

Introduction to 'C' Language - Module 7

Type Casting in C

Type Casting in C Language

Type casting in C is a way to convert a variable from one data type to another. This is useful in situations where you need to perform operations between variables of different types, or when you want to control how data is stored or represented.

There are two main types of type casting in C:

1. **Implicit Type Casting (Automatic Type Conversion)**
2. **Explicit Type Casting (Manual Type Conversion)**

1. Implicit Type Casting (Automatic Type Conversion)

Implicit type casting occurs automatically when the compiler converts a smaller data type to a larger data type. This is done to prevent data loss or overflow. The conversion is done based on the type hierarchy, where lower types like char and int are automatically promoted to higher types like float or double.

Example:

```
c Copy code
#include <stdio.h>

int main() {
    int i = 10;
    float f;

    f = i; // Implicit type casting from int to float

    printf("Value of i: %d\n", i);
    printf("Value of f: %f\n", f);

    return 0;
}
```

In the example above, the integer `i` is automatically converted to a float when assigned to `f`.

2. Explicit Type Casting (Manual Type Conversion)

Explicit type casting is when you manually convert one data type to another. This is done by using the cast operator (type), where type is the desired data type.

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Syntax:

```
c
(type) expression
```

Example:

```
c
#include <stdio.h>

int main() {
    int i = 10;
    float f = 5.5;
    int sum;

    sum = i + (int)f; // Explicit type casting from float to int

    printf("Sum: %d\n", sum);

    return 0;
}
```

In this example, the float `f` is explicitly converted to an integer before performing the addition. This ensures that the decimal part of `f` is truncated, and only the integer part is added to `i`.

Why Use Type Casting?

- **Prevent Data Loss:** Helps in avoiding unintended data loss when converting from a larger to a smaller data type.
- **Control Over Conversion:** Allows you to have explicit control over how data is converted.
- **Perform Mixed-Type Operations:** Enables operations between different data types, such as dividing an integer by a float and storing the result as a float.

Type Hierarchy in C

In implicit casting, the types are converted according to the following hierarchy:

char < int < float < double

This means that a char can be automatically promoted to an int, an int can be promoted to a float, and so on.

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Things to Be Cautious About

- **Loss of Data:** Converting a larger data type (like double) to a smaller data type (like int) can lead to loss of precision or data.
- **Overflow/Underflow:** Converting types with different ranges can lead to overflow or underflow issues.
- **Readability:** Overusing explicit type casting can make your code harder to read and maintain.

Summary

Type casting is a powerful feature in C that allows you to control the way data is converted from one type to another. While implicit casting is handled automatically by the compiler, explicit casting gives you the flexibility to dictate conversions according to your needs. However, it should be used judiciously to avoid issues related to data loss and code readability.

Assignment

Ques 1: Write a C program to declare an integer and a float. Assign the integer to the float variable and print both the values. Observe and explain the output.

Ques 2: Write a C program where you take a float value, explicitly cast it to an int, and then print both the original float value and the truncated int value.

Ques 3: Write a C program to declare a char variable with a letter and then assign it to an int variable. Print the integer value to see the ASCII value of the character.

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