PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++ and JAVA:

Lesson-10: Embedded Programming in Java

Java programming

- Starts from coding for the classes.
- Members in a class
- Fields– like variables or struc in C.
- Method – the operations on the fields, similar to function in C.
- instance fields and instance methods in a class– the members, whose new instances are also created as when the objects creates from the class.

Java programming

- Class– a named set of codes that has a number of members – data fields (variables), methods (functions), etc. so that object can be created from it.
- The operations done on the objects by passing the messages to the objects in object-oriented programming.
- Each class–a logical group with an identity, a state and a behaviour specification.

Inheritance in Java programming

- Java Class inherits members when a Java class extends from a parent class called super class.
- The inherited instance fields and methods can be overridden by redefining them in extended class.
- Methods can be overloaded by redefining them for different number of arguments.

Interface in Java programming

- Interface has only the abstract methods and static data fields
- Methods not implementation at the Interface
- Java class interfacing to an Interface implements the abstract methods specified at the Interface

Primitive data types in Java programming

- Java Class uses : Byte (8-bit), shot (16-bit), int (32-bit, long (64-bit, float, double, char (16-bit).

Reference data types

- Java Class uses reference data types.
- A reference can be Class type in which there are groups of fields and methods to operate on the fields.
- A reference can be Array type in which there are groups of objects as array elements.

Exception classes

- Many inbuilt Exception classes
- The occurrences of exceptional conditions are handled when exception is thrown.
- It is also possible to define exception conditions in a program so that exceptions are thrown from try block codes and caught by catch exception method .

Java Features

- Java is completely an OOP language
- Application program consists of classes and interfaces
- There is a huge class library on the network that makes program development quick
- Java has extensibility
- Java programs posses the ability to run under restricted permissions

Multiple threads in Java Program

- Java has in-built support for creating multiple threads
- It obviates the need for an operating system (OS) based scheduler for handling the tasks

Java Features

- Java generates the byte codes
- These are executed on an installed JVM (Java Virtual Machine) on a machine.
- Virtual machine takes the Java byte codes in the input and runs on the given platform (processor, system and OS). [Virtual machine (VM) in embedded systems is stored at the ROM.] Therefore, Java codes can host on diverse platforms.

Java Platform Independence Features

- Platform independence in hosting the compiled codes permit Java for network applications.
- Platform independence gives *portability* with respect to the processor and the OS used. Java is considered as write once and run anywhere .

Java Features

- Java is the language for most Web applications and allows machines of different types to communicate on the Web.
- Java is easier to learn by a C++ programmer.

Java Features

- Java does not permit pointer manipulation instructions. So it is robust in the sense that memory leaks and memory related errors do not occur. A memory leak occurs, for example, when attempting to write to the end of a bounded array.
- Java does not permit dual way of object manipulation by value and reference.
- There are no struc, enum, typedef and union.
- Java does not permit multiple inheritances.
- Java does not permit operator overloading except for + sign used for string concatenation

Some disadvantages

- Java byte codes that are generated need a larger memory when a method has more than 3 or 4 local variables. An embedded Java system may need a minimum of 512 kB ROM and 512 kB RAM because of the need to first install JVM and then run the application.

Ways to overcome the disadvantages

1) Use of J2ME (Java 2 Micro Edition) or Java Card or EmbeddedJava helps in reducing the code size to 8 kB for the usual applications like smart card.

Summary

We learnt

- Java provides all the advantages of object oriented programming
- Declare private as many classes as possible. It helps in optimising the generated codes.

We learnt

- Java has inherent multithreaded features

- Java provides the benefits of extensive class libraries for network and web applications, modularity, robustness, secure restricted permissions, portability and platform independence.

We learnt

- Use *char*, *int* and *boolean* (scalar data types) in place of objects (reference data types) as arguments and use local variables as much as feasible.

We learnt J2ME provides

- secure restricted permissions
- portability
- platform independence for programming small devices such as mobile and card

End of Lesson 10 of Chapter 7
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Embedded Programming in Java