

Programming Language-II

Lecture # 9

Lecture Content

- What is an structure?
- Structure basics
- Structure array
- Structure with functions
 - Passing structure to function
 - Pass by value
 - Pass by reference
 - Returning structure from function

Structures

- A Structure is a collection of related data items, possibly of different types.
- A structure type in C++ is called struct.
- A struct is heterogeneous in that it can be composed of data of different types.
- In contrast, array is homogeneous since it can contain only data of the same type.
- Structure is user define(complex) data type.

Structures

- Structures hold data that belong **together**.
- Examples:
 - Student record: student id, name, major, gender, start year, ...
 - Bank account: account number, name, currency, balance, ...
 - Address book: name, address, telephone number, ...

struct basics

- Definition of a structure:

```
struct <struct-type>{  
    <type> <identifier_list>;  
    <type> <identifier_list>;  
    ...  
} ;
```

Each identifier
defines a member
of the structure.

- Example:

```
struct Date {  
    int day;  
    int month;  
    int year;  
} ;
```

The “Date” structure
has 3 members,
day, month & year.

struct examples

- Example:

```
struct StudentInfo{  
    int Id;  
    int age;  
    char Gender;  
    double CGA;  
};
```

The “StudentInfo”
structure has 4 members
of different types.

- Example:

```
struct StudentGrade{  
    char Name[15];  
    char Course[9];  
    int Lab[5];  
    int Homework[3];  
    int Exam[2];  
};
```

The “StudentGrade”
structure has 5
members of
different array
types.

struct examples

- Example:

```
struct BankAccount{  
    char Name[15];  
    int AccountNo[10];  
    double balance;  
    Date Birthday;  
};
```

The “BankAccount” structure has simple, array and structure types as members.

- Example:

```
struct StudentRecord{  
    char Name[15];  
    int Id;  
    char Dept[5];  
    char Gender;  
};
```

The “StudentRecord” structure has 4 members.

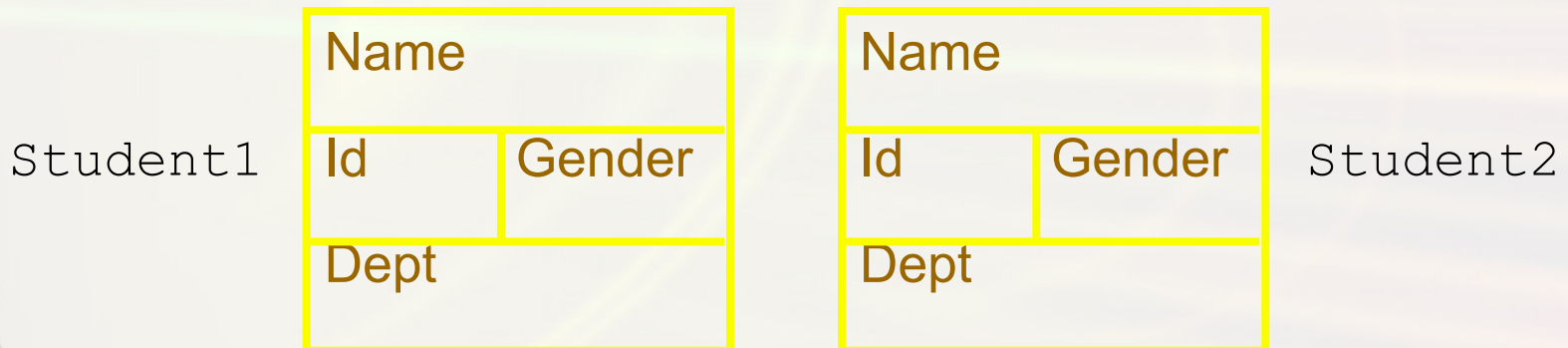
struct basics

- Declaration of a variable of struct type:

`<struct-type> <identifier_list>;`

- Example:

`StudentRecord Student1, Student2;`



`Student1` and `Student2` are variables of `StudentRecord` type.

Complete example

```
struct Person{  
    char name[50];  
    int age;  
    float salary;  
};
```

```
int main(){  
    Person p1;  
    cout << "Enter Full name: ";  
    cin.get(p1.name, 50);  
    cout << "Enter age: ";  
    cin >> p1.age;  
    cout << "Enter salary: ";  
    cin >> p1.salary;  
    cout << "\nDisplaying Information." << endl;  
    cout << "Name: " << p1.name << endl;  
    cout << "Age: " << p1.age << endl;  
    cout << "Salary: " << p1.salary;}
```

Output:

Enter Full name: Magdalena Dankova

Enter age: 27

Enter salary: 1024.4

Displaying Information.

Name: Magdalena Dankova

Age: 27

Salary: 1024.4

Structure array

```
#define MAX 2
```

```
struct Student  
{  
    char name[20];  
    int roll_no, i;  
    float marks;  
};
```

Structure array(Cont...)

```
int main(){
    Student arr_student[MAX];
    int i;

    for (i = 0; i < MAX; i++)
    {
        cout<<"\nEnter details of student "<<i+1<<endl;
        cout<<"Enter name: ";
        cin>>arr_student[i].name;
        cout<<"Enter roll no: ";
        cin>>arr_student[i].roll_no;
        cout<<"Enter marks: ";
        cin>>arr_student[i].marks;
    }
```

Structure array(Cont...)

```
cout<<endl;
cout<<"Name\tRoll no\tMarks\n";
for (i = 0; i < MAX; i++)
{
    cout << arr_student[i].name << "\t" <<
    arr_student[i].roll_no << "\t" <<
    arr_student[i].marks << "\n";
}
system("pause");
return 0;
}
```


C++ Structure and Function

```
void displayData(Person);    // Function declaration

int main()
{
    Person p;

    cout << "Enter Full name: ";
    cin.get(p.name, 50);
    cout << "Enter age: ";
    cin >> p.age;
    cout << "Enter salary: ";
    cin >> p.salary;

    // Function call with structure variable as an argument
    displayData(p);

    return 0;
}
```

C++ Structure and Function(Cont...)

```
void displayData(Person p)
{
    cout << "\nDisplaying Information." << endl;
    cout << "Name: " << p.name << endl;
    cout << "Age: " << p.age << endl;
    cout << "Salary: " << p.salary;
}
```

Output:

```
Enter Full name: Bill Jobs
Enter age: 55
Enter salary: 34233.4
```

```
Displaying Information.
Name: Bill Jobs
Age: 55
Salary: 34233.4
```

Returning structure from function in C++

```
struct Person {  
    char name[50];  
    int age;  
    float salary;  
};  
  
Person getData(Person);  
void displayData(Person);  
  
int main(){  
    Person p;  
    p = getData(p);  
    displayData(p);  
    return 0;  
}
```

Returning structure from function in C++

```
Person getData(Person p) {  
    cout << "Enter Full name: ";  
    cin.get(p.name, 50);  
    cout << "Enter age: ";  
    cin >> p.age;  
    cout << "Enter salary: ";  
    cin >> p.salary;  
    return p;  
}  
  
void displayData(Person p){  
    cout << "\nDisplaying Information." << endl;  
    cout << "Name: " << p.name << endl;  
    cout << "Age: " << p.age << endl;  
    cout << "Salary: " << p.salary;  
}
```