



浙江大学计算机学院
数字媒体与网络技术

Digital Asset Management

数字媒体资源管理

2. Introduction to Digital Media Format

任课老师：张宏鑫
2014-09-30



Outline

- Image format and coding methods
- Audio format and coding methods
- Video format and coding methods
- Introduction to HTML and XML
- Graphics format and coding methods



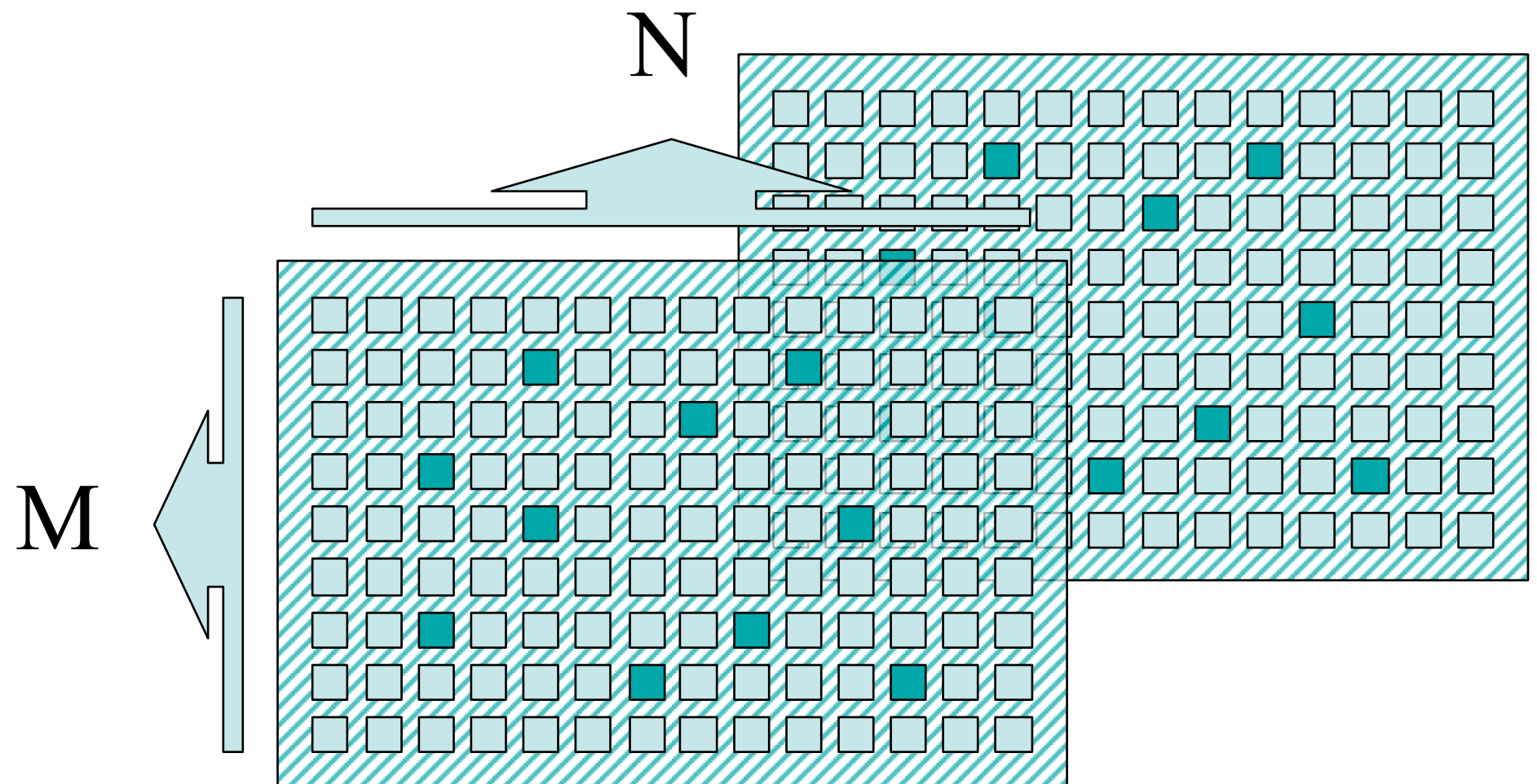


2.3. Video formats and coding methods



Representations of video

- Sequence of images ?!?
 - Can be viewed as a 3-dimensional matrix
 - But it is only 50% correct



Common video formats

- AVI (Microsoft, Divx, ...)
 - avi, wmv, asf
- RM (Realplayer)
 - rm, rmvb
- MOV (Quicktime)
 - mov
- MPEG
 - MPEG-1, MPEG-2, MPEG-4 ...



<http://www.bigbuckbunny.org/index.php/download/>



Video compression standards

- **MPEG standards**
 - Audio/Video compression, storage and play back standards
 - MPEG-1: VCD
 - MPEG-2: broadcast TV, e.g., DVD、HDTV etc.
 - MPEG-3: replaced by MPEG-2
 - MPEG-4: network video transfer, stream media
 - MPEG-7:
 - MPEG-21:
- **ITU-T H.26x series**



MPEG-1 Standard ISO/IEC 11172-2 (1991)

"Coding of moving pictures and associated audio for digital storage media"

- Video

- optimized for bit rates around 1.5 Mbit/s

- originally optimized for SIF picture format,

- but not limited to it:

- [**NTSC based**] : 352x240 pixels at 30 frames/sec

- [**PAL based**] : 352x288 pixels at 25 frames/sec

- progressive frames only

- no direct provision for interlaced video applications, such as broadcast television



MPEG-2 Standard ISO/IEC 13818-2 (1994)

- Video

- 2-15 or 16-80 Mbit/s bit rate (target bit rate: 4...9 Mbit/sec)

- TV and HDTV picture formats

- Supports interlaced material

- MPEG-2 consists of *profiles* (类) and *levels* (级)

- Main Profile, Main Level (MP@ML)

- 720x480 resolution video at 30 frames/sec

- < 15 Mbit/sec (typical ~4 Mbit/sec)

- for NTSC video

- Main Profile, High Level (MP@HL)

- 1920x1152 resolution video at 30 frames/sec

- < 80 Mbit/sec (typical ~15 Mbit/sec)

- HDTV



MPEG-1 v.s. MPEG-2

- MPEG-1 Apps ~

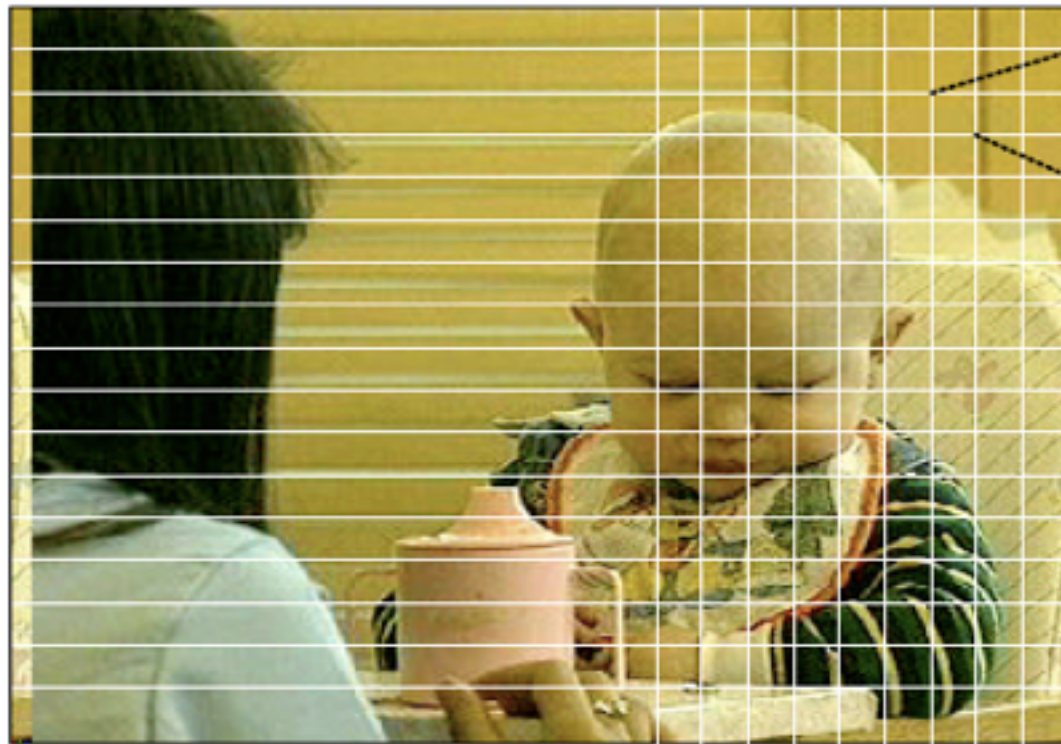
- CD-I, digital multimedia,
- video database, e.g. video-on-demand

- MPEG-2 Apps ~

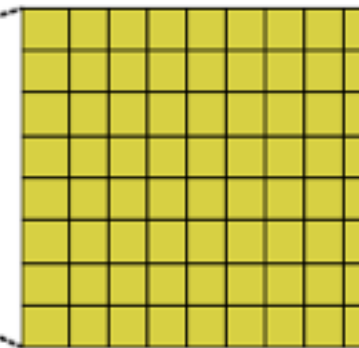
- satellite, cable, and terrestrial broadcasting,
- digital networks, and
- digital VCR



MPEG compression is based on 8 x 8 pixel **block processing**



8 pixels



8 pixels

- 8 x 8 pixel block can be numerically manipulated by fast signal processor in real time
- Motion estimation is based on comparing the blocks between series of pictures



MPEG: only compress moving parts

new picture



previous picture



difference



Encoder

Decoder

difference



previous picture

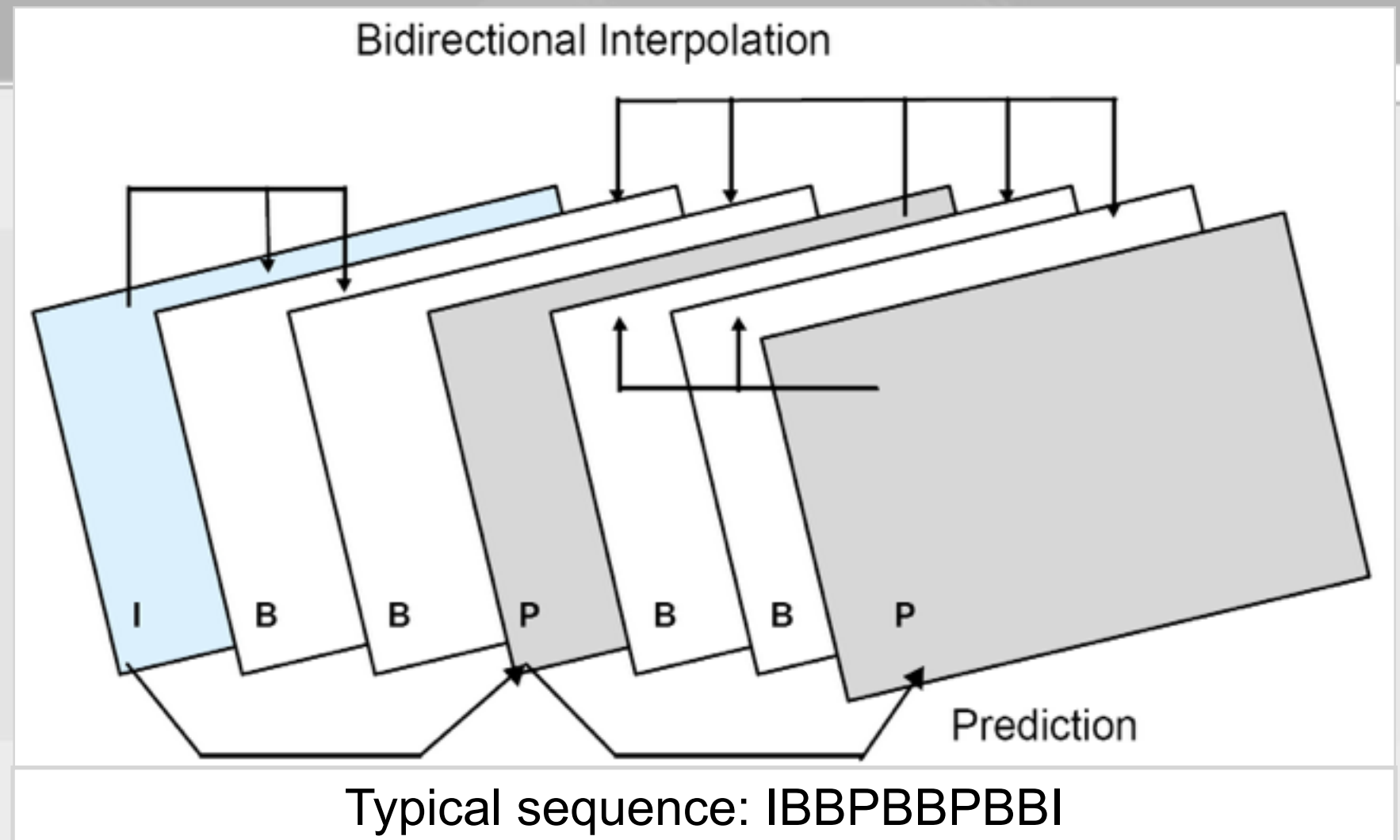


new picture



MPEG: motion compression

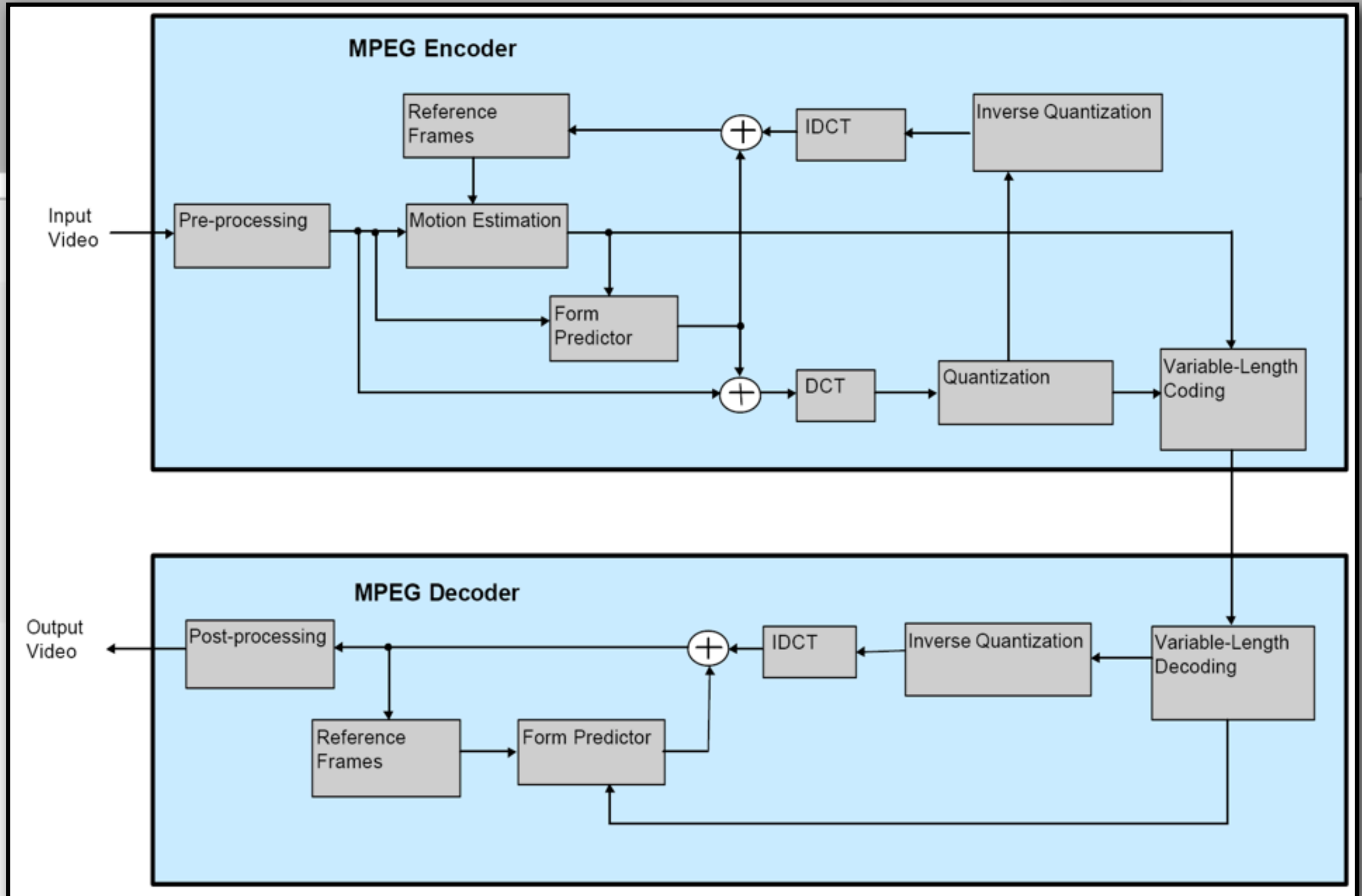
I = Intra-Frame
P = Predicted frame
B = Bi-directionally
interpolated frame



Video signal: stream of picture, it is not necessary to send every picture

- Whole picture is needed only when all the content is changed!
- Several pictures has to be buffered to memory to make prediction forward and backward





MPEG: other issues

- Motion compensating
- Intra-frame transfer order



Color video coding

- 抽样和编码整个模拟（彩色）视频信号
 - 例如，复合编码
- 对亮度和色度分别编码
 - 例如，组件编码
 - 亮度比色度更重要，可根据应用场合采用4:2:2，4:2:0, 4:4:4等不同的编码比率

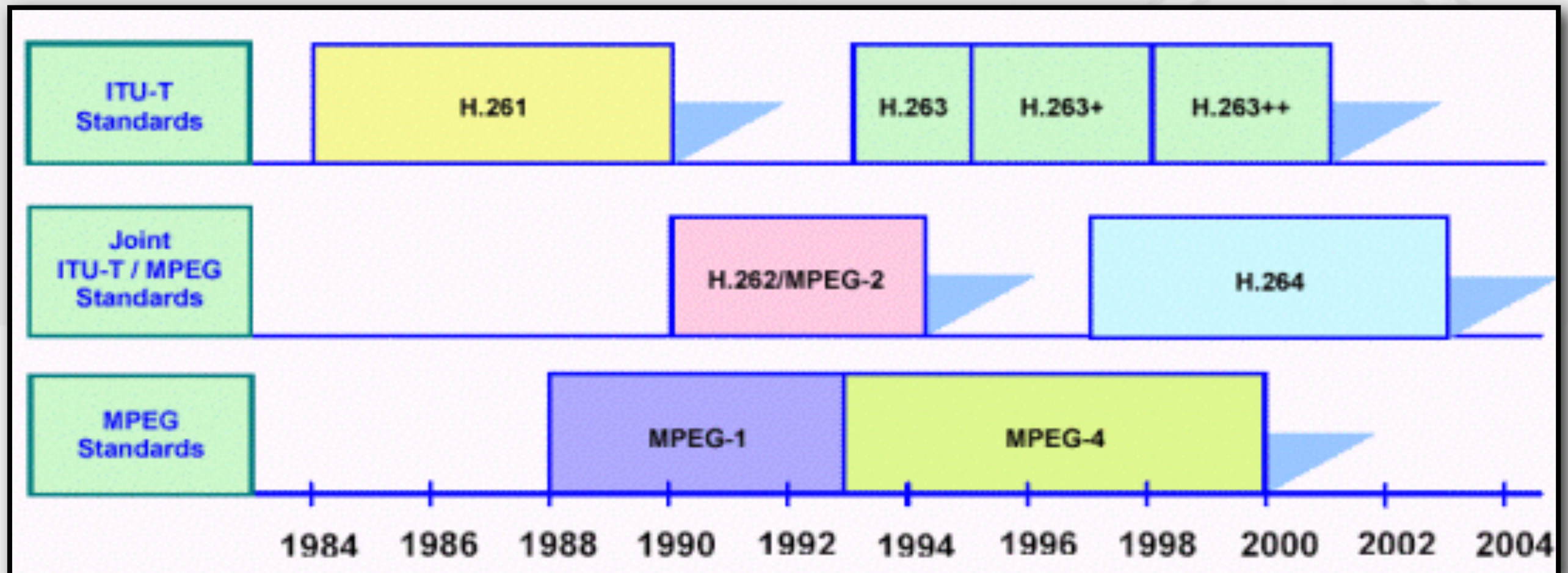


Overview of H.264

- JVT (Joint Video Team)
 - founded on December 2001, Pattaya Thailand.
 - video coding specialists from ITU-T and ISO, the two international standards organizations
 - goal**: define a new video coding standards to achieve high compression rate, high image quality, good network adaptive coding frame.
- H.264: A new video compression standard
 - accepted by ITU-T
 - accepted by ISO
 - called AVC (Advanced Video Coding) standard
 - as the 10th part of MPEG-4

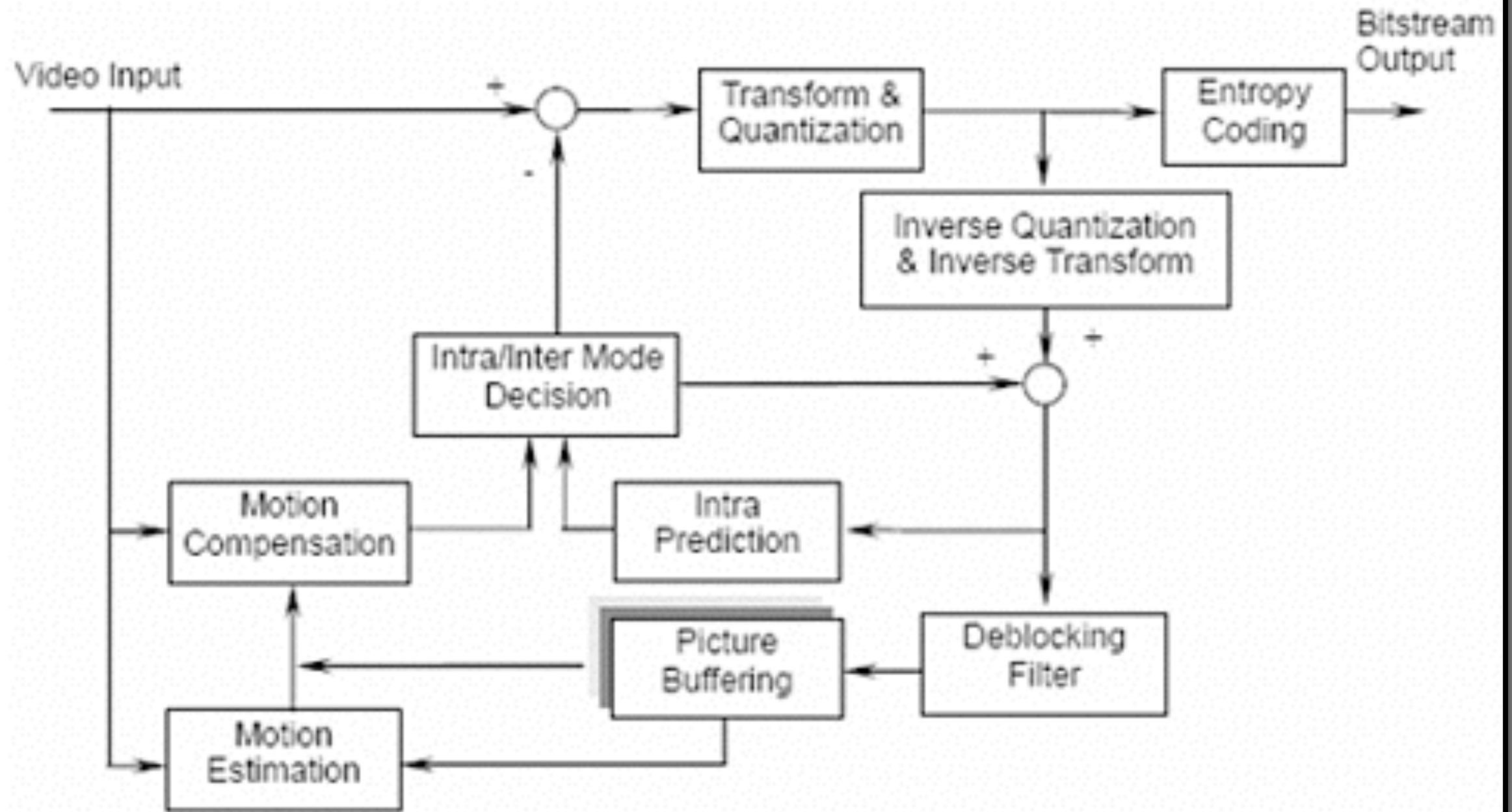


Major history of digital video standard



H.264 coding principle

ASTRI H.264 Baseline Profile Encoder Function Diagram



H.264的主要技术特点

1. 4类DCT整数变换以及相应的量化方法
2. 7种宏块预测模式
 - 16×16 , 16×8 , 8×16 , 8×8 , 8×4 , 4×8 , 4×4
 - 运动估计和补偿更加精确
3. 多参考帧
4. 帧内预测
5. 改进的去块效应滤波器 (Deblocking filter)
6. 增强的熵编码方法
 - UVLC (Universal VLC)、CAVLC (Context adaptive VLC) 和CABAC
7. 1/4像素插值
8. 宏块级逐行、隔行自适应编码MBAFF



Advantages and shortages of H.264

High compression rate

- In the same image quality, H.264 can be compressed as size of
 - 36% of MPEG-2, 61% of MPEG-4 , 51% of H.263
- Low bit stream, high quality

High error correctness rate

- H.264 provides necessary tools to solve the error coding problem in unstable network environments

Network adaptation

- H.264 provides Network Adaptation Layer so as to make files of H.264c can be easily transferred in different network environments.

High computation price

- In the same image quality, H.264 is twice of MPEG-2 in computation complexity.

Applications of H.264

- H.264 standards added a NAL (Network Abstraction Layer)
 - to face the network connection and interface problem in the real applications.
- **video communication**
 - In real-time communication, POLYCOM、TANDBERG、VCON、SONY etc. claimed their own H.264 based TV-meeting products.
- **digital TV broadcasting**
 - MPEG has already finished defining the MPEG-2 compatible standard on H.264 stream coding content
- **video storage-and-play-back**
 - For High resolution DVD (HD DVD) application, H.264/MPEG-4 AVC solution.



Summary of video coding

- Resolution
- Coding rate
- Motion coding
- Transfer performance





2.4. HTML and XML

结构化文档概览



Overview of HTML

- Hypertext Markup Language
 - Developed by **Tim Berners-Lee**
 - **lightweight** markup language vs. complex **SGML**.
 - Based on pure text format
- Rich abilities to display multimedia information.
 - Later added tags to support image and videos.
- HTML **3.2** => HTML **4.0** => HTML **5.0**
 - Different browser has their own display effects.



Overview of HTML



- Hypertext Markup Language
 - Developed by **Tim Berners-Lee**
 - **lightweight** markup language vs. complex **SGML**.
 - Based on pure text format
- Rich abilities to display multimedia information.
 - Later added tags to support image and videos.
- HTML **3.2** => HTML **4.0** => HTML **5.0**
 - Different browser has their own display effects.



Overview of all HTML elements

Reference: <http://htmlhelp.com/reference/wilbur/overview.html>

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
  <title>Apple中国</title>
  <meta http-equiv="content-type" content="text/html;
charset=gb2312">
  ...
</head>

<body>
<!-- Tag for Activity Group: General, Activity: Apple China -
Homepage -->
...
</body>
</html>
```

Overview of all HTML elements

Reference: <http://htmlhelp.com/reference/wilbur/overview.html>

Head →

Body →

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
  <title>Apple中国</title>
  <meta http-equiv="content-type" content="text/html;
charset=gb2312">
  ...
</head>
<body>
<!-- Tag for Activity Group: General, Activity: Apple China -
Homepage -->
  ...
</body>
</html>
```

Overview of HTML - Head elements

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN" "http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
  <title>Apple中国</title>
  <meta http-equiv="content-type" content="text/html; charset=gb2312">
  ...
  <link rel="home" href="http://www.apple.com/">
  ...
  <script src="http://images.apple.com/global/scripts/lib/prototype.js" type="text/javascript" charset="utf-8">
  </script>
  ...

  <style type="text/css" media="all">
  ...
  #billboard { width: 1100px; margin: 0 auto 15px; overflow: hidden; position: relative; }
  #ticker { margin-bottom: 15px; }
  #homefooter { margin: 60px auto 50px; }
  ...
  </style>
</head>
```

- **TITLE** - Document title
- **ISINDEX** - Primitive search
- **META** - Meta-information

- **LINK** - Site structure
- **BASE** - Document location
- **SCRIPT** - Inline script
- **STYLE** - Style information



Overview of HTML - Body elements

```
<html>
<head> ... </head>
<body>
  <H1> Hello, world </H1>
  <P> Digital Asset management is cool! </P>

</body>
</html>
```

- **Block level elements**

- Headings: H1 => H6

- Lists: UL, OL, DIR, MENU, LI, DL, DT, DD

- Text Containers: P, PRE, BLOCKQUOTE, ADDRESS

- others: DIV, CENTER, FORM, HR, TABLE

Overview of HTML - Body elements

```
<html>
<head> ... </head>
<body>
  <H1> Text-level elements </H1>
  <A href="http://www.google.com"> GOOGLE <IMG src=" ... "> </A>

</body>
</html>
```

- **Text-level elements**

- Logical markup: **EM ...**
- Special markup: **A, IMG, APPLET ...**
- Physical markup: **B, ...**
- Forms: **INPUT ...**
- Tables: **CAPTION, TR, TH, TD**

About CSS

叠样式表 (Cascading Style Sheets)

- http://www.w3school.com.cn/css/css_intro.asp
- 样式定义如何显示 HTML 元素
- 样式通常存储在样式表中 (*.css)
- 把样式添加到 HTML 4.0 中，是为了解决内容与表现分离的问题
- 外部样式表可以极大提高工作效率
- 外部样式表通常存储在 CSS 文件中
- 多个样式定义可层叠为一个

HTML 5.0

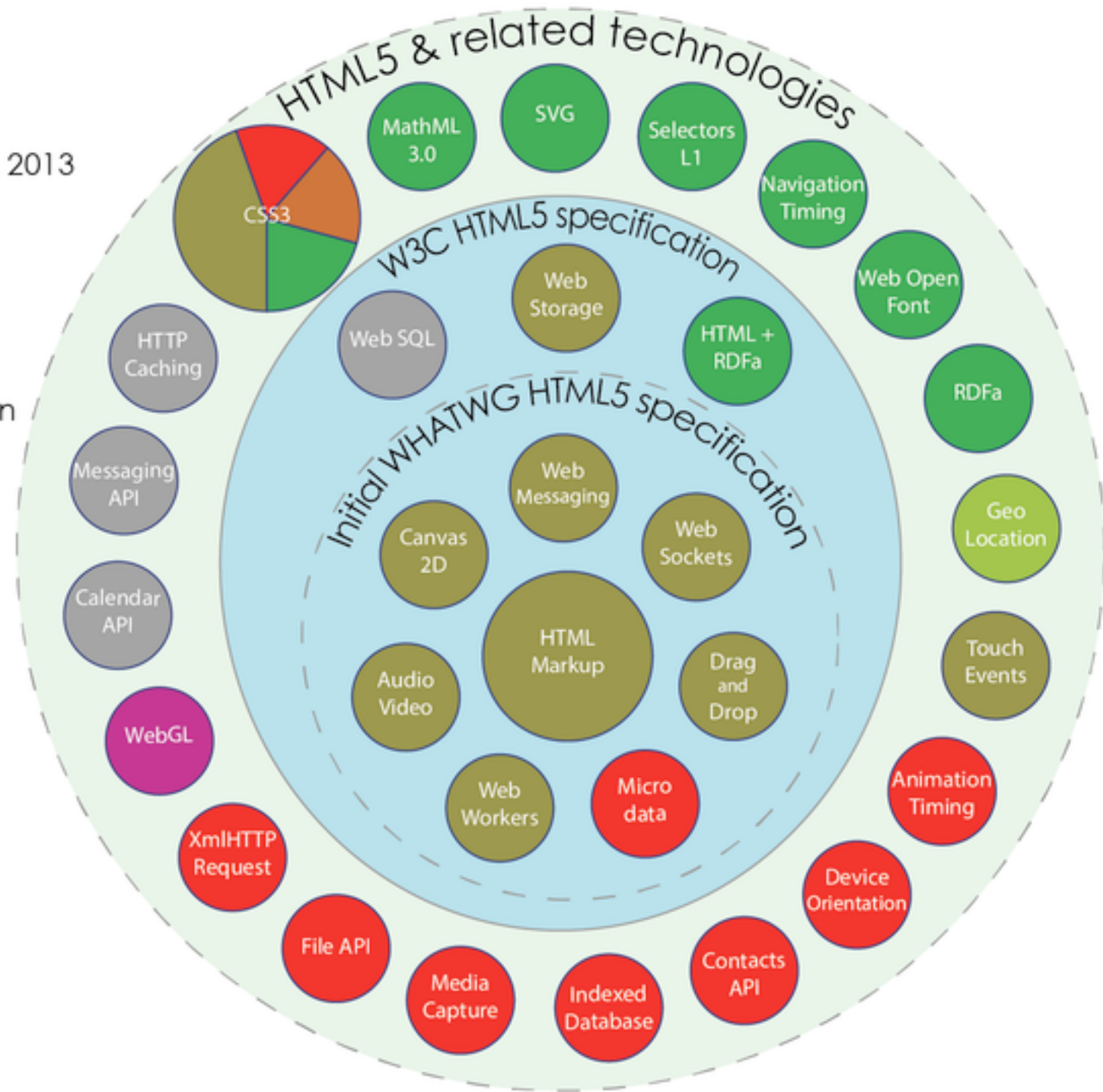


- 学习参考：<http://www.w3school.com.cn/html5/index.asp>
- 实例解释：<http://directguo.com/html5>
 - <http://html5-slide-template.googlecode.com/svn/trunk/html5-slide-template.html#slide1>
- 一套Web富客户端开发的工业标准
 - 许多新特性：内建的视频、音频标记，元素拖放功能
 - 最新的 Safari、Chrome、Firefox 以及 Opera 支持某些 HTML5 特性。Internet Explorer 9 也将支持

HTML5

Taxonomy & Status on January 20, 2013

- W3C Recommendation
- Proposed Recommendation
- Candidate Recommendation
- Last Call
- Working Draft
- Non-W3C Specifications
- Deprecated



About JavaScript

- <http://www.cad.zju.edu.cn/home/zhx/DAM/2014/doku.php?id=js>
- JavaScript

