
**Information technology — Multimedia
content description interface —**

**Part 8:
Extraction and use of MPEG-7
descriptions**

iTeh STANDARD PREVIEW
*Technologies de l'information — Interface de description du contenu
multimédia —*
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Partie 8: Extraction et utilisation des descriptions MPEG-7

ISO/IEC TR 15938-8:2002

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Published in Switzerland

Contents

Foreword.....	vi
Introduction	vii
1 Scope.....	1
2 Terms and definitions.....	1
2.1 Conventions.....	1
2.1.1 Description tools	1
2.1.2 Naming convention	1
2.2 Terminology.....	2
2.2.1 Schema-related terminology	2
2.2.2 Content-related terminology	2
2.3 Symbols and abbreviated terms.....	6
2.3.1 Generic	6
2.3.2 Arithmetic operators	6
2.3.3 Logical operators.....	7
2.3.4 Relational operators.....	7
2.3.5 Bitwise operators.....	7
2.3.6 Conditional operators	7
2.3.7 Assignment	7
2.3.8 Constants	7
2.3.9 Functions.....	7
2.4 Default reference axis.....	8
3 MDS tools.....	8
3.1 Introduction	8
3.2 Schema tools.....	8
3.2.1 Introduction.....	8
3.2.2 Base types.....	8
3.2.3 Root element.....	8
3.2.4 Top-level types.....	10
3.2.5 Description metadata tools.....	18
3.3 Basic datatypes.....	21
3.3.1 Introduction.....	21
3.3.2 Integer datatypes	21
3.3.3 Real datatypes	21
3.3.4 Vectors and matrices	21
3.3.5 Probability datatypes	23
3.3.6 String datatypes.....	24
3.4 Linking, identification and localization tools	25
3.4.1 Introduction.....	25
3.4.2 References to Ds and DSs	25
3.4.3 Unique Identifier	26
3.4.4 Time description tools	26
3.4.5 Media Locators	29
3.5 Basic description tools.....	30
3.5.1 Introduction.....	30
3.5.2 Language identification	31
3.5.3 Textual annotation.....	32
3.5.4 Classification Schemes and Terms	37
3.5.5 Description of agents.....	49
3.5.6 Description of places	53
3.5.7 Graphs and relations.....	53
3.5.8 Ordering Tools.....	55
3.5.9 Affective description	56
3.5.10 Phonetic description.....	67
3.6 Media description tools	67
3.6.1 Introduction.....	67
3.6.2 Media information tools	68
3.7 Creation and production description tools	73

3.7.1	Introduction.....	73
3.7.2	Creation information tools.....	74
3.8	Usage description tools	76
3.8.1	Introduction.....	76
3.8.2	Usage information tools	77
3.9	Structure description tools	78
3.9.1	Introduction.....	78
3.9.2	Base segment description tools	79
3.9.3	Segment attribute description tools.....	80
3.9.4	Visual segment description tools	87
3.9.5	Audio segment description tools.....	109
3.9.6	Audio-visual segment description tools	110
3.9.7	Multimedia segment description tools.....	113
3.9.8	Ink segment description tools.....	114
3.9.9	Video editing segment description tools	122
3.9.10	Structural relation classification schemes	129
3.10	Semantics description tools	133
3.10.1	Introduction.....	133
3.10.2	Abstraction model	134
3.10.3	Semantic entity description tools	134
3.10.4	Semantic attribute description tools	150
3.10.5	Semantic relation classification schemes	153
3.11	Navigation and access tools.....	157
3.11.1	Introduction.....	157
3.11.2	Summarization	158
3.11.3	Views, partitions and decompositions	184
3.11.4	Variations of the content	199
3.12	Content organization tools.....	202
3.12.1	Introduction.....	202
3.12.2	Collections	202
3.12.3	Models	208
3.12.4	Probability models	209
3.12.5	Analytic models	214
3.12.6	Cluster models.....	219
3.12.7	Classification models.....	220
3.13	User interaction tools	223
3.13.1	Introduction.....	223
3.13.2	User preferences	223
3.13.3	Usage History.....	235
4	Visual tools	240
4.1	Basic visual tools	240
4.1.1	Grid layout.....	240
4.1.2	Visual time series	240
4.1.3	2D-3D multiple view.....	247
4.1.4	Spatial 2D coordinates.....	251
4.1.5	Temporal interpolation.....	254
4.2	Color description tools.....	257
4.2.1	Color space	257
4.2.2	Color quantization	258
4.2.3	Dominant color	259
4.2.4	Scalable color	262
4.2.5	Color layout.....	264
4.2.6	Color structure.....	268
4.2.7	GoF/GoP color	279
4.3	Texture description tools	280
4.3.1	Homogeneous texture.....	280
4.3.2	Texture browsing.....	283
4.3.3	Edge histogram.....	286
4.4	Shape description tools	291
4.4.1	Region-based shape	291

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 ISO/IEC TR 15938-8:2002
<https://standards.iteh.ai/catalog/standards/sist/8e7f952b-fb1-4047-b713-hc9e24786bf3/iso-iec-tr-15938-8-2002>

4.4.2	Contour-based shape.....	294
4.4.3	Shape 3D	298
4.5	Motion description tools	302
4.5.1	Camera motion.....	302
4.5.2	Motion trajectory.....	307
4.5.3	Parametric motion	309
4.5.4	Motion activity.....	313
4.6	Localization tools	319
4.6.1	Region locator.....	319
4.6.2	Spatio-temporal locator	322
4.7	Other visual tools	329
4.7.1	Face recognition	329
Annex A	Patent statements	338
	Bibliography	340

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[ISO/IEC TR 15938-8:2002](https://standards.iteh.ai/catalog/standards/sist/8e7f952b-ffb1-4047-b713-bc9e24786bf3/iso-iec-tr-15938-8-2002)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

- type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;
- type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;
- type 3, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

ISO/IEC TR 15938-8, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 15938 consists of the following parts, under the general title *Information technology — Multimedia content description interface*:

- *Part 1: Systems*
- *Part 2: Description definition language*
- *Part 3: Visual*
- *Part 4: Audio*
- *Part 5: Multimedia description schemes*
- *Part 6: Reference software*
- *Part 7: Conformance testing*
- *Part 8: Extraction and use of MPEG-7 descriptions*

Introduction

This standard, also known as "Multimedia Content Description Interface," provides a standardized set of technologies for describing multimedia content. The standard addresses a broad spectrum of multimedia applications and requirements by providing a metadata system for describing the features of multimedia content.

The following are specified in this standard:

- **Description Schemes (DS)** describe entities or relationships pertaining to multimedia content. Description Schemes specify the structure and semantics of their components, which may be Description Schemes, Descriptors, or datatypes.
- **Descriptors (D)** describe features, attributes, or groups of attributes of multimedia content.
- **Datatypes** are the basic reusable datatypes employed by Description Schemes and Descriptors
- **Systems tools** support delivery of descriptions, multiplexing of descriptions with multimedia content, synchronization, file format, and so forth.

This standard is subdivided into eight parts:

Part 1 – Systems: specifies the tools for preparing descriptions for efficient transport and storage, compressing descriptions, and allowing synchronization between content and descriptions.

Part 2 – Description definition language: specifies the language for defining the standard set of description tools (DSs, Ds, and datatypes) and for defining new description tools.

Part 3 – Visual: specifies the description tools pertaining to visual content.

Part 4 – Audio: specifies the description tools pertaining to audio content.

Part 5 – Multimedia description schemes: specifies the generic description tools pertaining to multimedia including audio and visual content.

Part 6 – Reference software: provides a software implementation of the standard.

Part 7 – Conformance testing: specifies the guidelines and procedures for testing conformance of implementations of the standard.

Part 8 – Extraction and use of MPEG-7 descriptions: provides guidelines and examples of the extraction and use of descriptions.

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Information technology — Multimedia content description interface —

Part 8: Extraction and use of MPEG-7 descriptions

1 Scope

This International Standard specifies a metadata system for describing multimedia content. This document gives examples of extraction and use of descriptions using Description Schemes, Descriptors, and datatypes specified in ISO/IEC 15938. The following set of subclauses are provided for each description tool, where optional subclauses are indicated as (optional):

- Informative examples (optional): provides informative examples that illustrate the instantiation of the description tool in creating descriptions.
- Extraction (optional): provides informative examples that illustrate the extraction of descriptions from multimedia content.
- Use (optional): provides informative examples that illustrate the use of descriptions.

This document is meant to be a companion technical report for Part 5 (Multimedia Description Schemes) and Part 3 (Visual) of ISO/IEC 15938. As such, the content of this technical report is not easily understood without the technical specifications. In this technical report, effort has been made to preserve the specific subclause numbering of ISO/IEC 15938-5 and ISO/IEC 15938-3 to allow easy correlation of the content on extraction and use in the technical report with the technical specifications.

2 Terms and definitions

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2.1 Conventions

2.1.1 Description tools

This part of ISO/IEC 15938 specifies the multimedia description tools as follows:

- **Description Scheme (DS)** – a description tool that describes entities or relationships pertaining to multimedia content. DSs specify the structure and semantics of their components, which may be Description Schemes, Descriptors, or datatypes.
- **Descriptor (D)** – a description tool that describes a feature, attribute, or group of attributes of multimedia content.
- **Datatype** – a basic reusable datatype employed by Description Schemes and Descriptors.
- **Description Tool (or tool)** – refers to a Description Scheme, Descriptor, or Datatype.

2.1.2 Naming convention

In order to specify the multimedia description tools, this part of ISO/IEC 15938 uses constructs provided by the Description Definition Language (DDL) specified in ISO/IEC 15938-2, such as "element", "attribute", "simpleType" and "complexType". The names associated to these constructs are created on the basis of the following conventions:

- If the name is composed of multiple words, the first letter of each word is capitalized, with the exception that the capitalization of the first word depends on the type of construct as follows:
- Element naming: the first letter of the first word is capitalized (e.g. `TimePoint` element of `TimeType`).
- Attribute naming: the first letter of the first word is not capitalized (e.g. `timeUnit` attribute of `IncrDurationType`).
- complexType naming: the first letter of the first word is capitalized, and the suffix "Type" is used at the end of the name (e.g. `PersonType`).

ISO/IEC TR 15938-8:2002(E)

- simpleType naming: the first letter of the first word is not capitalized, the suffix "Type" may be used at the end of the name (e.g. timePointType).

Note that when referencing a complexType or simpleType in the definition of a description tool, the "Type" suffix is not used. For instance, the text refers to the "Time datatype" (instead of "TimeType datatype"), to the "MediaLocator D" (instead of "MediaLocatorType D") and to the "Person DS" (instead of "PersonType DS").

2.2 Terminology

For the purposes of this part of ISO/IEC 15938, the following terms and definitions apply.

2.2.1 Schema-related terminology

2.2.1.1

Attribute

A field of a **description tool** which is of simple type.

2.2.1.2

Base type

A **type** that serves as the root **type** of a derivation hierarchy for other **types**.

2.2.1.3

Datatype

A primitive reusable **type** employed by **Description Schemes** and **Descriptors**.

2.2.1.4

Derived type

A **type** that is defined in terms of extension or restriction of other **types**.

2.2.1.5

Description

An instantiation of one or more **description tools**.

2.2.1.6

Description Scheme

A **description tool** that describes entities or relationships pertaining to **multimedia content**. **Description Schemes** specify the structure and semantics of their components, which may be **Description Schemes**, **Descriptors**, or **datatypes**.

2.2.1.7

Description Tool

A **Description Scheme**, **Descriptor**, or **datatype**.

2.2.1.8

Descriptor

A description tool that describes a feature, **attribute**, or group of attributes of multimedia content.

2.2.1.9

Instantiation

Assignment of values to the fields (elements, attributes) of one or more **description tools**.

2.2.1.10

Element

A field of a **description tool** which is of complex type.

2.2.1.11

Schema

The set of related **description tools**, for example, those specified in ISO/IEC 15938.

2.2.1.12

Type

The format used for collection of letters, digits, and/or symbols, to depict values of an element or attribute of **description tool**. A **type** consists of a set of distinct values, a set of lexical representations, and a set of facets that characterize properties of the value space, individual values, or lexical items.

2.2.2 Content-related terminology

2.2.2.1

Abstraction

A secondary representation that is created from or is related to the **content**. For example, a **summary** of a **video** or a **model** of a **feature**.

2.2.2.2**AC coefficient**

Any DCT coefficient for which the frequency in one or both dimensions is non-zero.

2.2.2.3**Acquisition**

The process of acquiring **audio** or **visual** data from a source.

2.2.2.4**Action**

A semantically identifiable behavior of an object or group of objects, for example, a soccer player kicking ball.

2.2.2.5**Agent**

A person, organization, or group of persons.

2.2.2.6**Audio**

Time-varying **data** or signal intended for listening or hearing. Also, related to the aural modality.

2.2.2.7**Audio-visual**

content consisting of both **audio** and **video** data.

2.2.2.8**Automatic**

Processing of **multimedia data**, **content**, or **metadata** by means of computer, hardware, or other software device.

2.2.2.9**Classification Scheme**

A list of defined terms and their meanings.

2.2.2.10**Content****Multimedia content**

A representation of the information contained in or related to **multimedia data** in a formalized manner suitable for interpretation by human means. **Content** refers to the **data** and the **metadata**.

2.2.2.11**Copyright**

A right that establishes the ownership of **data**, **content**, or **metadata**.

2.2.2.12**Data****Essence****Multimedia Data**

A representation of **multimedia** in a formalized manner suitable for communication, interpretation, or processing by automatic means.

2.2.2.13**DC coefficient**

The DCT coefficient for which the frequency in both dimensions is zero.

2.2.2.14**DCT coefficient**

The signed amplitude of a specific cosine basis function.

2.2.2.15**Editing**

The process of combining, extracting, and refining **multimedia data**.

2.2.2.16**Eigenface**

An eigenvector obtained from the principal component analysis of facial images.

2.2.2.17**Entity**

Any concrete or abstract thing of interest related to the **multimedia content**.

ISO/IEC TR 15938-8:2002(E)

2.2.2.18

Event

A noteworthy occurrence that happens at a point in time or during a temporal interval. Alternatively used as a change in state.

2.2.2.19

Feature

A distinctive characteristic of **multimedia content** that signifies something to a human observer, such as the "color" or "texture" of an image.

2.2.2.20

Filtering

A process for selecting multimedia content that satisfies certain criteria. This process may include ranking the content according to the extent that it satisfies the criteria.

2.2.2.21

Format

The characteristics of the stored or physical representation of the **data**.

2.2.2.22

Frame

A single **image** from a **video**.

2.2.2.23

Image

2D spatially-varying visual data acquired from a visual source.

2.2.2.24

Key frame

A representative **frame** of a **video** or a **segment**.

2.2.2.25

Locator

Specifies the location or address of **multimedia data** or a **segment**.

2.2.2.26

Model

A parametric or statistical representation of **multimedia content** or **features**.

2.2.2.27

Manual

Processing of **multimedia data**, **content**, or **metadata** by human means.

2.2.2.28

Metadata

The information and documentation which makes **multimedia data** understandable and shareable to users over time.

2.2.2.29

Multimedia

Data comprising one or modalities, such as images, audio, video, 3D models, ink content, and so forth.

2.2.2.30

Navigation

A process by which a **user** accesses **multimedia content** and steers a course through the content in a controlled manner.

2.2.2.31

Object

An object with a physical representation in the natural world.

2.2.2.32

Region

A spatial unit of **multimedia**, for example, a 2D spatial **region** of an **image**, or a moving region of **video**.

2.2.2.33

Relation

Any association among entities.

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2.2.2.34**Rights**

Information that determines the ownership and terms of use of **multimedia data, content, or metadata**. Refers to Intellectual Property Rights, Copyrights, and the Access Rights.

2.2.2.35**Scene**

An episode or sequence of events representing continuous action in one location.

2.2.2.36**Search**

A process for searching **multimedia content** that satisfies certain criteria. This process may include ranking the content according to the extent that it satisfies the criteria.

2.2.2.37**Segment**

A spatial or temporal unit of **multimedia**, for example, a temporal **segment** of **video**, or a **segment** of an **image**.

2.2.2.38**Semantics**

Information relating to the underlying meaning or understanding of **multimedia content**. Alternatively, refers to the specification of the meaning of **description tools**.

2.2.2.39**Summary**

An abstraction of **multimedia content** that summarizes the **content**.

2.2.2.40**User**

An end-user or consumer of **multimedia content**.

2.2.2.41**User Preferences**

The preferences of a **user** pertaining to **multimedia content**. This includes the user's tastes, likes and dislikes with respect to the content and its properties, as well as preferences with respect to the consumption process.

2.2.2.42**Usage History**

A history of actions that a **user** of **multimedia content** has carried out over a certain period of time, such as recording a specific piece of content, or playing back recorded content at a specific time.

2.2.2.43**Variation**

An alternative version of **multimedia content**., which may be derived through transcoding, summarization, translation, reduction, and so forth.

2.2.2.44**Video**

A space- and time-varying visual **data** or **signal** intended for viewing; commonly represented as a discrete sequence of **images** or **frames**.

2.2.2.45**View**

A portion of an **image, video** or **audio** signal, defined in terms of a partition. A partition is a multi-dimensional region defined in the space, time and/or frequency plane.

2.2.2.46**Visual**

Related to the visual modality.

2.2.2.47**View Decomposition**

An organized set of **views** that provides a structured decomposition of an **image, video** or **audio** signal in multi-dimensional space, time and/or frequency.

2.2.2.48**3D mesh model**

Representation model of the surface of 3D objects using a set of faces and nodes. (i.e. polygonal meshes)

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2.3 Symbols and abbreviated terms

2.3.1 Generic

For the purposes of this part of ISO/IEC 15938, the symbols and abbreviated terms given in the following apply:

ART:	Angular-Radial Transform
AV:	Audio-visual
CSS:	Curvature Scale Space
CIE:	International Commission on Illumination
CIF:	Common Intermediate Format
CS:	Classification Scheme
D:	Descriptor
Ds:	Descriptors
DCT:	Discrete Cosine Transform
DDL:	Description Definition Language
DS:	Description Scheme
DSs:	Description Schemes
FOC:	Focus of Contraction
FOE:	Focus of Expansion
GLA:	Generalized Lloyd Algorithm
GoF:	Group of Frames
GoP:	Group of Pictures
HMMD:	Hue-Min-Max-Difference
HSV:	Hue-Saturation-Value
IANA:	Internet Assigned Numbers Authority
IETF:	Internet Engineering Task Force
IPMP:	Intellectual Property Management and Protection
ISO:	International Organization for Standardization
JPEG:	Joint Photographic Experts Group
MDS:	Multimedia Description Scheme
MNV:	Mean Normal Vector
MPEG:	Moving Picture Experts Group
MPEG-2:	Generic coding of moving pictures and associated audio information (see ISO/IEC 13818)
MPEG-4:	Coding of audio-visual objects (see ISO/IEC 14496)
MPEG-7:	Multimedia Content Description Interface Standard (see ISO/IEC 15938)
MP3:	MPEG-2 layer 3 audio coding
NAC:	Normalized Auto-Correlation
QCIF:	Quarter Common Intermediate Format
PWM:	Pseudo Weighted Measure
RGB:	Red-Green-Blue
SMPTE:	Society of Motion Picture and Television Engineers
SSD:	Shape Spectrum Descriptor
TZ:	Time Zone
TZD:	Time Zone Difference
URI:	Uniform Resource Identifier (see RFC 2396)
URL:	Uniform Resource Locator (see RFC 2396)
W3C:	World Wide Web Consortium
XML:	Extensible Markup Language
XOR :	eXclusive-OR

2.3.2 Arithmetic operators

+	Addition
-	Subtraction (as a binary operator) or negation (as a unary operator)
++	Increment, i.e. x++ is equivalent to x=x+1
--	Decrement, i.e. x-- is equivalent to x=x-1
+=	Accumulation, i.e. x+=2 is equivalent to x=x+2
/=	divide and substitute, i.e. x/=2 is equivalent to x=x/2
*	Multiplication
x	Multiplication
^	Power

- / Integer division with truncation of the result towards zero. For example, 7/4 and -7/-4 are truncated to 1, -7/4 and 7/-4 are truncated to -1.
- // Integer division with rounding to the nearest integer. Half-integer values are rounded away from zero unless otherwise specified. For example, 3//2 is rounded to 2, and -3//2 is rounded to -2.
- ÷ Used to indicate division in mathematical equations where no rounding is intended
- % Modulus operator, defined only for positive numbers
- ld Logarithm base 2
- ceil Minimum integer number greater or equal than the given floating point number

$$\text{Sign()} \quad \text{Sign}(x) = \begin{cases} 1 & x \geq 0 \\ -1 & x < 0 \end{cases}$$

$$\text{Abs()} \quad \text{Abs}(x) = \begin{cases} x & x \geq 0 \\ -x & x < 0 \end{cases}$$

$$\sum_{i=a}^{i<b} f(i) \quad \text{Summation of } f(i) \text{ with } i \text{ taking integer values from } a \text{ up to, but not including } b.$$

2.3.3 Logical operators

- || Logical OR
- && Logical AND
- ! Logical NOT

2.3.4 Relational operators

- > Greater than
- >= Greater than or equal to
- ≥ Greater than or equal to
- < Less than
- <= Less than or equal to
- ≤ Less than or equal to
- == Equal to
- != Not equal to
- max[] Maximum value in argument list
- min[] Minimum value in argument list
- median[] median value in argument list

2.3.5 Bitwise operators

- | OR
- & AND
- >> Shift right with sign extension
- << Shift left with zero fill

2.3.6 Conditional operators

$$?: \quad \text{condition} ? a : b = \begin{cases} a & \text{if } (\text{condition}) \\ b & \text{otherwise} \end{cases}$$

2.3.7 Assignment

- = Assignment operator

2.3.8 Constants

- π 3.141 592 653 58...
- e 2.718 281 828 45...

2.3.9 Functions

- max() Maximum value in argument list
- min() Minimum value in argument list