Therefore, the above program should be written as follows:

```
void dummy(float *a)
{
 float b=*a;
 dummy(&b);
 }
struct book
{
char name[20] ;
float price ;
int pages ;
} ;
void main( )
{    struct book   b[3];
int i ;
for ( i = 0 ; i <= 2 ; i++ )
{
printf ( "\nEnter name, price and pages " ) ;
scanf ( "%s %f %d", b[i].name, &b[i].price,
&b[i].pages ) ;
}
for ( i = 0 ; i <= 2 ; i++ )
printf ( "\n%s%f %d", b[i].name, b[i].price,
b[i].pages ) ; getch();
}
```

Additional Features of Structures

The values of a structure variable can be assigned to another structure variable of the same type using the assignment operator.

```
 main( )
{
struct employee
{
char name[10] ;
int age ;
float salary ;
} ;
struct employee e1 = { "Sanjay", 30, 5500.50 } ;
struct employee e2, e3 ;
e2=e1;
e3 = e1 ; /* copying all elements at one go */
printf ( "\n%s %d %f", e1.name, e1.age, e1.salary ) ;
printf ( "\n%s %d %f", e2.name, e2.age, e2.salary ) ;
printf ( "\n%s %d %f", e3.name, e3.age, e3.salary ) ;
}
```

Additional Features of Structures

One structure can be nested within another structure. Using this facility complex data types can be created. The following program shows nested structures.

```
main( )
{
struct student
{
char phone[15] ;
char city[25] ;
int pin ;
} ;
struct emp
{
char name[25] ;
struct student s1;
} ;
struct emp s2 = { "raj", "531046", "nagpur", 10 };
printf ( "\nname = %s phone = %s", s2.name, s2.s1.phone ) ;
printf ( "\ncity = %s pin = %d", s2.s1.city, s2.s1.pin ) ;
}
```

```
struct address
{
char phone[15] ;
char city[25] ;
int pin ;
struct emp
{
char name[25] ;
char address1  [40];
} s1;

}s2;
```

WAP to read and display the information of a student using a nested structure.

```
void main()  {
struct DOB
{   int day;
    int month;
    int year;
};
struct student
{         char name[100];
           int roll_no;
          struct DOB d1;
};
struct student s1;
clrscr();
printf("\n Enter the name  and roll number : ");
scanf("%s  %d", s1.name, &s1.roll_no);
printf("\n Enter the DOB : ");
scanf("%d %d %d", &s1.d1.day, &s1.d1.month, &s1.d1.year);
printf("\n NAME = %s  ROLL No. = %d", s1.name, s1.roll_no);
printf("\n DOB = %d – %d – %d", s1.d1.day, s1.d1.month, s1.d1.year);
getch();
}
```

WAP to read and display the information of a student using a nested structure.

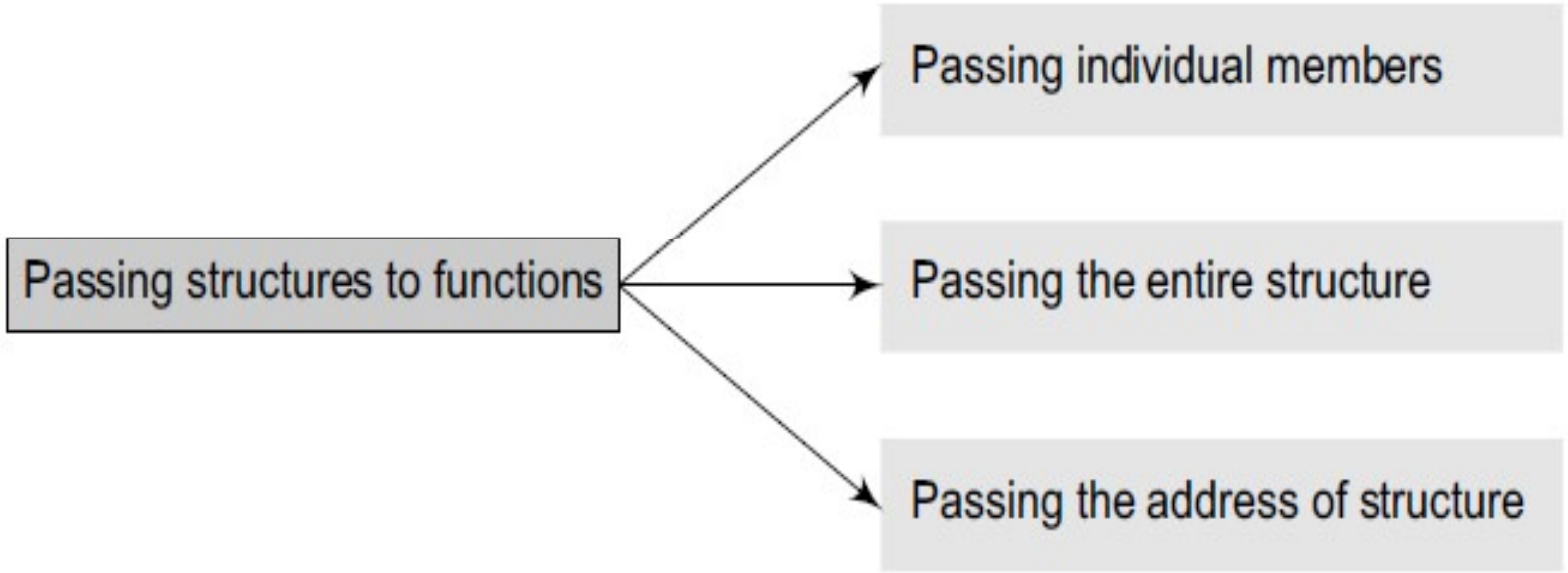
```
#include <stdio.h>
#include <string.h>
 struct student_college_detail
{    int college_id;
    char college_name[50];
};
 struct student_detail
{    int id;
    char name[20];
    float percentage;
    struct student_college_detail clg_data;         // structure within structure
}stu_data, *stu_data_ptr;
 int main()
{  struct student_detail stu_data = {1, "Raju", 90.5, 71145,  "Anna University"};
    stu_data_ptr = &stu_data;
     printf(" Id is: %d \n", stu_data_ptr->id);
    printf(" Name is: %s \n", stu_data_ptr->name);
    printf(" Percentage is: %f \n\n",      stu_data_ptr->percentage);
    printf(" College Id is: %d \n",    stu_data_ptr->clg_data.college_id);
    printf(" College Name is: %s \n",     stu_data_ptr->clg_data.college_name);
     return 0;
}
```

WAP to read and display the information of a student using a nested structure.

```
#include <stdio.h>
#include <string.h>
struct Employee
{    int id;
   char name[20];
   struct Date
    {  int dd;
      int mm;
      int yyyy;
    }doj;
}e1;
int main( )
{   e1.id=101;     //storing employee information
   strcpy(e1.name, "Sonoo Jaiswal");  //copying string into char array
   e1.doj.dd=10;
   e1.doj.mm=11;
   e1.doj.yyyy=2014;
    printf( "employee id : %d\n", e1.id);
   printf( "employee name : %s\n", e1.name);
   printf( ”date of joining (dd/mm/yyyy) : %d/%d/%d\n", e1.doj.dd,e1.doj.mm,e1.
doj.yyyy);
   return 0;
}
```

STRUCTURES AND FUNCTIONS

- we must have a mechanism to pass them to functions and return them. A function may access the members of a structure in three ways as shown in Fig.



Additional Features of Structures (Passing individual elements)

Like an ordinary variable, a structure variable can also be passed to a function. We may either pass individual structure elements or the entire structure variable at one go.

```
struct POINT
{
int x;
int y;
};
void display(int, int);
int main()
{
struct POINT p1 ; //= {2, 3};
printf("input the value of x and y");
scanf("%d%d", &p1.x, &p1.y);
display(p1.x, p1.y);
return 0;
}
void display(int a, int b)
{
printf(" The coordinates of the point are:
%d %d", a, b);
}
```

```
 void display ( char *, char *, int  );
int main( )
{
struct book
{
char name[25] ;
char author[25] ;
int callno ;
} ;
struct book  b1 = { "Let us C",
"YPK", 101 } ;
display ( b1.name, b1.author,
b1.callno ) ;
}
void display ( char *s, char *t, int
n )
{
printf ( "\n%s %s %d", s, t, n ) ;
}
```

Additional Features of Structures (Passing the Entire Structure)

A better way would be to pass the entire structure variable at a time. This method is shown in the following program.

```
struct book
{
char name[25] ;
char author[25] ;
int callno ;
} ;
void display( struct book  );
main( )
{
struct book  b1 = { "Let us C", "YPK", 101 } ;
display ( b1 ) ;
}
void display ( struct book  b )
{
printf ( "\n%s %s %d", b.name, b.author, b.callno ) ;
}
```

Additional Features of Structures

we can pass the address of a structure variable to a function. note that to access the structure elements using pointer to a structure we have to use the '**->**' **operator.**

```
/* Passing address of a structure variable */
struct book
{
char name[25] ;
char author[25] ;
int callno ;
} ;
void display ( struct book *b );
main( )
{
struct book b1 = { "Let us C", "YPK", 101 } ;
display ( &b1 ) ;
}
void display ( struct book *b )
{
printf ( "\n%s %s %d", b->name, b->author, b->callno ) ;
}
```

Additional Features of Structures

The way we can have a pointer pointing to an **int, or a pointer** pointing to a **char, similarly we can have a pointer pointing to** a **struct. Such pointers are known as 'structure pointers'.**

```
main( )
{
struct book
{
char name[25] ;
char author[25] ;
int callno ;
} ;
struct book  *b1 = { "Let us C", "YPK",
101 } ;
printf ( "\n%s %s %d", b1->name, b1-
>author, b1->callno ) ;
}
```

```
main( )
{
struct book
{
char name[25] ;
char author[25] ;
int callno ;
}*ptr ;
struct book  b1 = { "Let us C",
"YPK", 101 } ;
//struct book  *ptr ;
ptr = &b1 ;
printf ( "\n%s %s %d", b1.name,
b1.author, b1.callno ) ;
printf ( "\n%s %s %d", ptr->name,
ptr->author, ptr->callno ) ;
}
```

Use of Typedef with Structures

- The C language provides a keyword called **typedef** which we can use to synonyms for data types. Following is an example typedef

```
typedef struct Student
{
char[15] name;
int rollno;
int age;
} Stu;
```

Now that struct Student has been change to "Stu".

Exercise

1. Program to illustrate the relationship b/w union and structure
2. Write a C Program to Add Two Distances (in inch-feet) System Using Structures
3. Write C Program to Add Two Complex Numbers by Passing Structure to a Function
4. Write a C Program to Calculate Difference Between Two Time Periods.
5. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation.
6. Write a C Program to implement employee record using pointers to structures.

References

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Thanks