CS 240 Programming in C

Structures

Oct 4, 2022

Structures in C

A structure is a collection of one or more variables, possibly of different types, grouped together under a single name for convenient handling. (Structures are called "records" in some languages, notably Pascal.) Structures help to organize complicated data, particularly in large programs, because they permit a group of related variables to be treated as a unit instead of as separate entities. [1]

[1] Page no. 127 of textbook

Structure Definition

```
struct address {
char name[50];
char street[100];
int apt;
char city[50];
char state[20];
char pin[5];
};
```

Real Life Example

```c
struct Car {
  char brand[50];
  char model[50];
  int year;
};

int main() {
  struct Car car1 = {"BMW", "X5", 1999};
  struct Car car2 = {"Ford", "Mustang", 1969};
  struct Car car3 = {"Toyota", "Corolla", 2011};

  printf("%s %s %d\n", car1.brand, car1.model, car1.year);
  printf("%s %s %d\n", car2.brand, car2.model, car2.year);
  printf("%s %s %d\n", car3.brand, car3.model, car3.year);

  return 0;
}
```

2

[2] https://www.w3schools.com/c/c_structs.php

Array of Structures

```
struct Car
{
    int year;
    char *make;
    char *model;
};

void printCar(struct Car car) {⟺}

int main()
{
    struct Car cars[] = {
        {2019, "Toyota", "Camry"},
        {2018, "Honda", "Civic"},
        {2017, "Ford", "Fusion"},
        {2016, "Chevy", "Cruze"},
        {2015, "Nissan", "Altima"}};

    for (int i = 0; i < 5; i++)
        printCar(cars[i]);
```

Pointer of Structures

Like primitive types, we can have pointer to a structure. If we have a pointer to structure, members are accessed using arrow (->) operator.

Typedef

We use the typedef keyword to create an alias name for data types. It is commonly used with structures to simplify the syntax of declaring variables.

Union

A union is a user-defined type similar to structs in C except for one key difference.
Structures allocate enough space to store all their members, whereas unions can only hold one member value at a time.

Bit-fields

A bit field is a data structure that consists of one or more adjacent bits which have been allocated for specific purposes, so that any single bit or group of bits within the structure can be set or inspected. A bit field is most commonly used to represent integral types of known, fixed bit-width, such as single-bit Booleans. [3]

[3] https://en.wikipedia.org/wiki/Bit_field

Demo

- Phonebook Program
- Matrix Calculator