ASSIGNMENT TOP SHEET
Faculty of Creative Arts, Technologies & Science
Department of Computer Science & Technology

Student Ref. No: 1019722
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Unit Name MSc Project
Deadline for Submission(s)
26th September 2011, by 12 noon

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Assignment Details:

Design & Implementation of a Procedure for VFX Content Generation

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Design & Implementation of a Procedure for VFX Content Generation

M.Sc. Computer Animation
Masters Thesis Report
Department of Computer Science & Technology

Dr. Edmond Prakash

2010/11
ABSTRACT

As a student of M.Sc. Computer Animation I have tried my best to cover all the aspects of this project.

Being a student is great, but sooner or later I am going to have a transition to "the real world". I am about to make that transition; graduation is around the corner and I find myself looking forward to join the workforce. When I look back to my year of study at the University of Bedfordshire, I am amazed that I have learned much but there is much more to learn.

The greatest experience I acquired is that with this project I gained a lot of experience to work on the motion capture and learned new techniques that are used in industry to create high quality VFX with 3d animation. I have tried my level best to keep the accuracy in designs and realistic as possible but most important thing is that I have worked for the first time on motion capture and I am very much successful in generating the output that I imagined.

The realistic models, usage of MoCaps, mind blowing VFX, environments, materials all have been done according to the perspective of imitating them to the actual objects. By doing this most importantly I have passed through several hurdles and bottlenecks that can appear in the work process.

One of the most important characteristic of my project is that I have not used any special purpose hardware for my work. All the designing and modeling has been done on simple core i7 machine without high speed graphics cards or rendering cards. I also haven’t got any motion capture cameras so I bought pre-captured MoCaps from internet.

Shots that are rendered in 3DS Max were later on blended with the real life footage using After Effects. After the rendering a lot of work is performed in the Post Production for generating VFX and doing green screening.
ACKNOWLEDGMENT

First of all, I thank Almighty Allah who praises me with the ability to think, work and deliver what I was assigned to do. Secondly, I must be grateful to my internal Prof. Edmond Prakash who helped me in this project. Without his professional guidance, I was not able to complete my project successfully.
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CHAPTER 1

INTRODUCTION

1) INTRODUCTION

The media industry is getting competitive day by day and along the passage of time, new technologies are arriving for the use of computer generated imagery in films, dramas etc. Almost every film today has got some animation and special effects for generating the scenes that are not possible in real life. In this modern era, Animation Designing is becoming a necessity for almost all kinds of projects when considering a virtual model of any product or an entertainment movie which is rather much difficult in fact almost impossible to make happen physically. 3D Modeling and Animation therefore is becoming a compulsory subject in Computing Departments.

Animation is a sub category of Graphics Designing. In a broader definition of Graphic Designing, we must say that a virtual image of any real world objects. Graphics are of several categories. They may be related to web or the Internet. The Graphics may be useful in the Press for printing or it may be in the form of an animated movie.

The movies like Avatar, 2012, Inception, Transformers, Matrix etc, all have got wonderful effects. Avatar has pushed new boundaries in the field of 3D animation and motion capturing. It showed us how we can merge the real life acting with 3d animation. The motion capture technology has made it much easier to animate the facial expressions also. Animators does not need to do anything on post production side as the markers placed on the face capture the facial movements and apply the data on the character’s face. The output is not that huge that the working beyond creating some particular effect is.

In my project, I am trying to merge animation along with the real life footage to create a clip that will involve animation and special effects. Since motion capture device is expensive and I can’t afford it by myself so I have bought pre-captured MoCaps that I will use on my rigged characters. The project I selected is related to one of the most advanced design standards as it included the latest motion capture technique that is much more advanced than simple 3d animation.

This chapter deals with a brief introduction to the overall system of Development of this project. Details will be available as the reader advances.

1.1 PROBLEM

My project is slightly different from a typical Computer Animation project. I am here not
exactly creating a simple 3d animation but my intentions contain ideas, innovations, and creative approach at the advanced designing levels in the world of 3D and Motion Capture.

My main reason for selection of this project is that I wanted to work on something new that I have learned during my course. It’s not only simple 3d animation but I also wanted to use motion capture with 3d animation and also generate some VFX so that it could be a one complete project including everything I have learned here. With my project I may motivate my junior students entering computer animation field. Moreover with this project I will also be able to enhance my designing skills at the most professional and advanced level.

As far as the importance of this field is considered, Graphic and Animation Designing is considered one of the most highly paid services everywhere in the world and it’s worth is increasing day by day as the use of computer generated imagery (CGI) is getting popular in media industry.

1.2 MAIN AIM

Mainly there are two perspectives of why I have chosen Motion Capture Animation along with VFX content generation as my project.

- My first goal is that what I am learning here will not only be useful in my jobs, as well as if I plan to study or work further in purely motion capture technology then this is my base and will provide great help in entering the field professionally.

- My second goal is that since I am here to generate a motion capture animation along with VFX. This is not only to make me well versed in Motion Capture; but also it will attract my juniors to develop their skills in this technology.

1.3 WHAT I FOCUS TO ACHIEVE?

As far as my objectives are concerned following are what I focus to achieve through this project:

- Advancing my Designing Skills.
- Making myself compatible with the field of Multimedia.
- Learning Motion Capture Techniques.
- Maintaining accuracy in my designs which is considered extremely important in Engineering.
- Generation of VFX
- Practicing Green Screen Technique

After completing this project, I will be sufficient to design or model any kind of simulation for machinery, environment or scenarios in 3D environment. Not only this, but as mentioned in the points above, it will also give a start in Cinematography where I can use our CAD Graphics Skills to enhance quality and maintain the accuracy in design.

1.4 VALUE IN OPEN MARKET

There are two things what make this project extremely valuable in the market.
The Project itself is of high worth in the market as these advanced motion capture techniques are not commonly used on educational level. This project will help me out in polishing my portfolio so that I can show my skills in the industry.

Through this project, I may make myself important for Entertainment Industry including Advertising Agencies, Visual Effects Companies or Television Channels as well as in the Virtual Simulation Industry where the simulation designing is being carried out for better production of equipment or construction of environments or factories without investing resources.

1.5 METHODOLOGY

Now this is how I have made it possible to accomplish my goals and objectives. Details of this section will be discussed later. It is here just to give an idea of our work flow.

To achieve what I projected, I have made a Work Flow diagram named as Graphics Development Life Cycle (GDLC). This diagram can be credited as my scheduling algorithm. This workflow model deals with all the steps/phases that are important and to be implemented in process.

1.6 TECHNOLOGIES & TOOLS

My technology is concerned with the concept of designing in a predefined but unlimited 3d world. My project contains especially modeled objects using mesh techniques. This is the most basic technique just like writing a computer program in assembly or coding a webpage in HTML rather than using Adobe Dreamweaver to design it. This mesh modeling technique gives me very precise architecture and command over the objects. As will be discussed later, the tools are same as used for Modeling, in the market all over the globe. Mainly my designing tools include:

3D STUDIO MAX v 2011 by Discreet Autodesk
A special 3D modeling and animation designing software used all over the world to design 3D models of any lively imaginative object. This software provides us the power to use computer to make virtual world as close to the real world it could be.

ADOBE AFTER EFFECTS by Adobe Systems
This software is basically used for applying special effects and finishing to the movies as well as the green technique is also done using this program.

iCLONE v 3.0 by Reallusion
A special 3D animation and visual effects software used to animate complex 3D characters along with some visual effects.

POSER v 7 by Meta Creations
Specifically a 3D character animation software that is used to animate characters along with their props.

ADOBE PHOTOSHOP v CS3 by Adobe Systems
Used for designing of textures plus any desired still pictured if required in the movie.

SOUND DEVELOPMENT SOFTWARES
Most of our audio sounds including effects, recording and music are developed using two software:
1) Sony Vegas 10.0 HD Platinum

SONY VEGAS by Sony Pictures
Very effective and light software used for both sound and video editing along with some transitions and audio effects. This software supports a huge variety of file types to import, edit and export.
CHAPTER 2

RESEARCH

2.1 BACKGROUND

This chapter deals with the usage of scenarios. What I mean is that it is one the noteworthy chapters that include the preface of the physical project. This will tell about how the project commenced, what was projected to accomplish, what were the initial hindrances I faced in the starting of the project. How were they solved? It also includes how the project can be useful to the end user, what will it serve to the people and how can it help me out in the industry as was also discussed in the previous chapter. Since I have mentioned several times in my past documents that my project is slightly different from the conventional projects of computer animation therefore my perceptions and documentation style will be considerably different as the general used commonly. One thing is mentionable that this chapter is a general description of my work without going in depth.

2.2 PROJECT PLAN

The overall project plan is divided into phase wise distribution mechanism. The major impact of this workflow on my working was of great help in synchronizing my work with time. Although, the task was not easy to execute in such low resources where I have got a single i7 machine but I tried my level best to generate the best possible output from my resources. I have divided my project into two phases which commence just after the project has been approved and ends with the submission. Both of these phases are subdivided into separate modules. These modules provide the basis of a linear as well as hierarchical approach to my project workflow.
This process model is referred to as Graphics Development Life Cycle (GDLC) will be discussed with details in Chapter – 3 – Working Strategies and Activities.

**Step Wise Distribution of Single Phase**
The main objectives that I was ought to achieve were to carry out the project with a preplanned architecture to make it more professional and regularize the work with time frames in order to complete it successfully on time. As shown in the figure 2.2 after the commencement of each phase, I made the estimations of the work distributed in the categories in their respective module. Now following that module I started related tasks to carry out.
Figure 2.2 shows my work plan

Time by time as the project commenced, I looked after my resources as being sufficient or not. If they were considered in-sufficient then the workload was re-sequenced. Later work was carried out and tested for quality. On success, the phase was finalized and I moved on to the next phase.

2.3 ESTIMATIONS

These estimations include Time Duration, Cost Involved, checking out the availability of resources, observation of market trends, as well as probability of future problems that are expected to be faced during the project work being carried out.

**Time Duration**

As I have decided to make the output merged of motion capture, VFX and 3d
animation so this time duration completely depended on how complex are my designs and how much time they take to render and what kind of effects I am applying. This topic is further discussed in Chapter 6.

**Costs Involved**

My main objective was to perform the work in low cost and limited resources so as to make it more practical. After aggregating all the equipment that I bought for the project including Portable DVD’s for writing the finalized output, USB for carrying data as well as some printing expenses, I have spent a sum of £50 approximately.

**Resource Management**

Resource Management was equally important to get a complete and working picture of the Movie. Most of my work load was divided according to time and priorities, the parts that included more time for rendering and generating were put on top priorities as compared to the tasks that don’t needed much time.

**Observation of Market Trends**

This is what I considered the greatest factor to be focused while making my project. As market is concerned, I have tried to build my project with most professional standards. These standards include the designing, usage of up to date software tools and applying most modern techniques to complete the cinematographic image sequences.

### 2.4 RELEVANT PRACTICES

Initially when the project started, there were several things that I have to take notice of. One of them was the training to accomplish the goals. For this purpose several tutorials were practiced by me in order to get hands on these techniques.

**CHAPTER THREE**

**DESIGN**

This chapter deals with the design strategies of how the work has been carried out during the period of preparation of the project. It tells us about the main activities that were involved in advancing the project. This chapter also includes a detailed study of GDLC (Graphics Development Life Cycle) which I have considered my route to accomplishment of my objectives. The methodology is discussed in general to give a knowhow of the project to the reader.
3.1 METHODOLOGY

The main idea of my characters was not based on anything really but it was just a mind built sketch to show any character as the main purpose was not to focus on the character but on its movement through motion capture. I just viewed some robotic and human models in order to get an idea of the structure and anatomy of these models. Most of my emphasis was on rigging and animation instead of modeling. Some models were designed to use in After Effects in order to generate the VFX on real life images and footage.

Mainly the techniques that are applied for the modeling of the characters and objects are the Polygonal modeling or Mesh modeling depending upon the geometry of the model. Also I tried to make the materials by the use of Photoshop so accurate to give the most realistic effect. Sometimes I have used materials instead of creating the whole 3d model as there is no need to focus that particular object and the material was giving same appearance as the physical model.

Moreover I created bones structure for attachment of the physique of the character, sometimes biped is also used instead of bones. This is done to provide the movement of characters more realistic and also to apply MoCaps to the models. The characters are designed using Polygons / Meshes.

As you can see in the GDLC on the right whole of my process goes sequentially as well as hierarchically. The main aspect of my work is priority assigning to the tasks. My work has been distributed in priorities so that I can start the more time consuming tasks first. Using this approach I can carry my work in parallel so that more and more of the work can be completed in the least possible time. It is notable that scenes will not be rendered sequentially but they will be combined later into one single movie with all the special effects and text etc.

3.2 GRAPHICS DEVELOPMENT LIFE CYCLE (GDLC)

Our project development cycle referred to as GDLC i.e. Graphics Development Life Cycle can be explained as a predefined sequence of steps that was built to help me in my project development and management to accomplish the goals more precisely and accurately.

3.3 PHASE DISTRIBUTION

The GDLC has been distributed in two phases. These phases are concerned with the nature of work that is being carried out in the specific process. These phases are as follows:

- Modeling & Animation Phase
- Rendering & After Effects Phase

If we closely observe the phases, it can be seen that each phase is distributed in modules of work. These modules are distributed inside the phase in a sequential pattern which
refers to the work done stepwise. It was also discussed in the previous topic, in the GDLC. For sake of correctness in the animation these phases are interlinked through distinct paths to return to a specific module as desired.

**Modeling & Animation Phase**

This is the first phase of GDLC. The first module is SKETCHING (Module). This refers to the initialization of the process and shows how the work starts and allows me to fulfill my initial requirements before further proceeding at advanced levels in the hierarchy. In the sketching process, after determining the Storyboard; comes the Blueprinting process. Note that Blueprints are the rough sketching and pictures made for anything that is ought to be modeled in the 3D space. It required the survey for the objects and the environments to be designed. After the Blueprinting / Sketching is been finalized we process to the MODELING (Module).

There are basically 3 main approaches to the models in our project.

1) Organic Modeling – refers to the modeling of living objects
2) Objects – refers to the Geometry i.e. real time objects other than Living Beings to be modeled
3) Dummies – Helpers designed to assist in the animation and movement of various objects in some specific manner.

Then comes the ANIMATION (Module). Animation is the intermediate process model on which the movie depends at the most. It allows us to use the modeled objects and helpers to produce some motion picture or a movie. It involves movement and synchronization of movement with sound (LIP SYNCH) and surroundings.
This process is redundant as well as in case of an error in the modeling phase I can proceed back to Modeling to check for correctness of design accordingly as to how the animation has to occur.

**Rendering & Special Effects Phase**

The second phase of the GDLC is that which deals with the after effects and outputting of the images into a motion video after editing.
The rendering phase is mainly considered with the final output of the model without any after effects applied. Formal definition of Rendering can be formulated as:

Rendering shades the scene’s geometry using the lighting we’ve set up, the materials you’ve applied, and environment settings, such as background and atmosphere. [1]

Rendering is the most essential phase of any animated design since it prepares the final output with all the maps and the realistic effects applied to the design. You can see in the figure 3.3 (a) which is the 3D model without the final result in 3D space. Whereas the figure 3.3 (b) is converted to a realistic image after applying the process of rendering onto it.

The second important module in this phase is the Special Effects module. These include Video posts, render elements and explosions. The video posts deal with the Atmosphere and color checks. The panel of Video Post provides the compositing for the rendered output of different objects, footages, bitmap images, image processing functions, and so on after which we comes the Render Elements roll out. Rendering to elements panel allows you to detach various information for rendering into individual image files so that it could be useful if you work with any image-processing or special-effects software. You may later do compositing with the element renderings.

Below given is the list of elements that you can choose to render individually from the add button:

- **Specular**: The specular component of the rendering
- **Diffuse**: The diffuse component of the rendering.
- **Self-Illumination:** The self-illumination component of the rendering.

- **Reflection:** The reflections in the rendering.

- **Refraction:** The refractions in the rendering.

- **Shadow:** The shadows in the rendering. This element helps to save black-and-white shadows only.

- **Atmosphere:** The atmospheric effects in the rendering.

- **Blend:** A custom combination of the previous elements.

- **Z Depth:** This is the grayscale representation of the Z depth, or depth within the view of objects present in the scene. The objects that are closer appear in white and the depth of the scene in black. The intermediate objects are shown in grey, the darker the deeper the object is within the view.

- **Alpha:** This is the grayscale representation of the alpha channel, or we can say transparency of the scene. Transparent pixels appear in white color (value=255) and opaque pixels in black color (value=0). Translucent pixels appear in gray color. The darker the pixel, the more transparent it is. The Alpha channel is useful for the compositing of elements.

- **Background:** This is the background of the whole scene. The other elements do not include the background. This element is useful if you want to use some particular background in whole scene. 3d Max do not trims the background with respect to geometry so the objects placed in the scene must be kept with proper color correction and angles so that they could blend easily with the background.

- **Ink:** This is the Ink component (borders) of Ink ‘n Paint materials.

- **Paint:** This is the Paint component (surfaces) of Ink ‘n Paint materials.

It is important to mention that I have placed render elements into the special effects category mainly because the Render Elements tab provide a customized rendering options which can be produced up to the requirement. Hence it may be considered separate from conventional rendering. This phase also includes the final editing and sound engineering to create a natural effect in the movie.

### 3.4 WORKLOAD DISTRIBUTION

The work was divided into time segments with respect to priority and time consumption. For example the 3D modeling process that took most of the time was started at the very first before anything else. This modeling was then followed by rendering of the shots and saving the shots for future use. After modeling and rendering I look on towards merging
and green screening on Adobe After Effects.

**Network Rendering**

When the project proposal was submitted, it was the main thing in my mind to perform the work on the cluster of computers. For me to implement this feature; I developed one network at my house. All necessary installation was carried out on me and my friend’s system from scratch to prepare both of pc’s them for being able to conduct the process of Network Rendering. Backburner, a Network Renderer developed by Autodesk Inc. was used on these computers to fulfill the speed gap as well as the project requirements for the successful accomplishments.

![ButterflyNetRender Network Setup](image)

Figure 3.7 Network Rendering [1]

The major procedure that the network renderer follows is that each workstation is assigned a task of single frame and different frames are sent to the different workstations. There are several advantages of using backburner rather than rendering on a single PC. First of all, the time duration cuts exponentially with the speed getting higher due to parallelism. Secondly incase if a terminal gets down, the respective job is transferred to some other terminal hence provides reliability in work and satisfaction to some extent against hazards. Network rendering uses multiple computers to perform rendering. Even
a small network of two or three PCs can save a lot of rendering time and help you in completing the project within the specific time. It is basically designed to render anything that is been setup in your file; that is, the viewport will be rendered, the camera views are rendered, and vice versa as saved in the main source file.
CHAPTER FOUR

SYSTEM SUBDESCRIPTIONS

This section explains the detailed description of raster and vector graphics / images. It also includes detailed notes on modeling, animations, lights, cameras and materials. My subsystem includes the designing of various objects and skills of animating them to give out a realistic effect. This section only presents the tools used and their descriptions inside the software other than the designing, modeling and animation of specific objects which will be discussed in the next chapter. In short, a complete know-how of the 3D space and concepts involved in various kinds of animation including the special effects production will be discussed herein. Most of this chapter has been collected from different sources including Libraries, Internet and Max Tutorials to develop the major concepts in the reader before proceeding to the next chapter.

Computer Graphics

Computer Graphics is the field of information technology in which computers generate two and three dimensional images that are needed in research projects, media industry, artists, architectural uses and many more. Due to computer graphics, it is very easier now to use any package due to its GUI (Graphical User Interface). Computer graphics has replaced the need to memorize difficult syntaxes and commands to perform operations but we can very easily perform those tasks with simple clicks on different buttons that are represented in the form of computer graphics.

Raster & Vector Graphics

Raster Graphics are those in which the images are generated and stored in the form of tiny dots that are known as pixels in graphics language. These pixels are arranged in rows and columns. In raster graphics, these kinds of images are treated as a bunch of pixels. Pixel is a short form of Pixel Element which is also called as Pel sometimes. In memory, the bit is the smallest unit, so in the same way, in graphics, the pixel is the smallest element that is used in creating graphics.

We can also represent image as a combination of two colors. For e.g.: The image in the range of gray color only.

Vector Graphics is another part of computer graphics that is used to determine the length, directions in which the lines will be drawn etc with the help of mathematical descriptions. In vector graphics, lines are used to create drawings instead of pixels as in raster graphics.

3D Concept

What is the common thing between all the objects present around us? There are about two or may be three things that are common in these objects. May be these things are very much same or very different from each other.
These things are the length, width and height. In 3D (shorted form Three Dimensional) space, these three dimensions are known as X, Y and Z axes that corresponds to width, length and height. If any object has got all these three components i.e. X, Y and Z axis, than it is known as 3D object otherwise its 2D or two dimensional.

**World Space Origin & Object Space**

Vertices that are represented by dots basically define the location of all points present in 3D space at some specific distance from the starting point which is called World Space Origin. The main concept is that any time we move, scale or rotate the object, its relative distance from the world space changes which gives the appearance of movement. The relative changes from the world space origins are carried out by the means of modifying edges, faces, polygons or elements. World space is the main universal coordinate system that is used to track objects present in the scene. If you look at home grid that is in the viewports, you will notice the world-space coordinate system. All objects that are present in your scene are located in world space by their respective position, rotation, and scaling (their transforms).

In comparison, object space tracks the location of everything that is applied to an object. The exact location of all vertices of an object, the position of modifiers, mapping of coordinates, and materials, everything is defined in the object space.

**Modeling**

The first step in a making an animated motion picture is the creation of 3D objects that will later be used to present the movement capabilities. The skin or surface of an object, such as teapot, is represented either as polygons or as a series of curved surfaces, normally triangles. The points present on object surface that are called vertices (as mentioned above), are represented in our computers by their spatial coordinates. Rest of the characteristics of the model, like the color of every vertex and the direction that is perpendicular to the surface of each vertex is called the normal. Polygons are not used to create smooth surfaces; so models that have more details requires a huge number of polygons to generate an image that looks smooth and natural.

Building models is actually sculpting of the digital 3D data. Normally a traditional sculptor always starts with his raw form like wood, stone or marble. Then applying certain techniques of chipping away at the mass gradually, he makes some desired sculptor of a real world object as a final result. Similarly to design a 3D model the modeler also always starts with a raw form, usually a box or a sphere on which some cutting, extruding, beveling or molding is applied to make a 3D object. The modeling of the models used in our movie will be presented in the next chapter with detailed views.

**Basic Tools for modeling in Max**

The Objects tab panel lets you create a number of geometric primitives as well as NURBS surfaces, Bones and dynamic objects.

The basic objects available in max for three dimensional objects after modification are:
- Box
- Cone
- Sphere
- Geosphere
- Cylinder
- Tube
- Torus
- Teapot
- Pyramid
- Plane
- Hedra

**Animation**

Animation came from the inspiration of human vision. If you see a series of still images that are in some connection with each other in quick succession, then your brain will perceive those images as a one continuous motion. Each image that is present in a timeline is called a frame.

In previous times, the major problem that came in creating animations was that the animator needs to generate a huge number of keyframes. It was depending upon the quality that is required, sometimes an animation of one minute may require between 720 and 1800 individual still images. Drawing of images by using hand is a difficult and time consuming job. This is the point where key framing comes in.

Mostly frames present in an animation are routing, the change in previous frame is directed towards the next frame after it, and they all proceed step by step to some predefined goal. In early times, the animation companies realized that if they allow their animators to draw only the important keyframes than they could save a lot of time and increase the productivity too. The team under the animators will then check the frames that are needed between those keyframes.

Nowadays, software works for us as our assistant. We perform like an animator and hence we create only the keyframes that mark and record the beginning and the ending of each transformation. The software then calculates the values present in between these keyframes that result in generation tweened animation.

**Traditional Animation Method**

In early times, the most difficult task in creating an animation was the efforts of the animator that needed to generate a huge number of frames. Sometimes, the animation of one second may require 30 individual images depending upon the requirement of the animation and its quality.

**Max's Key-Frame Animation**

After we drawn all the keyframes and the tweens, we need a rendering that will generate final images. Once all of the keyframes and tweens were drawn, the images had to be
inked or rendered to produce the final images.

The first and last keyframes record from the beginning of the transformation till the end of it. These transformations are applied on the objects or elements that are present in the scene.

Suppose you have got a teapot which is not yet animated. If we turn the Auto key to on and move the teapot from frame 0 (zero) to frame 20 (twenty) and also apply some rotation on x-axis, say 45 degrees. What will happen than key will be created between frame 0 and 20 for rotation as well as movement.

**Timings in Animation (Standards)**

Animation has got different formats. The most common are two formats that are used widely by the professionals. First one is film that is created at 24 FPS (frames per second) while the second one is NTSC (National Television Standards Committee) which is created at 30 FPS. 3d Studio Max is based upon time. It stores your times and animation values with its internal precision of 1/4800 of a second. We can change the configuration for time display as per our requirements.

**Lighting**

The 3d Studio Max has got lighting just as the normal life lighting works. Lights are objects that virtually imitate the behavior of our daily life lights such as lights in our home of office, the instruments of lighting that are used in media industry like TV channels etc, and also the sun itself in the 3D world (mostly). Every light object cast their own light in very different way, with respect to different real-world light sources. Lights are extremely important in any 3D design. A good strategy using the lights can upgrade the quality more than expected; conversely a poor level of Lighting can destroy the quality of the output of even a well modeled object.

If you don’t use any lights in your scene then the scene will be shaded or rendered by default lighting. We add lights in our scene to make it more realistic. With the use of light, the clarity of objects is improved. Also apart from general lighting, we can also use lights to project specific objects.

The Light objects as put in the scene, they replace the default lighting. Default light doesn’t work if you create even a single light in your scene. In the same way if you again delete all the lights, the default light will turn on automatically. Default lighting includes two invisible lights arranged in a way that one is placed left side above in the scene and second one is placed bottom side and right of the scene.

**Lights Available in Max**

There are three kinds of lights in 3d Studio max that are stated as standard light, daylight and photometric light. Each type is shown as light object in the viewport. They have got many parameters same including the shadow generators. But the daylight and the skylight have different parameters.
Standard Lights

The Standard lights are basically computer-based light objects which simulate our daily life lights like sun, lights used in instruments, lamps or lights used in our homes. Each light object casts the lights in its own way with respect to the light sources and objects present in the scene. Standard lights don’t have physically-based values whereas photometric lights have got these. There are a total of six types of standard light objects:

- Target Spot
- Free Spot
- Target Direct
- Free Direct
- Omni
- Skylight

Daylight Lights

Daylight lights are basically made up of two components: the sun and the sky. This system uses these two components to simulate sunlight. Below given are the photometric daylight lights:

IES Sun
IES Sky

We can use the daylight lights manually in the scene but if we require the best results, it's better that we use these lights with respect to the Daylight system. Daylight system merges the two daylight components that are sun and sky which allows you to set the date and the time positions along with the light type you want to use.

Photometric Lights

Photometric lights use photometric (light energy) values that allow us to define light more accurately and perfectly as they are present in the real world. We can modify their intensity, color temperature and other characteristics of the real-world lights. We can also render the scene to visualize and refine our scene. There are a total of six kinds of photometric lights:

- Target Point Light (Photometric)
- Target Linear Light (Photometric)
- Target Area Light (Photometric)
- Free Point Light (Photometric)
- Free Linear Light (Photometric)
- Free Area Light (Photometric)

Features of Max Lights

Intensity

HSV value of the light is known as its Intensity. The maximum value is (255) at which the light is brightest, whereas the (0) is the minimum value at which the light is completely dark.

A surface is fully illuminated when the angle of incidence in 0 degrees (that is, the light
source strikes the surface perpendicularly). There is no attenuation, and the light is white. Attenuation is affected if we increase the angle of incidence or if the light has got some color then the intensity of the surface can be minimized.

**Angle of Incidence**
3d Studio Max always uses a vector directing from the lighting object towards the face. It also includes face normal for the calculation of the angle of incidence.

We can say that the orientation and position of the lights with respect to the object are the things that control the angle of incidence.

**Attenuation**
3D Studio Max has got no attenuation as a default. For using attenuation in order to render some scene or shading, we need to turn it on for one or more than one lights. Every light in 3d max supports attenuation. 3d max allows us to control the attenuation that from which point it should begin and where it should end up.

**Reflected Light and Ambient Light**
If we render the scene with max’s default lighting, than we cannot calculate the effect that could be generated from the lights reflected from the objects present in the scene. This is why we often needs to add more lights in comparison with the scene that is lightened up by default lighting in our real world. We can use radiosity if we want to generate the results of the reflected lights.

The Ambient light affects the contrast. As higher we take the value of Ambient light, the lower the value of contrast will be. If we want to tint the scene then also the color of Ambient light is changes that affect the tint property. Sometimes Ambient light works as a bounced light and gets its color from the objects that are present in the scene.

**Color**
Normally the color of the lights comes from the process that generates the light. For e.g. suppose the lamp that is casting orange-yellow light, some cast blue-white light etc. The color of light also depends upon the medium by which the light passed through. For e.g. fog in the atmosphere in light blue day light.

**Cameras**
Cameras in our daily life use the lenses in order to focus the light that is reflected by the objects or by the scene on a focal plane as this plane as got a light-sensitive surface.

**Focal Length**
Focal length is the distance that is present between the lens of the camera and the light-sensitive surface. These deals with the scene of how much area should be covered and recorded. The focal length with lower value includes the wider scene in their angle as compared with the one with higher focal length. But one thing to notice is that focal length with lower value shows very good details of distant objects.

This is always measured in millimeters. Normally photographers use 50mm focal length lens. The lens having lower value then 50mm is known as a short or wideorange photography. The lens with more than 50mm focal length is known as long or telephoto
Field of View (FOV)
The field of view (FOV) allows you to control that how much area of the scene is visible. The FOV is measures in degrees of the horizon. The FOV is directly in connection with the focal length. For e.g., a 50mm lens shows 45 degrees of the horizon which means that the longer the lend will be, the narrower the FOV will be. Similarly, the shorter the lens will be, the wider the FOV will be.

Cameras available in Max
Cameras are used to represent a scene from specific point of view. In the camera viewport in 3d max, we can modify the camera positions because it gives us a view as if we are looking from its lens. This viewport is helpful in creating geometry or if we need to render a scene from specific any view. We can use more than one camera in order to render scene from different views.

3d max has got two types of cameras:
The first one is target camera. This is normally used to view the area present around a target of the camera. When we create a target camera in the scene, we see a two parts of the camera. One is camera itself and the one is its target that is represented by a small white box. When you create a target camera, you see a two-part icon representing the camera and its target (a white box). Both of these parts of the target camera can be animated individually. Target cameras are helpful in the scenes in which cameras has not got any path to follow.

The second one is Free camera. This is used to view the entire area present in the direction of the camera. When we create a free camera, it is represented by a single part as a camera icon and its angle. The icon of this camera is same as that of target camera but this one is without the target. Free cameras are useful when we have got a path for the camera to follow.

Materials
Materials are the property that helps to visualize the objects in a way in which it reflects or transmits the lights. We can play with textures, maps, reflections, refractions etc within a materials panel. Materials can also be defined as the data that is used to apply on surface or phases of objects so that how that objects appears upon rendering. Materials always affect the original color of the objects, the glossiness, the opacity and many more.

Material Editor
If managed properly, materials can provide realistic look and feel to the objects. Materials works in connection with light properties, shading and rendering gives us the feel of how the scene will look after rendering or we can get an idea of how that looks like in real-world. It also provides us functions in order to create and modify the maps and the materials.

We can apply textures and maps to modify the surfaces of the objects and to make them look realistic. The properties include texture, bumpiness, refraction, reflection, opacity etc. Many basic properties can be modified using a map. Any sort of image can be used as a map which will create some patterns based upon the parameters that we set. It has
also got a rat-trace map that is widely used for creating realistic reflections and refractions.

2D Maps

2d maps are the two-dimensional images that we map on the surface of our objects or we can also use as a scene background in environment map.

- **Bitmap**: It is basically a bunch of pixels that is saved as one still-image file. These formats include .jpg, .png, .tga etc or any animation file format such as .avi, .mpg, .flv etc.

- **Bricks**: This is used to create bricks like material with specific colors that we define or any other tiled materials. We can apply our colors and material maps.

- **Checker**: It is used to combine any two colors in a pattern of checker. We can use map instead of color also.

- **Combustion**: This is package that works in connection with discrete combustion. We can paint our bitmap directly or also we can paint our object directly and result will update the material editor and the scene.

- **Gradient**: Used to create the linear or radial ramp of three colors.

- **Gradient Ramp**: Used to create great ramps, in which we can use as many colors as we want, as many maps as we want and blends as we want to use.

- **Swirl**: Used to create swirled (spirally) patterns of two colors or maps.

3D Maps:

The patterns that are generated in all three axes i.e. X, Y and Z are called as 3D maps. The following is a list 3d maps that are available in 3ds max:

- **Cellular**: Generates a cellular pattern that's useful for a variety of visual effects. Including mosaic tiling, pebbled surfaces, and ocean surfaces.

- **Dent**: Generated three-dimensional bumps over a surface.

- **Falloff**: Generates a value form white to black based on the angular falloff of the face normals on the surface of the geometry. The falloff map provides greater flexibility when creating opacity, falloff effects. Other effects include shadow/light, distance blend, and fresnel.

- **Marble**: Simulates the grain of marble with two explicit colors and a third intermediate color.
- **Noise:** Noise is a turbulence pattern in a three dimensions. Like checker in 2d, it is based on two colors, either of which can be mapped.

- **Particle Age:** Alerts the color (or map) of a particle based on the particle's life.

- **Particle MBlur:** (MBlur is short for Motion Blur). Alerts the opacity of the leading and trailing ends of particles based on their rate of movement.

- **Perlin Marble:** An alternative procedural marble map with a turbulence pattern.

- **Planet:** Simulates the contours of a planet as seen form space.

- **Smoke:** Generates fractal-based turbulence pattern to simulate the effects of smoke in a beam of light, or other cloudy, flowing mapping effect.

- **Speckle:** Generates the speckled surface for creating patterned surfaces that can simulate granite and similar materials.

- **Splat:** Generates fractal pattern similar to splattered paint.

- **Stucco:** Generates a fractal pattern similar to stucco.

- **Water:** Creates watery or wavy effects by generating a number of spherical wave centers and randomly distributing them.

- **Wood:** Creates a 3D wood grain pattern.

**Other Maps**

**Compositor Map Types**

These are two types of compositions. In image processing, a compositing image superimposes two or more images to combine them.

- **Composite:** Composites multiple maps. Unlike Mix, composite doesn't have explicit controls for the amount of mixing. Instead, it bases the mix amount on the maps alpha channel.

- **Mask:** A map that controls where a second map is applied to the surface.

- **Mix:** Mixes two colors or two maps. You can adjust the amount of mixing of mixing using a blend level you specify. The blend level can be mapped.

- **RGB Multiple:** Combines two maps by multiplying their RGB and alpha values.

- **Color Modifiers:** These color modifiers are included:

- **Output:** Applies bitmap output functions to parametric maps, such as Checker, that don’t have these settings. These functions adjust the colors output by the
map.

- **RGB Tint**: Tints the color of a map based on red, green and blue values.

- **Vertex Color**: Displays the effects of assigned vertex colors in the rendered scene. You assign vertex colors from the editable mesh.

- **Other**
  These include the map types that generate reflections and refractions.

  - **Flat Mirror**: Generates reflections for flat surfaces. You assign it to faces rather than to the object as a whole.
  - **Raytrace**: Creates accurate, fully retraced reflections and refractions.
  - **Reflect/Refractions**: Generates reflections or refractions automatically, based on surrounding objects and the environment.

  - **Thin Wall Refraction**: Generates refractions automatically, simulating objects and the environment as seen through a refractive material such as glass or water.

**UVW Wrapping Coordinate Channels**

Every object in the scene can acquire 1 to 99 UVW mapping coordinate channels. The mapping by default will always be UVW 1. The map modifier of UVW can export the coordinates to any of these channels. The maps present in material can use any UVW channel.

**Compositing**

After all the models are completed and checked, the scenes are rendered into short sequences of animation called clips. These clips may be in the form of avi, tga (sequences) or some other codec and saved separately. Now comes the compositing phase.

Each video track in the Timeline window contains an alpha channel that stores transparency information. All video track frames are completely transparent except where you've added opaque content such as video, still images, or titles. You can make areas of opaque content partially or completely transparent by adjusting a clip's alpha channel or applying a matte or key to a clip. Clips on upper tracks cover clips on lower tracks except where alpha channels indicate transparency. Adobe Premiere Pro composites clips from the lowest track up, and the final video frame is a composite of clips on all visible tracks. Areas where all tracks are empty or transparent appear black.

Compositing can be taken as a general term to refer to the videos and sound mixing operations and arranging different scenes in orderly fashion so as to get a meaningful motion video. We will not be going in extreme detail to these concepts but to get an idea it is good to mention them.

Apart from general definition, compositing is the process of creating a composite image by superimposing multiple images. Because video frames are completely opaque by
default, compositing requires that parts of video frame be transparent. When part of a clip is transparent, transparency information is stored in the clip's alpha channel. You can combine partially transparent clips using stacked tracks, and use a clip's color channel to create and effect in a clip on a lower track. It includes the following concepts.

**Alpha Channel**

It is the channel that defines transparent areas for the clip that contains the channel. The alpha channel is an extra channel in addition to the visible color channels (such as RGB). While the alpha channel indicates transparency, the channel itself is usually hidden. The alpha channel can store the clip and its transparency both, without affecting the original color channel of the footage. You can also ignore an existing alpha channel and use Adobe Premiere Pro transparency effects to create a new one. When you view the alpha channel in the Monitor window (see choosing a Display Mode setting), white areas indicate opacity, black indicates transparency, and gray indicates partial transparency. Because an alpha channel uses shades of gray to store transparency information, some effects can apply a grayscale image (or the luminosity values of a color image) to an alpha channel.

**Mask**

Sometimes used as another word for alpha channel; also describes the process of modifying an alpha channel.

**Matte**

The Matte is the property by which we can identify the areas that are transparent in the clip or in the image. We use matte generally if we have got a channel or a clip that identifies the transparency area more better than the alpha channel or sometimes if the clip or image don’t have the alpha channel included.

**Keying**

Keying is a technique in which we define the transparency by any particular color or the brightness to an image. The pixels that match with the color of the key becomes transparent. We use keying to remove the background with any uniform color, for e.g. green screen.
CHAPTER FIVE

DESIGN & PERFORMANCE ISSUES

This is an extension of the previous chapter. After the reader gets an idea of all the tools and concepts used in the system, we proceed with the arrangement of the scenes in the movie and the making of the objects will be discussed. In the starting of this chapter the ER model has been presented and according to the flow of this model goes this chapter in sequence. Note that this chapter only briefs the designing procedures and their performance & impacts on the results in the project without going deep down the rabbit hole like Alice.

5.1 Entity Relationship Model

According to the entity relationship diagram shown in figure 5.1 the whole of our process is mainly dependent upon priorities. It starts with the storyboard that has been made in accordance with the specified requirements and standards.

![Diagram of Entity Relationship Model]

Figure 5.1 as shown the flowchart of my work priorities

The scenarios are of equal importance because on the basis of these situations the models, animation and environments are designed, rendered and after composition converted into a full featured movie.
5.2 Animation
Animation is the major part of my project and is the last module of Phase 1. According to the GDLC discussed in Chapter 3, the animation in my process is a repeated approach to which I return when required.

Conventionally, animation is the process of giving life to objects in the 3D world (mostly) if 3D animation is considered. Animation engages various types of movement. It may be as simple as a ball bouncing, or as difficult as a person speaking virtually on the words. Be it a simple one or something complex the main concept behind the animation is the change of image periodically to show something in the action (the concept of CEL animation). Some of these techniques are discussed below:

5.3 Tweening
Tweening is a simple concept. I will not go in details here since all these concepts are already discussed in Chapter 4 but it’s mentionable that when something moves mostly a tweening process is applied.

The concept of tweening has not been used in my movie as it was not required.

5.4 Character Animation
The character animation is one of the most challenging situations for any movie. For character animation it is required that all the characters must imitate the actual humans or living beings. Character animation is not restricted to only humans. A butterfly flying in the forest or a cat running away from a dog is also considered in character animation.

The character requires two kinds of animation:
1) Movements like walking, jumping, running etc
2) Lip Synching (speech)

5.5 Movements of Characters
Although movement of characters can be performed manually but it is mostly carried out by using MoCaps, so that it controls the character accurately and smartly. A biped character (raw character object provided in 3d Max) is shown in the figure below:
The movement of the character in my project is done through the use of MoCaps.
CHAPTER SIX

PROJECT ESTIMATIONS

This chapter deals with the predicted requirements before the starting of the project and the actual outcomes observed during and at the finalization of the project. The predictions were mainly based on the logical estimations but differences were experienced at some level.

What are Estimations?
Predictions made at some level about the future outcomes of any process or the resource that may be used for the production can be termed as estimates. These estimates may be in the form of calculated solutions, algorithmic results or purely conceptualized thinking. Whatever be the case estimates provide a great deal of help to achieve the desired results.

Estimations can be of time duration, processing cost, future problems etc.

My Estimations
When I started the project, certain predictions and estimations were made depending on the production costs, rendering time, design complexity and expected problems.

6.1 Production Cost
Production costs are the major estimations of costs that are related directly to the production process. These may include the cost of the software needed to carry out the project, the hardware purchased. The expenses may also be related to the marketing of the project etc.

The project of 3D animation is one of the most expensive projects. There are mainly two reasons of that. First is that the cost of the software related to the processes are very high. Secondly, to achieve the desired high quality output, special purpose devices are available in the market as well as high speed machinery is also one of the most important requirements. A commercial project in 3D may consume thousands of pounds or even more to get standard outputs.

At the student level, definitely I cannot put up such high budgets, but worked on alternatives. The required software were mostly available as a free for student purpose. To balance out the speed difference I used cluster based rendering instead of 3D Graphic Acceleration Cards. To keep up the speed there was one more consideration that I had to take under notice i.e. design complexity (It will be discussed in the next topic). Clustered Rendering is a technique used extensively in the market to substitute the speed gap and accelerate the production process.

The major expense that was carried out in this project was buying of cables for building up the cluster. The cost of print outs, posters and DVD’s is also included. Hence a total of approximately £100 was spent on the project collectively but this rate does not include the costs of the software as they were on student license and were free to use.
6.2 Rendering Time
The rendering time is also a major factor in the designing of an animated feature film. The rendering time depends upon the speed of the available equipment and the nature of designs. Now a days, Dual Processor Pentium 4 systems and Macintosh systems are being used extensively in the market for managing 3D projects. Different Graphic Accelerator cards are also available to speed up the rendering process. These include NVIDIA, Trident, G-Force and Creative's 3D cards.

According to my estimate the shots were about to take 10 days to complete the rendering process. This estimation was a bit deviated at the end and was a considerable problem that I faced.

6.3 Design Complexity
Design Complexity can be defined as the level of meshes or weight of the modeled objects should be kept low to achieve a high performance of the systems. By weight I mean that the patch net making up the object should be simple.

It was my initial decision that I have to make the models as simple as possible without compromising the quality of the objects and to a certain extent I succeeded in achieving this objective. As you can see in the objects shown in this report in the previous chapter, most of the objects in the project are based on low polygonal network and the particle system that I used is also not complex.

6.4 Deviation from the Actual Estimations
I cannot present calculated values or formulated equations for future estimations rather only logics may be used in my case, due to the nature of the project. The most deviation appeared in the Rendering Time duration. This mainly happened because certain restrictions got involved eventually in the project. These include the System Failures, Time Management and the system's speeds. Due to these reasons, I have excluded two more footages that I was planning to complete.

6.5 System Resources
The System Resources means the machinery, tools (mostly software in our case) and manpower which is required to build up any project. Each of these things has their own importance. Absence of any required resource may end up in some flaw, delay or difficulty in making the project.

Required Resources
The system level resources that were required for the project for good output include:
- 6 - 8 Pentium IV Systems minimum 2 GHz
- 3D Cards / Powerful Video Accelerator and card can also be used
- RAM 2 GBs or above
- 80 - 120 GBs of Hard Disks
- Ethernet / Network Connections
- I/O Devices
- Essential Softwares (Topic 1.5)

Resources Used
The devices that were available to me for the completion of project are:
- 2 Pentium IV & 1 Core i7 Laptop
- 1GB VGA Card
- RAM 4GB maximum
- 120 GB Hard Drive
- Ethernet available
- I/O Devices
- Essential software
CHAPTER SEVEN

EXPANDIBILITY, RECOMMENDATIONS & CONCLUSIONS

Every project has some margin of enhancement in the future. This chapter deals with the future enhancements that can be made to the project and recommendations that are crucial for discussion.

7.1 Expandability
All projects possess great level of expandability but the approaches to various projects are different. These approaches may depend upon the nature of the project, behavior of the project or level of perception of the students or the project members.

Expandability is sometimes replaced by flexibility in the project. Flexibility means adoptive nature of the project that can highly effective in various situations. More flexible is the software, more the users get attracted to it.

How can my Project Enhance
3D concept provides a greater level of observation and creativity in a person. The expansion in my project may be carried out in creating some proper story that includes VFX and motion capturing. My perspective was to create awareness among my juniors that they must try to work on VFX along with 3d animation and also try motion capturing thing as our university has got motion capture studio now and they can practice over there. The enhancement may also be carried out in refining my effects and models to do much better in the field of Graphics.

7.2 Recommendations
Graphics requires greater level of consistency and observation telling you how you perceive the world around yourself. To develop in this field the first important requirement is to increase the observation of oneself. Secondly, Graphics also requires greater concentration and imaginative thinking. To do better than what I did in the project, the models must be kept simple and the quality must be kept high using the meshes. For VFX, the higher amount of RAM is required and bit more particles to generate realistic effects. To finish the work in lesser time greater number of PC’s will do a good job.

7.3 Conclusion
The project was an attempt to generate the VFX content that is being widely used in media industry these days. I have tried to merge the motion capture data with real footage in order to generate special effects content. The Motion Capture was an entirely new for me and I have learned in university recently about it. It took a lot of time to get my hands on controlling MoCaps with 3d models as I didn’t had any prior knowledge or experience of working with motion capture. Due to lack of resources I couldn’t practiced the motion capture device but I learned how to use the captured data with our models.

The university has got labs for motion capture but for some reasons we haven’t visited the lab a single time. I had plans before starting my thesis to record my own MoCaps in
the lab so that I can learn to use device as well as the cleaning of motion captured data. There are several companies on internet which sell their captured MoCaps online so I bought some MoCaps online which are not expensive but in fact they are quite cheaper.

Using motion capture data with the skeleton and bones system gave me good knowledge of using MoCaps. I used simple camera without a tripod stand for recording my shots. There was no proper lighting and all shots were recorded in daylight system. Some shots were recorded five times in order to achieve what I required for the composition. But overall process of my thesis gave me experience of how to use camera, lighting, angles in order to use footage for VFX and also apart from this I learned a lot of major techniques for polishing the composition part.
CHAPTER EIGHT

PROJECT SCHEDULE, REFERENCES & APPENDICES

This section consists of project scheduling, some references and glossary of the terms that are being used in our report.

Project Schedule

Timing Analysis
Below presented is the approximated time chart of our project. Note that these values presented in the diagram are approximated apart from the time taken in examinations and other schedules. This diagram is presented in the number of percentage total hours that each module took to complete out of approximately 480 hours.

Time Analysis

Bimonthly Progress Reports

8.1 PROGRESS REPORT 1:

Introduction

As you know that I have selected the project a VFX Content Generation, there are three Phases which I consider as our primary concern. These are:

• Ideas, Analysis and the Modeling Phase.
• The Animation and Rendering Phase
• Special Effects, Final Render and outputting for Media Player.

In this report I look at the in-depth details of three above mentioned Phases. My main objective is to complete the 1st phase in first month of the dissertation and the other two phases in the remaining two months. In this report, I have entered all the details of the accomplishments and difficulties faced and the priorities assigned to the different tasks on the basis of time consumption. Keeping in view the completion deadline for the first phase, I tried to complete the task before the targeted timeline so as to get more time for next phases that included rendering.
8.2 Date Wise Distribution

This section of the report gives a detailed layout of the date wise distribution of work. Let me begin the review as follows:

**Brief Description - 8th June**

I completed my some tutorials for VFX and started to search for my footage and photos in order to start working on them.

**TARGETTED AREA**

-------> **Ideas and Storyboard**

The main issue of this day I thought was the idea for the footage and settlement of the storyboard. A rough sketch of the storyboard was made depending on the different ideas that I got inspired from some of the movies. The requirements were also noted down that were involved in the completion of the project.

At the end, I end up with some storyboards and ideas that I thought I can generate for special effects. The main problem was to record some clip with green screen and for that, I thought to search internet for free to use available footages with green screen background so that I can apply my effect on to it.

Difficulties and problems noticed this day are defined in the Logging Sheet 1 in a more detailed form.

**Brief Description - 22th June**

**TARGETTED AREA**

-------> **Cost Estimation**

As moving on with the ideas and storyboards, I came to this point to estimate my cost in order to fulfill my requirements. What I needed to buy that I cannot do by myself like MoCaps, shall I need any 3rd plug-ins, or I may need to buy license for any product. When all the data was collected, the first priority was to buy MoCaps as I found that software are available on student license but not MoCaps.

Difficulties and problems noticed this day are defined in the Logging Sheet 2 in a more detailed form.

**Brief Description – 1st July**

**TARGETTED AREA**

-------> **Models and Gantt Chart**

The main target for this day was an overview of the analysis that was done in previous days. The analysis reports mainly consisted of the searches which showed a great deal of help materials, tutorials, online meetings with professional designers to learn about their working strategies. Some very useful searches were found for the use of MoCaps and its future developments that are on the way now a days.

After finalizing the analysis phase, practical assignments and tasks were prioritized
according to the time consumption for the development and the output. These tasks are concerned with the Story Boards, Materialization, Modeling, and Final Compositing of the footage.

**Brief Description - 15th July**

**TARGETTED AREA**  

--------> Requirement Analysis & Practical Startup for Compositing

The main focus on this day was the practical startup of how and where to start the practical work for compositing phase. I worked out on installations of the PC’s and make them ready for batch rendering process. In the same time I also make some rough footage for my final idea of project.

Coming to the work regarding the project, storyboards were completed by this day and also the rough sketches of what type of effect I want to apply on the footage was also drawn. The Modeling of the character is still under progress but almost 70% completed. I am also trying to find some sound samples in order to make my output feel more realistic.

This report has been made on 25th July 2011 in which all the logging sheet data was aggregated, descriptions were noted down for this report and the data is collected. I am sending the copy of this report to Mr. Edmond Prakash to have a review of what has been done so far.

### 8.3 DISSERTATION

**BI-MONTHLY PROGRESS SHEET**

**PROJECT TITLE:** DESIGN & IMPLEMENTATION OF A PROCEDURE FOR VFX CONTENT GENERATION

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<thead>
<tr>
<th>Task(s) Prioritized</th>
<th>Status of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Survey</td>
<td>Completed</td>
</tr>
<tr>
<td>• Research</td>
<td>Under completion response</td>
</tr>
<tr>
<td>• Modeling of Character</td>
<td>No</td>
</tr>
<tr>
<td>• Survey</td>
<td>Completed</td>
</tr>
<tr>
<td>• Research</td>
<td>Under completion response</td>
</tr>
<tr>
<td>• Sketching</td>
<td>No</td>
</tr>
<tr>
<td>• Survey</td>
<td>Completed</td>
</tr>
<tr>
<td>• Research</td>
<td>Under completion response</td>
</tr>
<tr>
<td>• Contact Professionals</td>
<td>No</td>
</tr>
<tr>
<td>• Survey</td>
<td>Completed</td>
</tr>
<tr>
<td>• Research</td>
<td>Under completion response</td>
</tr>
<tr>
<td>• Contact</td>
<td>No</td>
</tr>
</tbody>
</table>
**Overall Status of previous Bi-monthly assignment.**

- Completed
- Under completion
- No response

Almost completed to 90% of the project task.

**Tasks for the next two months till completion:**

Character, Rendering, Compositing and Test Animation

It is projected that in the next two months of my project, I will be mainly considering on the following sections:

- **Character** modeling is one of the toughest jobs considered in 3d modeling. Character after its modeling, goes to rigging phase and then finally goes for texturing. As I am using MoCaps for animation so after rigging, I don’t need manual animation for that. I will apply the pre-captured MoCaps for animation that will make my work really easy and will save a lot of time.

- **Rendering:** I am rendering alpha-channel shots in order to merge them with my footage and pictures in Adobe After Effects i.e. my compositing phase. Shadows are also generated separately which will be then merged with colored outputs and finally I will apply color correction and final touches to them.

- **Compositing** is the most lengthiest and time consuming phase of my project. As I want my generated output to be real looking so proper color correction, merging of models with footage and images, and finally most important merging of special effects. I am trying to give as much time as I can to this phase as this is the main target of my project.

- **Test animation** requires a test rendering of the modeled objects. Note that, it is not the final render. According to my idea, I will try my level best to achieve the test animation phase so that when the final phase of my project starts, I will be sufficient with the knowledge of how my character is capable of giving a quality output and after this I can estimate how much time the final rendering will take.

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**8.4 DISSEMINATION LOGGING SHEET 1**

**Date:** 12\textsuperscript{th} June, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

**TASKS TARGETTED:**

The main issue targeted was the idea for the footage and settlement of the storyboard. A rough sketch of the storyboard was made depending on the different ideas from inspiration of various movies. The requirements were also focused that are involved in the completion of project.
The details of the topic are mentioned earlier in this report.

**QUESTIONS/PROBLEMS:**
Idea was going out of budget as well as the time which is my primary concern for the completion of the project in time.

**REMEDY / RECOMMENDATIONS:**
I thought different approaches to achieve my objectives. I consulted different external professional designers and searched methods on the internet and so the remedy of this difficulty was found soon.

---

**DISSERTATION LOGGING SHEET 2**

**Date:** 20th June, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

**TASKS TARGETTED:**
I looked over the expenses first as I got a solution for my MoCaps, I need to buy pre-captured MoCaps from external company. When all the data was collected, I sorted out everything that matched my idea and was useful for me.

**QUESTIONS/PROBLEMS:**
1) The major problem that I faced was that the authorized personnel were not available. My main requirement is to talk and discuss my idea and seek some guidance from them but due to their jobs, it took some time to reach them and getting reply back.
   2) Another problem that I faced was batch rendering PC’s availability. The PC’s are not free all the time for use and also they are not at home so I need to visit the location for rendering that was really far from my place.

**REMEDY / RECOMMENDATIONS:**
I have got a friend in my home country which helped me in contacting some professionals and that’s why I was able to contact them within time.

The problem of PC’s was solved when I discussed with my employer and he gave me permission to use two PC’s of his office after job timings.
**News Brief**

**Date:** 5<sup>th</sup> July, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

**TASKS TARGETTED:**
I overviewed the analysis reports that were done till the time. The analysis reports mainly consisted of the data that was downloaded and selected for use. It also contained some guidelines which were given by professionals in the industry.

**QUESTIONS/PROBLEMS:**
Practically I faced no such problem in this section. The analysis was a bit time taking but it was managed to complete somehow.

**REMEDY / RECOMMENDATIONS:**
After these analysis, I bought an external hard disk of 1TB in order to save my backup source files, rendered outputs and downloaded MoCaps. As far as the reports are concerned these analysis reports will continue in the future as well as they are a nice source of collected data.

---

**Dissertation Logging Sheet 4**

**Date:** 22<sup>nd</sup> July, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

**TASKS TARGETTED:**
I checked the downloaded MoCaps as sometimes it happens that MoCaps contained some garbage data and it needs to be cleaned. I am unable to clean the data at this stage so I sorted out the data that is useful for me separately. The rest of MoCaps are saved for future use if needed somewhere.

**QUESTIONS/PROBLEMS:**
The problems I faced in MoCaps part was that I was bound to use pre-captured MoCaps so I cannot apply my own motion that I thought, I can only use the motion which are available to me on MoCaps. Although our university has got motion capture device and lab but due to some reasons we are unable to use that. In fact the motion capture lab, we haven’t visited it a single time.

**REMEDY / RECOMMENDATIONS:**
I just given some time to MoCaps, and checked them on 3d Max’s biped. The motions that are useful for me are copied into separate folder whereas the rest are kept saved somewhere else.
PROGRESS REPORT 2:

Introduction:
As was also mentioned in my previous report I have selected the project a MoCaps and VFX Content Generation, so there are 3 Phases which I considered as my primary concern.

In this report I, will be discussing the arrangements and the work that was done for the poster designing and also the compositing of my footage with special effects.

Date Wise Distribution

This section of the report gives a detailed layout of the date wise distribution of work. Let me begin the review as follows:

Brief Description – 5th August

Thought of some ideas for poster and worked out on special effects.

TARGETTED AREA --------> Ideas and Storyboard

I am thinking of some ideas for poster designing as I need to define my process that I am following for my project in pictorial way. First I looked up the guidelines given by university for designing. I am thinking to draw some vector based layouts in order to clearly convey my process to the viewers. I am attaching some snapshots from my artifact and trying to draw a flow chart kind of diagram so that my process could be clearly shown step by step. In the same time, I am generating rendered outputs for test rendering. The PC’s for batch rendering are available after a week i.e. from 10th of August so I will start heavy batch rendering there. Some workout on character animation using MoCaps is also in progress.

Brief Description – 30th August

TARGETTED AREA --------> Printing quotation, Work Analysis

The main thing focused here is the quotations for the printing of the poster and some other expenses needed on submission. I also looked some other posters related to my project in order to get an idea of how can I make it delivering and simple. The main guidelines are provided by the university so there is not enough to work for. I visited some outlets in my area and I set the cost of approx £100 will be enough for everything needed.

The second thing that is focused is the work analysis that is being done till date and how is it proceeding. I am rendering objects with different angles for and also with different lighting and color correction so that they are merged without coloring errors.

Brief Description – 22nd September

TARGETTED AREA --------> Professionals Opinion, Finalizing Outputs
The main thing focused is to show my progress and some output till date to the professionals with whom we talked. One of them asked me certain questions about the project which I replied to him and he advised me about some errors that I was making and it was consuming more time. They also told me some tricks and tutorials for Adobe After Effects which helped a lot.

I also focused the work done so far and reviewed the check list of the work done. The materials and the models were reviewed and I noticed that the modeling phase is almost completed and VFX phase is on its way to completion.

**DISSECTATION**

**BI-MONTHLY PROGRESS SHEET**

**PROJECT TITLE:** DESIGN & IMPLEMENTATION OF A PROCEDURE FOR A VFX CONTENT GENERATION

<table>
<thead>
<tr>
<th>Task(s) Prioritized</th>
<th>Status of Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Data Finalizing Graphics Aggregation Modeling Character Animation</td>
<td>➤ Completed response Under completion No</td>
</tr>
<tr>
<td>• Modeling Sketching</td>
<td>➤ Completed response Under completion No</td>
</tr>
<tr>
<td>• MoCaps Test Getting New Tools Required</td>
<td>Completed response ➤ Under completion No</td>
</tr>
<tr>
<td>• Poster Designing Verifying Checklist</td>
<td>➤ Completed response Under completion No</td>
</tr>
</tbody>
</table>

**Overall Status of previous Bi-monthly assignment.**

Completed ➤ Under completion No response

Almost completed to 85% of the project task.

**Tasks focused for the remaining time:**

**Test animation, batch rendering and compositing**

It is projected that in the remaining time of my project, I will be mainly considering on the following sections:

- **Test animation:** It is compulsory for me to do test animations so that I can check and review my work. I also started merging of scenes in After Effects for color
correction and VFX. Note that it is not the final render.

- **Batch rendering:** Batch rendering is being done in my office and also at home with roommate’s PC but the main rendering was done in office.

- **Compositing:** I am merging my footage with the model and trying to apply realistic effects related to my idea and storyboard. The effects although taking a lot of time but when it comes to output, I am really getting close to my required results.

### DISSEPTION LOGGING SHEET 5

**Date:** 15th August, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

<table>
<thead>
<tr>
<th>TASKS TARGETTED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I focused on my project designing cost and also look other expenses keeping in mind that the work should not be delayed during printing quotations. Took some quotation from the shops nearby and finalized the one that suited me.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>QUESTIONS/PROBLEMS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practically no problems were faced. The media analysis was put up for the printing of poster. I collected the media samples and made a cost analysis report for different types.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REMEDY / RECOMMENDATIONS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I tried to make my poster competitive and to show professionalism in my work. It was also projected that my work will take about 5 weeks to complete finally if I go on with the same pace.</td>
</tr>
</tbody>
</table>

### FYP MEETING LOGGING SHEET 6

**Date:** 2nd September, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

<table>
<thead>
<tr>
<th>TASKS TARGETTED:</th>
</tr>
</thead>
<tbody>
<tr>
<td>I made a feasibility report for my budget and also sorted out the media, ideas and methods for designing my poster. I was trying to convey my idea and process in a pictorial view. My poster should tell visually of how and what I have worked on so that’s why I was really focusing on poster too with my project.</td>
</tr>
</tbody>
</table>
QUESTIONS/PROBLEMS:
Practically no problems were faced.

REMEDIY / RECOMMENDATIONS:
The printing size was given by university i.e. A1. So there is nothing more to worry about sizing etc.

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Dissertation Logging Sheet 7

**Date:** 22\(^{nd}\) September, 2011

**Name of the project:** Design & Implementation of a Procedure For VFX Content Generation

**Tasks Targetted:**
In the first half of the working time I had meeting with some professionals in the industry. I showed them my work done yet including the model, story boards, idea and method to achieve that.
Now I am working on compositing phase as this is time consuming task for giving realistic results. Its rendering doesn’t take much time but working does take.

**Questions/Problems:**
Practically no problems were faced.

**Remedy / Recommendations:**
Reviewed my progress in relation with the suggestions given by professionals and rectified few errors that I noticed. Character modeling and rigging is finalized; MoCaps are completed; now the merging of scenes with proper color correction and finalizing the effects is on its way to completion.
REFERENCES


LINKS:

APPENDICES

APPENDIX A

Project Proposal: The Project Proposal document has been given in CD.

APPENDIX B

Interim Report: Interim Report is also given in CD.

APPENDIX C

Project Poster

APPENDIX D

A CD is enclosed along with this thesis report; it consists of the following Files and Documents in it.
1) Adobe After Effects Source Files
2) MoCap File
3) 3D Studio Max Character
4) Recorded Footage
5) Interim Report
6) Project Poster