Concerning the field of digital signal processing

Media, Television

College of Engineering ELECTRONICS AND COMMUNICATIONS ENGINEERING NDC Compound, *Anonas* St. Sta. Mesa, Manila {draw: line} Research Work with Defense Submitted By: Group 3 - Alpha Signal Rho BSECE IV-1 Leader : SANTOS, Ralph Rhyan G. Members: BELANO, Gracielle D. ESPINOSA, Joey Q. HERNANDEZ, Jan Roldan B. MATIC, Millicent G. RIVO, Sarah Ezekiel M. VILLENA, Kane Dave R Engr. Gerhard P. Tan Instructor Introduction It is known that our fast-paced emergingtechnologyhas been able to give us anything that we wish.

Concerning the field of Digital Signal Processing, our latest technology has been able to give birth to many new forms of media file format both in audio and video. A few number of groups tried to produce different media file formats that would be of their greatest preferences but a certain group known as the Moving Picture Experts Group with the combined help of different professionals all around the world were able to create several media file formats that are of great use and in many ways universal. These said formats were then treated as the standards and then were implemented and it was used worldwide.

After being assigned a certain file format per group, the certain multimedia file format that will be discussed by our group in this paper is the MP4 file or the file extension format known as . mp4. It is known that the . mp4 file format is the multimedia file container format for the MPEG-4 so some topics about MPEG-4 will also be discussed. Also, we will feature its history, applications, advantages and disadvantages and as well as the future for this certain file format. Different issues surrounding the main topic will be tackled as well and will be explained with the full extent of our capabilities.

This research work was designed for students like us to gain new knowledge and discover the fundamentals behind the different technological advancements that we are already enjoying. It could be taken in account that all of our group members participated and did their part in constructing this research paper. History MPEG-4 part 12, which is known as ISO Base Media File Format, was originally the 1st version of the file format for MPEG-4. It was based upon Apple’s QuickTime container format. Afterwards, this part was then revised and thus giving birth to the MPEG-4 part 14 which is the MP4 file format.

This occurred in the year 2003 wherein the difference between the two is the Part 1 or the System Standard. The first version then became the basis for many other file formats that were released afterwards. Theories and Principles What is MP4? {draw: frame} IV. Interact with the audiovisual scene generated at the receiver’s end. MPEG-4 Standards The basic components of streaming media are encoders, servers and players. The encoder compresses the video and distributes the compressed video to players that decode and render it. For interoperability the overlapping areas in Figure 2 need standardization, that is file formats, protocols and codecs.

The MPEG-4 standard covers it all. {draw: frame} Figure 2 – Streaming media components More recent parts added into MPEG-4 are: • Part 9: Reference Hardware Description", Phase 1 Hardware Accelerators, Phase 2 Optimized Reference Software integration through Virtual Socket • Part 10: Advanced Video Coding (as discussed below) • Part 11: Scene description (to be split off from part 1) • Part 12: ISO Media File Format. • Part 13 : IPMP

Extensions. • Part 14 : MP4 File Format (based on part 12). • Part 15 : AVC File Format (also based on part 12). • Part 16 : AFX (Animation Framework eXtensions) and MuW (Multi-user Worlds). Part 17 : Timed text subtitle format • Part 18 : Font Compression and Streaming • Part 19 : Synthesized Texture Stream • Part 20 : Lightweight Application Screen Representation (LASeR) • Part 21 : MPEG-J Graphical Framework eXtension (GFX) • Part 22 : Open Font Format Specification (OFFS) based on OpenType • Part 23 : SymbolicMusicRepresentation (SMR) {draw: frame} Figure 3: Classification of MPEG-4 Toolset {draw: frame} Figure 4: The parts of MPEG-4, the arrows represent flow of bits Because of its universality and flexibility, the MPEG-4 could be applied almost everything.

Of course, since there are media files that do not make use of all the tools provided by the MPEG-4, it resulted in the creation of different profiles. Such profiles are classified according to the tools that they make use of. In general, the different file formats that could contain the MPEG-4 system are as follows: . m4a – media container for raw audio only . m4v – media container for raw video only . mp4 – media container for audio, video and still images . 3gp & . 3g2 – media container used in cellular phones Data Streams • Still images (e. g. as a fixed background); • Video objects (e. . a talking person - without the background; • 2–D and 3-D objects such as those used for animations; Audio objects (e. g. the voice associated with that person, background music) Every single one of these media objects present when gathering them in MPEG-4 are stored individually into what we refer to as “ data streams”. In MPEG-4, every object is tightly coupled with a stream: such binding is made by the means of the Object Descriptor Framework

which links an object to an actual stream. This design seems obvious for video objects that rely on a compressed video stream.

It has been pushed a bit further: the scene description and the description of object descriptors are themselves streams. In other words, the presentation itself is a stream which updates the scene graph and relies on a dynamic set of descriptors, which allow referencing the actual media streams. These design principles can be summarized in the following figure, which gives a visualization of a scene. {draw: frame} Figure 5: An MPEG-4 scene aggregating different media streams Different objects can be encoded and transmitted separately to the decoder in their own elementary streams.

The composition only takes places after decoding instead of before encoding. This applies to both visual objects and audio alike. In order to do the composition, MPEG-4 includes a special scene description language, called BIFS, for binary Format for Scenes. Atoms After the streams are collected, they are then stored into object – oriented structures called “ atoms”. These atoms are what primarily compose an MP4 file. The type field is usually four printable characters. Atom structured files are used in a number of applications, and it is possible to form multi-purpose files which contain the atoms required by more than one specification.

Examples include not only the ISO Base File Formatfamilydescribed here, but also the JPEG 2000 file format family, which for the most part is a still-image file format. {draw: frame} Figure 6: Complex File with External Media Data In the MP4 file format, determining how to decode a track involves two decisions. First, what kind of track is it: audio, visual, and so on? And then,

precisely how are the samples are coded? The first decision is made by examining the handler type; along with the handler type, there is a type-specific header atom within the track structures for each kind of track. draw: frame} Figure 7: MP4 Handler type and Header atom type {draw: frame} Figure 8: Relation between different objects Application Television Broadcasting MPEG-4 offers well enough compression for transmitting hundreds of channels and satellite TV cable that consumers expect applicable even in high definition televisions. Broadcast applications can take advantage of the MPEG-4 standard to offer high-quality interactive content delivered over traditional TV networks or cable TV networks.

MobileCommunicationand Entertainment MPEG-4 handsets are established for the purpose of having two-way video calls or watch video programming over 3G networks. The MPEG-4 standard allows video streaming of very low bit rate content over all types of networks. It makes provisions for streaming in error-prone environments. These qualities are crucial when streaming rich content to wireless devices. Internet Streaming MPEG-4 has several characteristics that make it the ideal standard for streaming rich media over the internet.

For the narrowband Internet, applications can use content compressed at low rates. For broadband Internet, applications can use the same content encoded at higher bit rates. The interactive nature of MPEG-4 means that MPEG-4 content can be used in advanced multimedia applications. And because MPEG-4 allows for scalability, the same content can be streamed to different devices over heterogeneous networks. Portable Gaming Distance

Learning and Training One of the keys to distance learning and training is the ability to transmit over different networking infrastructures and interactivity.

In a corporate training scenario, MPEG-4 content can be broadcasted via satellite to company branches in remote locations and over the LAN to employees at headquarters. Digital Still Cameras and Convergence Devices Most digital cameras now include movie modes for capture of short video sequences and with the new affordability of high-capacity flash memory, it is possible to build camera-like Mobile Content Convergence Devices that include the functions of a camera, camcorder and music player in one device.

Given its compression efficiency, multi-platform support and its freedom from platform bundling requirements, MPEG-4 is an ideal fit for these devices. Satellite Radio MPEG-4’s audio codec have been employed in several systems for satellite radio and multimedia broadcasting. Security Video surveillances are modern means of security employment. Often, the devices used must limit the video resolution and frame rate to provide a reasonable recording time, and mostly require proprietary video players or some plug-ins to view the stored content.

Recording using MPEG-4 enables and provides full resolution and desired frame rates. Also, MPEG-4 coding reduces storage cost. Its interoperability also allows users to combine equipment from different manufacturers in their systems and still be able to export a certain video in a universally readable format. MATLAB SIMULATION Since we know that from the principle of MPEG-4, each media object present in the scene while it is taken will be conveyed

into its own elementary stream. These media objects could be an audio, video or a still image.

The first thing to do is record first an analog signal with the use of the matlab tool known as daqscope. daqscope A window showing an example oscilloscope will be shown. It will look like the picture below. By pressing the arrow button, the recording of an analog signal will begin. The generated signal will depend on the sounds that will be acquired from a recording device such as a computer microphone. After recording on both channels, you can then close the window. The recorded signal will be treated as “ winsound0”. addchannel(ai, 1: 2); set(ai,'SampleRate', 44100) set(ai,'SamplesPerTrigger', 44100) tart(ai) wait(ai, 2) data = getdata(ai); plot(data) The example analog signal that we made look like the next figure. {draw: frame} video = mmread('mymovie. mpg', 1: 100); This command would then generate the first 100 frames of the video that we have chosen. In our example we used a sample video from the MATLAB folder known as vipmen we converted it first to an mpg file then renamed it into mymovie. The figure below shows some sample frames. {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} {draw: frame} I = imread('mymovie. pg'); I = im2double(I); T = dctmtx(8); B = blkproc(I,[8 8],'P1xP2', T, T'); B2 = blkproc(B,[8 8],'P1. *x', mask); I2 = blkproc(B2,[8 8],'P1xP2', T', T); imshow(I), figure, imshow(I2) Advantages and Disadvantages The main advantage of the MP4 file format is its interoperability. Since mpeg-4 contains many different tools for different programs for different purposes, it stood up and showed its universality and

multi-functionality which we think is the most basic pre-requisite for a media file format to be of great importance.

Also, because of that same reason, MP4 is common and would work across different types of players from different manufacturers. It became natural for us to make use of it. Another advantage is that there is no additional infrastructure investment needed for its development unlike mpeg-2 that required billions of dollar to be developed, the MPEG-4 used the pre-existing knowledge and altered it to its preference. The greatest disadvantage would be the licensing terms and the content fee of the MP4 file format.

This could be a hindrance for companies that would be using it in a large scale. It could be the reason to slow down the adoption of MP4 for broadcasting in IP networks. Another is with the ever known piracy problem since it relies on data encryption. Also, the download time in a broadband connection, which is much longer than the time consumed when downloading regular files, having the fact that MP4’s are still generally large files. Emerging Technology References:

Principles of Digital Audio by Ken C. Pohlmann Principles of Multimedia by Ranjan Parekh MPEG-4 Whitepaper, www. medialab. sonera. fl http://my. opera. com/ebest24/blog/2006/11/11/general-mp4-information http://www. coolutils. com/Formats/MP4 http://www. zimbio. com/QuickTime/articles/4/History+MP4+Technology+Apple http://www. chiariglione. org/mpeg/standards/mpeg-4/mpeg-4. htm http://www. ncsu. edu/it/multimedia/mpeg4. html http://www. mpegif. org/resources/mpeg4userfaq. php