Multimedia over internet

Classification of Multimedia

持续的 (space-time based)
离散的 (space-based)

声音 (Sound)
移动图象 (Moving Images)
滚动 (Scrolls)
动画 (Animation)
静止图像 (Still Images)
文本 (Text)
图形 (Graphics)

捕捉自现实世界 (Captured from real world)
由计算机合成 (Synthesized by computers)

Taxonomy of Multimedia Applications

通信 (Communications)
交互 (Interactive)
分布 (Distribution)
检索 (Retrieval)

1:1
1:m
m:m

视频电话 (Videophone)
实时广播 (Live broadcast)
组会议/共享白板 (group conference/shared whiteboard)
邮件 (Email)
公告板 (Bulletin board)
组会议/新闻组 (Group conference/News groups)

图像数据库 (Image Database)
新闻频道 (News channel)
点播 (Video-on-demand)
3D 导航 (3D Navigation)
Media Demo Sites
- Radio Disney
- Mars Panorama
- Cog in Wheel
- Florida Estuary
- Media Ring Telephone
- G2 Compound Media
- Real Audio Library

- Synchronous?
- 1-1, 1-m, m-m?
- Human-to-human vs. human-to-machine?

Bandwidth Consumption

<table>
<thead>
<tr>
<th>Content &amp; Format</th>
<th>Video Resolution</th>
<th>Uncompressed Bit rate</th>
<th>Compressed Bit rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>TV video</td>
<td>480x480 24Hz</td>
<td>105 Mbits/sec</td>
<td>6.5 Mbits/sec</td>
</tr>
<tr>
<td>Film video</td>
<td>480x480 29.97 Hz</td>
<td>168 Mbits/sec</td>
<td>4.5 Mbits/sec</td>
</tr>
<tr>
<td>PAL video</td>
<td>576x576 25 Hz</td>
<td>199 Mbits/sec</td>
<td>3.5 Mbits/sec</td>
</tr>
<tr>
<td>HDTV video</td>
<td>1920x1080 30 Hz</td>
<td>1493 Mbits/sec</td>
<td>18-30 Mbits/sec</td>
</tr>
<tr>
<td>HDTV video</td>
<td>1280x720 60 Hz</td>
<td>1327 Mbits/sec</td>
<td>18-30 Mbits/sec</td>
</tr>
<tr>
<td>ISDN videophone</td>
<td>352x288</td>
<td>1.4 Mbits/sec</td>
<td>64-1920 kbits/sec</td>
</tr>
<tr>
<td>PSTN videophone</td>
<td>352x288</td>
<td>1.4 Mbits/sec</td>
<td>64-1920 kbits/sec</td>
</tr>
<tr>
<td>Two-channel stereo audio</td>
<td>1.4 Mbits/sec</td>
<td>64-1920 kbits/sec</td>
<td>64-1920 kbits/sec</td>
</tr>
<tr>
<td>Five-channel stereo audio</td>
<td>3.5 Mbits/sec</td>
<td>384-968 kbits/sec</td>
<td>384-968 kbits/sec</td>
</tr>
</tbody>
</table>

- Massive bandwidth needed for multimedia future.
- Compression and time synchronization will be vital.

Bandwidth Supply

<table>
<thead>
<tr>
<th>Medium</th>
<th>Bits/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSTN modems</td>
<td>Up to 56 kbits/sec</td>
</tr>
<tr>
<td>ISDN</td>
<td>64-120 kbits/sec</td>
</tr>
<tr>
<td>LAN</td>
<td>10-100 Mbits/sec</td>
</tr>
<tr>
<td>ATM</td>
<td>135-622 Mbits/sec or more</td>
</tr>
<tr>
<td>CD-ROM (normal speed)</td>
<td>1.4 Mbits/sec</td>
</tr>
<tr>
<td>Digital Video Disk</td>
<td>9-10 Mbits/sec</td>
</tr>
<tr>
<td>Over-the-air Video</td>
<td>18-20 Mbits/sec</td>
</tr>
<tr>
<td>CATV</td>
<td>20-40 Mbits/sec</td>
</tr>
</tbody>
</table>

Multimedia Streaming

Download and Streaming
Scalable Transmission

Research Challenges (we will investigate papers on)

- Network Issues
  - Scalable multimedia delivery
  - Temporal QoS provisioning
  - Congestion management
  - Synchronization
  - Multimedia distribution network
  - Multimedia caching
  - Streaming & Multicasting

- Information handling
  - Content-based search
  - Efficient compression, coding & transcoding
  - Quality vs. rate tradeoff
  - Composite Object handling
  - Spatial-temporal object definition