

Chapter three

Requirements and Specifications of Project

3.1 Modeling

A model is a representation of an object, system or an idea in a generalized form other than in the real world, for the purpose of study.

A model can be either physical (touchable), or mathematical (virtual or untouchable). Furthermore there are mathematical models like analytical queuing models, simulations ...etc.

How to evaluate the system performance?

Quite often we have at least three options to evaluate a system.

- **Experiments:**
Use existing instances of the system and perform operations on it – the resulting overall performance is to be measured.
- **Analysis:**
Develop a mathematical equation to describe the system performance.
- **Simulation:**
Develop a computer simulation program, which implements a model of the system, and perform experiments by running the computer program more than one time.

3.2 Simulation

A simulation model is a particular type of a mathematical model of the system.

A simulation model can be static or dynamic. Static means a view onto the system state at a particular point in time and dynamic means a view onto the system state over a time interval.

A) Dynamic simulation as two types:

- **Deterministic:**
Simulation models without random variables.
- **Stochastic:**
Simulation models with random variables.

B) Example of simulation application:

- Designing and analyzing manufacturing systems.
- Evaluating a new military weapons system, for example: rockets, missiles ...etc.
- Designing military plans for demonstration purpose.

3.3 Military Simulation

Also known informally as war game, a military simulation is an implementation, in which theories of warfare can be tested and refined without the need for actual hostilities. The simulation may exist in many different forms but in varying degrees of realism. Quite often, the scope of simulation can be widened to include political and social factors.

Many governments use simulations, both individually and collaboratively, to develop tactical and strategy solutions.

A) Type of military simulation:

- Design military plans.
- Evaluating new weapons upon on mass, speed and other physical attributes.
- Physical training exercises, by using advanced technology like sensing devices, to measure the performance precisely.

3.4 Unity3d

Unity or Unity3d is a cross-platform 3D engine built-in IDE developed by Unity Technologies. It is used to develop simulation applications, games (2D & 3D) for web plug-ins, desktop platforms, consoles and mobile devices. The engine was developed in C/C++ programming language, and is able to support code written in C#, JavaScript and Boo.

Unity3D version 3.4 supports many platforms. Thus we can use it to developing for iOS, Android, Windows, OS X, Web browsers, Play station 3, and Xbox. Moreover, there will be new platforms soon in new updated (like flash and Wii-U platform) environments.

A) Features:

Rendering or graphics engine in Unity uses Direct3D for windows, OpenGL for Mac and window, OpenGL ES for IOS and Android.

Unity supports importing files from a wide variety of applications, like Autodesk 3dsmax, Maya, Softimage, Blender, mode, Zbrush, Cinema 4D, Cheetah3D, Adobe Photoshop....etc. These files can be added to the project and managed through Unity's graphical user interface.

Unity also has a build-in support for Nivida's (formerly Ageia's) PhysX physics engine for real-time physics simulation.

The engine scripting is build on mono, the open source implementation of the .net framework. The programmer can use C#, JavaScript or Boo through mono to write a script.

B) Licensing:

There are two main licenses for developers; unity and unity pro. The pro version is available, but you must buy it. The regular version is available for free download.

Both unity and unity pro include the development environment, but the pro version has many features like updating and support platforms and therefore more general than the regular version.

3.5 Visual Studio

Microsoft's Visual Studio is an integrated development environment (IDE) from Microsoft. It's used to develop console and graphics user interface applications along with windows from or WPF applications, web sites, web applications, and web services for all supported platforms by Microsoft: Windows, Windows Mobile, Windows CE, .Net Framework, .Net Compact Framework and Microsoft Silver light.

Visual Studio includes a code editor supporting IntelliSense as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a forms designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that enhances the functionality at almost every level including

adding support for source-control systems (like Subversion and Visual SourceSafe).

A) Programming language supported by Visual studio:

Visual Studio supports many programming languages. Built-in languages include C/C++ (via visual C++), VB.NET (via Visual Basic.Net), C# (via Visual C#.Net), and F# (via visual F#.Net). Furthermore, support is offered to many other languages via language services installed separately.

3.6 Mono

Mono is a free and open source project led by Xamarin (formerly by Novell and originally by Ximian) to create an ECMA standard compliant It offers .NET Framework-compatible set of tools including, among others, a C# compiler and a Common Language Runtime.

The stated purpose of Mono is not only to be able to run Microsoft .NET applications cross-platform, but also to bring better development tools to Linux developers. Mono can be run on many software systems including Android (and most other Linux distributions), BSD, OS X, Windows, Solaris, and some for game consoles such as PlayStation 3, Wii, and Xbox 360.

A) Mono Develop:

Mono Develop is a free GNOME integrated development environment primarily designed for C# and other .NET languages such as Nemerle, Boo, and Java (via IKVM.NET), although it also supports languages such as C, C++, Python, Java, and Vala.

Mono Develop was originally a port of SharpDevelop to Gtk#, but it has since evolved to meet the needs of Mono developers. The IDE includes class management, built-in help, code completion, Static (a GUI designer), project support, and an integrated debugger.

The MonoDoc browser provides access to API documentation and code samples. The documentation browser uses wiki-style content management, allowing developers to edit and improve the documentation.

3.7 3D Studio Max

Autodesk 3ds Max, formerly 3D Studio Max, is 3D computer graphics software for making 3D animations, models, and images. It was developed and produced by Autodesk Media and Entertainment. It has modeling capabilities, a flexible plug-in architecture and can be used on the Microsoft Windows platform. It is frequently used by video game developers, TV commercial studios and architectural visualization studios.

It is also used for movie effects and movie pre-visualization. In addition to its modeling and animation tools, the latest version of 3ds Max also features Shaders (such as ambient occlusion and subsurface scattering), dynamic simulation, particle systems, radiosity, normal map creation and rendering, global illumination, a customizable user interface, and its own scripting language.

3.8 Adobe Photoshop

Adobe Photoshop is a raster graphics editing program developed and published by Adobe Systems. Adobe's 2003 "Creative Suite" rebranding led to Adobe Photoshop 8's renaming to Adobe Photoshop CS. Thus, Adobe Photoshop CS6 is the 13th major release of Adobe Photoshop. The CS rebranding also resulted in Adobe offering numerous software packages containing multiple Adobe programs for a reduced price. Adobe Photoshop is released in two editions: Adobe Photoshop, and Adobe Photoshop Extended, with the Extended having extra 3D image creation, motion graphics editing, and advanced image analysis features.

Adobe Photoshop Extended is included in all of Adobe's Creative Suite offerings except Design Standard, which includes the Adobe Photoshop edition.

Alongside Photoshop and Photoshop Extended, Adobe also publishes Photoshop Elements and Photoshop Light room, collectively called "The Adobe Photoshop Family". In 2008, Adobe released Adobe Photoshop Express, a free web-based image editing tool to edit photos directly on blogs and social networking sites. In 2011 a version was released for the Android operating system and the IOS operating system. Adobe distributes Photoshop in Windows and Macintosh versions.

3.9 C# Programming Language

Pronounced “see sharp”, C# is multi-paradigm programming language encompassing strong typing, functional, generic, object oriented (class based), and component-oriented programming disciplines. It was developed by Microsoft for use in .Net platform.

C# is intended to be simple, modern, and general-purpose and object oriented programming language. Its development team is led by Andres Hejlsberg.

C# is used to develop for many types of applications and for many platforms through some tools like Mono project.