ISSN: 2250–3676

[IJESAT] INTERNATIONAL JOURNAL OF ENGINEERING SCIENCE & ADVANCED TECHNOLOGY Volume-2, Issue-5, 1308 – 1315

MULTIMEDIA AND HYPERMEDIA INFORMATION OBJECT: OBJECT ORIENTED MHEG STANDARD

R. N. Jugele[1] and V. N. Chavan[2]

[1]*Department of Computer Science, Science College, Congress Nagar, Nagpur. India.* ***rn_jugele@yahoo.com***
[2]*Head, Department of Computer Science, S. K. Porwal College, Kamptee, Dist : Nagpur. India*

Abstract

Multimedia information technology has become popular, conventional database system do not offer adequate support for modeling, indexing and manipulation of multimedia data. As a next step towards an object oriented representation of knowledge we focus on the concept of MHEG Object. The proof of concept can be implemented, which is based on a set of MHEG standards, entities and a few existing terminologies. In this paper we present an approach of an object-oriented by means of MHEG to implement the classes for multimedia object. In particular we shown different characteristics of real world entity as a single object which plays different roles and proposes the right level of abstraction of the resources and data representation.

Index Terms: hyper object, Multimedia, standards, role, object, script, level, classes, MHEG, interfacing, Multimedia object.

----------***----------

1. INTRODUCTION

Object-oriented paradigm provides several useful concepts which can be use to meet specific requirements[9][10] for modeling multimedia systems. This approach allows to model application, specific data types and classes including operations. Whereas conventional object-oriented approach shorts some features. The standard object-oriented model is not satisfactory when entities, which change the class to which they belong and their behavior during their life. When an object is allowed to acquire new object types, the problem arises and inconsistent behaviors may have been defined for these different object type. In Object-Oriented method encapsulation and inheritance property improves efficiency through reusability, extensibility and comprehensibility through uniformity, abstraction and modularity.

Object-Oriented programming promotes a naturalist approach in that programs are direct reflections of structures of problems. Compared with traditional strategies (like functional decomposition), an Object-Oriented design cycle initially may demand more work. However, the return on investment for finding and fine-tuning generic libraries of reusable objects is considerable when developing new applications[1],[2],[3] and [4]. The concept of multimedia and hypermedia systems information objects will be explained in the light of the Object-Oriented MHEG standard. Object-Oriented methodology is used in problem analysis and system design, as well as in algorithmic synthesis and software development.

2. MHEG STANDARD

We can introduces the scope of the MHEG standard and fundamentals of the standard [5] by considering standardization in general and the MHEG standardization process.

2.1. Perspectives

New technology is preceded by the definition of specifications by standardize institutes, in the electrotechnical domain CCITT, IEEE, and ISO are involved in the standardization process. The reason for development after standardization is that the investment in new technologies requires vast amounts and even the major global enterprises cannot afford the risk of being only little successful with their new products. Despite this consideration, the road to standardization is uneven, for examples are ISDN and HDTV.

2.2. Outlines

ISO and IEC develop the MHEG standard in JTCl/SC29/WG12 (Joint Technical Committee 1, Sub Committee 29, Work Group 12) which provides a combined standard for text, still-picture images and video as well as voice and audio. The main reason for standardization of

multimedia information object is that it is virtually impossible to develop integrated versions of independently written applications. Following are alternatives :
(a) a monolithic multimedia application for all operations on all media types.
(b) a universal data structure used as a driver between existing applications.
(c) a set of shared objects which hold the application's functionality, thus encapsulating information on performable operations[6].

2.3. Objectives

MHEG define a standard for the representation and coding of multimedia and hypermedia information objects and use in those multimedia applications which are characterized by their real time communications constraints. To deal with the potential applications requirements and functionalities, MHEG focuses on the following aspects:
(a) interactivity (on some input, go to specified link L).
(b) multimedia information synchronization (audio sequence S and according to video sequence V, have to be played in the correct order).
(c) communications synchronization through real-time presentation (the sequence sent at a source is the same as the one received at the cooperating put).
(d) real-time interchange (keep buffering low to keep sequences serialized).
(e) final form representation (straightforward coding of objects without additional application-specific structure-processing).

3. ROLE MODELING FOR ENTITIES IN REAL WORLD

Role is conceptually like an object, except that it has a special relationship to other objects which are said to play the role. A role can be played by an object or by another role[8]. A class is a set of possible individuals called instances. If the instances are object the class is called an object class. If the instances are roles then the class is called a role class. Role can be used to model the dynamic and multifaceted behavior of multimedia objects.

Images: An image object may require different effects or extra properties when it is used in different situations i.e. company logo.
Graphics: A graphics refers to the concept that allow the generation of drawing and other images based on formal description, program or data structure i.e. 3D graphical video display.
Audio: Audio refers different categories according to their content i.e. tracks of audio CD either it is soft, light, touchy or rock.
Video: A video may have different characteristics in different situations i.e. a video may require different sound effect or different quality preferences to give different impression.
Generated Media: It is a particular computer generated presentations like animation and music. A 3D animation may have different effects or add extra properties. Same as MIDI music may have different settings i.e. tempo, speed, channels, patches, keys and volume.
Hypertext: Link and structure of hypertext is required for different purposes, in fact roles can be used for different versions of a structured document which allow the document to be targeted for different purposes.

The advantage of having this concept is that it prevents the number of multiple inherited classes, no need to define class and its subclasses twice. This advantage does not exist in conventional object-oriented paradigm.

4. MHEG STANDARD

The following analysis is based on[5] and [7], Some of the items directly stem from their original counterparts and are repeated here, both to make the report stand-alone as well as to exploit the opportunity to be more clarifying than the standardization document. Following points highlights some of the standard and it does not intend to be a complete restyling of the working document.

4.1. System Layers

Multimedia applications are active in virtual rooms[12], there will be a common understanding on the way in which information, objects are built and interchanged, thus enabling cooperation. Information objects are elementary units of information flows from multiple media which are specified as objects and handled by using applications. So, on top of basic elements e.g. PCM coded sound in an audio application and basic elements of e.g. MPEG coded image in a video application, there has to be a platform for universally conceived information objects that can be accessed by the operational pairs which are involved in this audiovisual cooperation. The universality accounts for:
(a) Representation of information and attributes.
(b) Spatiotemporal synchronization.
(c) Conditionally triggered linking.

At this point, the standard leaves the user-oriented view, this is necessary to address technical issues associated with the implementation of user applications[11], based on integration of information in a user's perspective is dropped. Instead,

multimedia communications are split up in three layers (Fig.1.): the User Layer, where the user has access to a virtual room, the Application Layer, where application-specific functions are grouped and the Object Layer. The last layer is actually outside the scope of the standard it will be up to manufacturers to develop integral applications, using selections of standardized objects in lower layers.

LEVEL	FUNCTIONALITY
User layer	user information
application layer	scriptware inter object interaction
object layer	elementary object interaction

Fig.1- System-Oriented view of system layer

4.2. Basic Definition Application

Keywords: Script, Scriptware, Using Application.
Application is an application based on CCIT recommendations or ISO standards which uses MHEG Objects. The information service is provided by specific semantic relationships within a group of objects defined in a Script.

Class
Keywords: Abstract Class, MHEG Class, Object Class, Object Instance.
An MHEG Class is a class defined in the MHEG standard. An Abstract Class is an MHEG Class with only subclasses and no objects or instances. An Object Class is any category of objects that have a specific and homogeneous template towards Operations and attributes. Generated object in an Object Class is referred to as an Object Instance.

Event
Keyword: Event.
An Event is a signal of a change in the Dynamic Values.

Hierarchical Relations
Keywords: Descendant Relation, Independent Objects, Sibling Relation.
Two objects are Independent Objects when their parents differ and one is not the other's parent otherwise, there is a Descendant Relation. A descendant of a parent object is any MHEG Object which can be reached by successive parent-to-child relations. A Sibling Relation is said to exist between Component Objects descending from the same parent Composite Object.

Hypertext
Keyword: Hypertext.
To access text information by interaction with explicit document links is called as Hypertext.

Medium
Keywords: Storage Medium, Transmission Medium.
A Medium is a means by which information is perceived, expressed, stored and transmitted. A Storage Medium refers to the physical means on which data are stored.

Object Basics
Keywords: MHEG Object, Object Structure.
It is a finite self-defining piece of information that can be manipulated and interchanged as one integral unit by cooperating Applications. An MHEG Object is a coded representation of an instance of an MHEG Class. An Object Structure is a description of how an object's information is organized.

Object Types
Keywords: Basic Object, Content Object, Projector Object.
A Content Object is an encoded group of monomedia data and decoding parameters. In a Projector Object, information is associated with an object it covers the subject of presentation by defining attribute values based upon which conversion of interchange format to representation format is done. A Basic Object is an object consisting of a Content Object and zero or more Projector Objects.

Object Composition
Keywords: Component Object, Composite Object, Monomedia Object, Multimedia Object.
A Composite Object is a Basic Object containing the structure which defines spatiotemporal interobject relations of composing Component Objects, i.e. Objects embedded in a composite one. It containing objects of two or more representation media is called Multimedia Object. It consist of a file of information originating from a single medium e.g. pictograms in a menu-option selector mechanism and other are composed by multiple Component Objects which are synchronized and linked.

Object Linking
Keywords: Hyperobject, Hypermedia Object, MHEG Link, Root Object.
The link is unidirectional, is triggered by a condition in the originating object and is conditioned by additional criteria which are to be satisfied if the link is to be traversed, the link calls for an Operation on the destination object. When a Composite Object is structured by means of MHEG Links, it is called a Hyperobject. So, a Hyperobject describes specific links between input and output objects, the facilities for describing these links are provided within the framework of

this standard by means of representations of Composite Objects. In Hypermedia Objects special care is taken of the ability to access monomedia and multimedia information by navigating across links, such object is a Multimedia Object and a Hyperobject. A Root Object is an MHEG Object which acts as an entry-point to a set of linked MHEG Objects applied by a Using Application.

Object Interaction
Keywords: Input Object, Interactive Object, Output Object, Request Object.
An Input Object supports user-system interactivity, it can either be a Request Object, i.e. an object which requests a user to provide information or an Interactive Object, which is a Composite Object containing Input Objects and Output Objects. An Output Object is intended for information presentation towards the user. Information Objects defined in the standard correspond either to user input of e.g. a menu-option sequence or system output of e.g. a video-presentation sequence.

Operation
Keywords: Message, Operation, Rendering.
An Operation acts as an interface which allows a Using Application to manipulate MHEG Objects. MHEG Processes may ask through Messages for a Dynamic Instance to act or to return information. Finally, the act of rendering represents the application a Projector Object to a Content Object to obtain a projected object.

Perception
Keyword: Perception Medium.
A Perception Medium concerns the information-nature as the user experiences.

Presentation
Keywords: Interchange Medium, Presentation Medium.
A Presentation Medium is the physical means to reproduce information to the user or to acquire data from the user through input or output devices. An Interchange Medium denotes the type of means to interchange data, this Interchange Medium can be either a Storage Medium, a Transmission Medium or both.

Representation
Keywords: Dynamic Attribute, Dynamic Value, Final Form, Interchange Attribute, Interchange Value, Multimedia Representation, Representation, Representation Medium.
A Representation of an object gives a description of the Object Structure and contents. A Representation Medium states the interchanged data's type, whereby the information nature, described by its coded form is defined. A Dynamic Attribute is an attribute of an internal Representation of an MHEG Object in an MHEG Process its value is called the Dynamic Value. An Interchange Attribute is an attribute of an MHEG Object an Interchange Value is the value of an Interchange Attribute. Final Form is an interchange form for representation without requiring a change in the structure of an object, i.e. it does not require any spatiotemporal or semantic adaptation of the MHEG Objects. Multimedia Representation is the property of handling several types of Representation Media.

Resources
Keyword: Minimal Resources.
Minimal Resources covers systems with minimal buffering capacity, using communications channels with minimal throughput, e.g. when an audio sequence is to be presented in real-time at a receiver in a system with limited channel capacity.

State
Keywords: Dynamic State, Interchange State, MHEG Process.
A Dynamic State is a set of internal values in an MHEG Process. An Interchange state denotes a set of Interchange values this is the set of values of the MHEG Object.

4.3. Information Representation

With potential applications and consequent application requirements, the following list of technical requirements at the Object Layer has been proposed.

Synchronization
Overall synchronization between the composing components is essential - this is referred to as script synchronization. Conditional synchronization deals with the initiation of an operation if some test criterion holds, as an example, consider a MultiVision which starts a customized newsvideo as soon as broadcasting is finished. To link information on the right time and place in a multimedia presentation, is denoted as spatiotemporal synchronization. System synchronization treats basic synchronization in multiple media, like sound in a movie.

Composition
To allow for a simplified spatiotemporal handling of information objects by the using application, technical composition requirements are to be fulfilled.

Links
Links refer either to hypertext or to specific connections between information objects for direct access and operations. Links are used in composite objects to define intercomponent relationships or stand-alone to create and modify general interobject relationships.

Minimal resources
In minimal resources systems the relevant component data are extracted on a timely basis. In this standard the subject of sequencing is dealt with.

Object identification
The general form of object identification is needed for copyright, owner identification and unique identification.

Object reference
To physical inclusion a using application must be able to address both local and remote objects.

Input
Input is a mechanism required to acquire user input.

Content
Content is a mechanism for uniform interfacing to content data.

Uniform objects
Uniform objects are the basis to develop a uniform view of object updates instigated by using applications.

Uniform overview
A uniform view of static and dynamic objects for using applications is essential.

4.4. Representation Methodology

The Object-Oriented methodology fits requirements of active, autonomous and reusable information objects, thus encapsulating distracting details allowing for inheritance-inherent abstraction levels and homogeneous object description. The representation of MHEG information objects is done at four levels (Fig.2).

(a) An informal text description.
(b) An object-oriented definition of an object's structure in agreed upon semantics.
(c) A base notation for the structure of the representation.
(d) A base coded representation according to predefined coding rules.

The alternative representations at each of these levels are equivalent and can be translated to each other through isomorphism. Thus this standard does provide some structures and semantics to develop a common understanding but it does not intend to provide all semantics for using application based on standardized objects. Representations at level-c and level-d may be done using Abstract Syntax Notation 1 (ASN.l).

LEVEL	REPRESENTATION FUNCTIONALITY
Level-a	information text description of the presentation
Level-b	precise Object-Orirnted definition of representation
Level-c	formal structure for representation of base notation
Level-d	base code representation

Fig-2. Representation Methodology

A concise informal description at level-a provides for an initial intuitive understanding of the standardized elements in the representation of an object. Then at level-b with the help of a more precise Object-Oriented definition, further insight is given in class decadency, hierarchy and behavior. Here an object's semantics and structure are described according to the following pattern: attribute name, semantics, type and status.
On an object, a using application may invoke those operations which are listed at this level. The formal structure at level-c gives an object both body and boundary. At the same time, an encoding is provided by this standard when the actions are invoked by MHEG link object. No encoding is provided for operations invoked by a using application. Base coded representation is done according to the Basic Encoding Rules of ASN.l, at level-d following techniques are used:

(a) Represent each MHEG object class by a separate ASN.l module, formally accessible by a unique object identifier.
(b) Represent the inheritance of MHEG object classes attributes by import/export facilities.
(c) Identify each MHEG object instance uniquely by its classes object identifier and an individual interchange number.

4.5. MHEG Object Classes: Inheritance Tree

The major MHEG object classes are listed in the form of an inheritance tree. A core aspect of communications, interaction can be achieved by the interchange of information within several objects referencing to one another by pointing identifiers or by pointing actual data. When content data references within MHEG content objects are at stake for that two techniques can be used:

(a) The inclusion mechanism, i.e. the incorporation of the content data in the encoded MHEG object.
(b) The external identifier mechanism, i.e. the reference to an object's content through its public and system identifiers.

Now, consider a situation where reference is done towards an MHEG object as an indivisible entity for that three techniques can be used:

(a) Inclusion of one object into another.
(b) External identification through public and system identifiers.
(c) The interchange of numbers which address parts of objects, in turn, characterized by their object identifiers.
The MHEG Single Inheritance tree is shown in Fig. 3.

Fig-3. MHEG single inheritance tree

4.6. Spatiotemporal Presentation

Two independent general mechanisms are provided for utilization in a using application's architecture. The first, composition of MHEG objects, it is a recursive mechanism providing access points at which presentation processes attach reference points of projected objects. The next mechanism, projection of MHEG objects, it specifies how content data are articulated around a general reference point, including a life-progression list accounting to the time varying behavior of an object. Positioning an object thus requires a temporal axis T with an offset at zero and spatially, three orthogonal axes X, Y and Z in mathematical metrics.

As a projected object is the result of rendering i.e. of applying a projector object to a content object, object projection may modify the content data. Due to life-progression, a composite object or using application will try to fix a projected object in its list of nominal attribute values, interpolating intermediate points.

Knowing that one object may instigate another to get life, the subject of MHEG linking pops up again. This relation is injective, each object has at most one source and may have several puts. In conformance with standardization terminology, a start object (where a link originates from) is identified as a reference point, whereas its connected counterpart the end object (a composite object, a projected object or another link) is named position point. A link becomes active if all conditions are isochronously fulfilled, this group of expressions consists of one trigger condition satisfied when a dynamic attribute of the start object changes to a desired value due to MHEG process evolution or external execution of operations by links or a using application and zero or more additional conditions resulting from dynamic attributes in the MHEG process. To determine a component object's position point a using application utilizes the composition mechanism which identifies a set of components and their interlinking. It is not the content object which is attached directly to the position point provided by the composite object. If no projector has been supplied then a default projector is applied which does not change the size and duration of the content object but provides a default value for the reference point. The result is a projected object which may be attached to the position point. When MHEG links are used in composite objects, the conditions on affiliated component objects are evaluated against the following list of test-values for dynamic attributes:

(a) *ready* (an object is ready-to-use)
(b) *running* (an object is under control of a life-progress process)
(c) *selected* (a request has been responded to by the user)
(d) *current presentation time* (a life-progress process registers milliseconds since offset, so that this time can be verified against a test-value).

Suppose all critical tests are isochronously satisfied then some operations can be undertaken on the targeted end object.
If this end object is a composite object then the MHEG process may have to go through some of the following procedures:

(a) *prepare :* set an object ready (set the composite object ready and prepare components as arbitrated)
(b) *kill :* set an object not-ready (set the composite object not-ready and prepare components as arbitrated)
(c) *run :* if an object is not-ready then first do prepare and re-initiate run else or afterwards, pass object control to the life-progress process at current presentation time.
(d) *stop :* stack current time and remove control from the life-progress process (stack time, remove control over the component object, set the component object not-running and stack the component presentation time)
(e) *set time to zero* (set current presentation time of composite and components to zero)
(f) select : set dynamic value of attribute selected to true (undefined).

4.7. Using Applications

Using applications communicate to MHEG objects through the sending of messages which make objects to perform specific operations, independent of conforming application semantics. It even allowed for objects to be transferred between using applications of different systems with semantic differences resulting in a high degree of interoperability.

Because the standard has been designed in a modular way, conforming applications can be built on a limited set of data structure definitions of objects, decreasing the burden of overall support of all standardized objects, the restriction is that complete support is given to all parts of standardized facilities used by the application and that all facilities in all superclasses of the facility's class are supported as well.

Using applications may manipulate either overall objects or individual attributes. This interfacing between a using application and an information object is defined input of operations and output of their effects on the dynamic attributes, the allowed operations are: prepare, kill, run, stop, reset and select - the allowed dynamic attributes are: ready, running, selected and current presentation time.

5. STANDARD MHEG: OBJECT CLASSES

Only class level-a and class level-b will be reviewed for abstract classes and some of their direct descendent inheritance tree leafs. Taking into account that an extensive description of MHEG object classes will not be of interest, only one class is described here reconsider the MHEG single inheritance tree (Fig. 3.). For a complete specification of all classes[7].

Audio Projector Class

LEVEL-A

description: the MHEG audio projector object is an output projector object containing all the presentation information relative to an audio sequence

LEVEL-B

definition: the class is a concrete class. providing representation attributes for projector parameters relative to an audio sequence

attributes: VOLUME REFERENCE
default, indicating the volume at which a sound sequence is to be presented, by means of an integer ranging from -128 to 127 (default is 0)

S1EREO
default, specifying if a sound sequence is to be presented in stereo, by means of Boolean values TRUE for stereo and FALSE (default) for mono

BALANCE
default, defining balance for a sound sequence to be presented more at right or left, done by means of integer values ranging from -10 (all left) to 10 (all right) with a default 0 for an equally balanced mode

DIRECTION/SPEED
default, indicating direction and speed for the sequence to be presented by means of integer values ranging from -21 to 20 (default: 10 i.e. normal speed, direction forward)

inherits from : PROJECTOR CLASS
inherited by : NONE

CONCLUSION

Some general Object-Oriented principles underlying the current standard have been depicted. Then, attention has moved from standardization in general to the MHEG standard in specific. We have presented an approach of an object-oriented by means of MHEG to implement the classes for multimedia object for accessing the multimedia devices. In particular we shown different characteristics of real world entity as a single object which plays different roles. We discussed the role of different types of multimedia objects such as audio or video. We also propose the right level of abstraction of the resources and data representation.

REFERENCES

[1]. I. M. Graham, Object-Oriented Methods. Addison-Wesley, 1991.

[2]. C.C.D. Poo, Tartan, An Object-Oriented System Modelling Method for MIS Applications. National University of Singapore, Discs Publication, TRE6191, Iune 1991.

[3]. *S.A.* Williams, Programming Models for Parallel Systems. University of Reading, John Wiley, 1990.

[4]. E.G. Zondag, Object-Orientedness - ASurvey. University of Twente, December 1990.

[5]. F. Kretz, and F. Colailis, Standardizing Hypermedia Information Objects. IEEE Communications Magazine, Vol. 30 No.5, p. 60-70, May 1992.

[6]. N. Yankelovich, N.K. Meyrowitz and A. van Dam Reading and Writing the Electronic Book. IEEE Computer, Vol. 18, No. 10, p. 15-29, October 1985.

[7]. Various Coded Representation Of Multimedia And Hypermedia Information Objects, Part 1: Base Notation, Working Document *S-6.* ISOIlEC ITCl/SC29/WGI2, June 1992.

[8]. R. K. Wong, H. L. Chau and F. H. Lochovsky. Door = 'object with roles' + 'schema evolution', Technical Report HKUST-CS96-9, HKUSTA DCS, 1996.

[9]. S. Gibbs, C. Breitender and D. Tsichritzis. Data modeling of time-based media. SIGMOD Record, 23(2):91-102, June 1994.

[10]. W. Klas, E. J. Neuhold and M. Schreff. Using an object-oriented approach to model multimedia data. Computer Communications, Special Issue on Multimedia Systems, 13(4):204-216, May 1990.

[11]. R. N. Jugele and V. N. Chavan. Multimedia and Hypermedia : Communication Issues in Open Document Environment. Int. Journal of Computer Technology & Applications, ISSN:2229-6093,Vol 3 (3), May 2012, pp.1043-1049**.**

[12]. R. N. Jugele and V. N. Chavan. Method Designing for Multimedia and Hypermedia Application. Int. Journal of Computer Technology & Applications, ISSN:2229-6093,Vol 3, issue 4, July-August 2012, pp.1372-1377**.**

Books:

01. Principles of Multimedia
By. Ranjan Parekh
Tata McGraw Hill Companies.

02. Hypertext and Hypermedia.
By. J. Nielsen
Academic Press.

BIOGRAPHIES

R. N. Jugele received his B.Sc. degree from Nagpur University and M.Sc. degrees in Computer Science from Marathwada University, Aurangabad, Maharashtra, India in 1991 and 1993 respectively. Currently, he is working as a Associate Professor in Department of Computer Science, Science College, Congress Nagar, Nagpur. Maharashtra.

Dr. V. N. Chavan Head, Department of Computer Science, S. K. Porwal College, Kamptee, Dist : Nagpur. Maharashtra. He is research guide in Computer Science subject in various universities and have wide knowledge in research field since last 22 years. He is a member of various bodies in Computer Science subject.