<table>
<thead>
<tr>
<th><strong>Title</strong></th>
<th>Interactivity and diversity through digital TV</th>
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</thead>
<tbody>
<tr>
<td><strong>Author(s)</strong></td>
<td>Lee, Kenneth.</td>
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<tr>
<td><strong>Date</strong></td>
<td>1999</td>
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<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/10220/1757">http://hdl.handle.net/10220/1757</a></td>
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2nd Regional Symposium On New Media & Learning Technologies 8 – 10 September 1999, Singapore

INTERACTIVITY & DIVERSITY THROUGH DIGITAL TV

Kenneth Lee, TCS

Scope
- Introduction on DTV
- Diversity through DTV
- Interactivity through DTV
- The Road Ahead
- Conclusion

What is Digital TV?
- Consumer
  - TV set that receives and displays digital TV signals
- Consumer Electronics Manufacturers
  - TV set with digital signal processing within
- Broadcasters
  - Digital transmission of video, audio and data

Digital Transmission
- Source Coding
- MPEG Compression
- Channel Coding
  - Reed-Solomon Coding, Convolutional Coding
- Modulation
  - OFDM
- Broadcast

Benefits of Digital TV
- More efficient
- More robust
- Better picture quality
- Crystal clear digital quality sound
- More choice (programmes & applications)
- Greater interaction with TV

Block Diagram of Digital TV System
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What is Digital TV?

Digital Transmission

Benefits of Digital TV
How can I receive Digital TV?
- Set-top box
- Integrated Digital TV set
- PC plug-in card

Diversity through Digital TV
- Digital TV Standards
- Delivery Platforms
- Applications
- Content

Digital TV Standards
- Advanced Television Systems Committee, USA
- Digital Video Broadcasting, Europe
- Digital Broadcasting Experts Group, Japan

Comparison of DTV Standards
<table>
<thead>
<tr>
<th>ATSC</th>
<th>DVB</th>
<th>DIBEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
</tr>
<tr>
<td>Audio</td>
<td>Dolby AC-3</td>
<td>MPEG-2</td>
</tr>
<tr>
<td>Transport</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
</tr>
<tr>
<td>System</td>
<td>PSI</td>
<td>DVB SI</td>
</tr>
<tr>
<td>Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>8VSB</td>
<td>OFDM</td>
</tr>
<tr>
<td><strong>DTV Applications</strong></td>
<td><strong>TV Mobile</strong></td>
<td></td>
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<tr>
<td>---------------------</td>
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<td></td>
</tr>
<tr>
<td>• TV Mobile</td>
<td>• Concept of TV anytime, anywhere with updated information on the move</td>
<td></td>
</tr>
<tr>
<td>• Single Frequency Network (SFN)</td>
<td>• Successfully tested on MRT trains, SBS buses and LRT trains</td>
<td></td>
</tr>
<tr>
<td>• High Definition TV (HDTV)</td>
<td>• Possible launch in other public transportations</td>
<td></td>
</tr>
<tr>
<td>• Multi-Channel Surround Sound</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Data Broadcasting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Multi-lingual Subtitling/Multi-language Audio</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Digital Video Recording</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Interactive Services</td>
<td></td>
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<table>
<thead>
<tr>
<th><strong>Single Frequency Network (SFN)</strong></th>
<th><strong>High Definition TV (HDTV)</strong></th>
</tr>
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<tbody>
<tr>
<td>• Multiple transmitters are deployed for effective coverage</td>
<td>• Widescreen (16:9)</td>
</tr>
<tr>
<td>• Same frequency is used for these multiple transmitters</td>
<td>• 1920 x 1080 -&gt; &gt; 2 million pixels</td>
</tr>
<tr>
<td>• Frequency spectrum is conserved</td>
<td>• Superior picture quality</td>
</tr>
<tr>
<td></td>
<td><strong>Multi-Channel Surround Sound</strong></td>
</tr>
<tr>
<td></td>
<td>• Recreate cinematic experience at home</td>
</tr>
<tr>
<td></td>
<td>• 5.1 speaker system</td>
</tr>
<tr>
<td></td>
<td>• Dolby AC-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Data Broadcasting</strong></th>
<th><strong>Digital Video Recording</strong></th>
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</thead>
<tbody>
<tr>
<td>• Data can either be programme related or otherwise</td>
<td>• Quality as good as the source</td>
</tr>
<tr>
<td>• Examples include Digital Teletext, Web pages etc</td>
<td>• Either on tape or on hard disk</td>
</tr>
<tr>
<td><strong>Multi-Lingual Subtitling/Multi-Language Audio</strong></td>
<td><strong>Interactive Services</strong></td>
</tr>
<tr>
<td>• More than one language can be carried in the digital bitstream simultaneously</td>
<td>• Interactive applications can be enhanced with local storage (hard disk)</td>
</tr>
<tr>
<td></td>
<td>• Further details to be provided later</td>
</tr>
</tbody>
</table>
Digital TV Content (1)

- Video
  - Standard Definition TV (SDTV)
  - Enhanced Definition TV (EDTV)
  - High Definition TV (HDTV)
- Audio
  - Multi-Channel Surround Sound
  - Multi-Language Audio

Digital TV Content (2)

- Data
  - Multi-lingual Subtitles/ Closed Captions
  - Interactive content
  - Programme associated data
  - Web pages/ Multimedia content
  - Digital Teletext
  - File transfer/ Software download

Interactive Digital Broadcasting

- Merges mass appeal of traditional TV with rich, interactive power of Internet
- TV is pervasive and easy to use
- May or may not require a return/ back channel
  - telephone lines
  - cable
  - wireless

Degree of Interactivity

- Proto-interactivity
  - return path is not required
  - eg Teletext
- Full interactivity
  - return path is required
  - eg E-commerce

Medium of Interactive Content

- Broadcast
  - Audio, video and data streaming
- Walled Garden
  - Cached content
- Internet
  - Web browsing/ searching

Interactive Services

- Electronic Programme Guide (EPG)
- E-commerce/ Home Banking
- Personalized TV
- Interactive Advertisement
- On-demand Information/ Digital Teletext
- Polling/ Quiz
- Online Education
- Internet
- Games
Electronic Programme Guide (EPG)
- Programme guide for the multi-channel services
- Navigation tool
- Provide descriptions of programmes
- Allows sorting, searching, querying
- Gateway to interactive services
- Set user preference

E-Commerce/ Home Banking
- Pay Bills
- Purchase Merchandise
- Book Airline Tickets/ Travel Packages
- Order Groceries
- Check Bank Statements
- Transfer of Funds

Personalized TV
- Requires hard disk
- Based on user profile
- Creates your own channel
- Automatically records your favourite programmes
- Control over viewing
- Watch when you want, what you want and how you want

Interactive Advertisement
- Can be based on user profile
- Direct marketing channel
- Banner ads
- Special ad content
- Provide detailed product information

On-demand Information/ Digital Teletext
- Data broadcast
- Could be programme related or otherwise
- Real-time information
  - Weather
  - Traffic
  - Stock market

Polling/ Quiz
- Feedback from viewers through polling
- Simple home viewers' quiz
Online Education/ Course
- Course material is broadcast
- Interactive exercises/tests
- Enhance learning experience
- Programme may be repeated with the help of local storage

Internet
- Web browsing
- Email
- Internet Chat
- File Transfer/ Software Download
- Simultaneously while watching the TV

Games
- Online gaming
- Interactive games

Benefits of Interactive Digital Broadcasting
- Viewers
  - convenience
  - value-added services
- Advertisers
  - capture consumers’ feedback
  - targeted advertising
- Broadcasters
  - new revenue opportunities

Technologies & Standards of Interactive Digital Broadcasting

Who has started Interactive TV?
- AT&T
- QVC
- NBC
- NBC
- TBS
- FOX
- HBO
- MTV
- CNN
- Amazon Prime
- Netflix
- Sky
Issues to Interactive Digital Broadcasting
- Interactive platform
- Return channel platform
- Conditional access/Security
- Business Model
- Privacy

Factors to Successful Interactive Services
- Relevant content
- Value-added
- Ease of use
- Instant access
- Secure network
- Local storage
- Built-in safety checks

The Road Ahead......

Future Trends
- Set-top boxes will have increasing power and storage capacity
- Voice technology
- Home networking
- More converging products
- Ubiquitous wireless and net access
- Bumper bandwidth

TCS' Direction
- Exploit latest technology to provide quality picture and sound
- Provide value-added programmes and services to our viewers
- Continue to enrich and delight the world

Conclusion
- DTV is here to stay
- New and wide range of services
- Change the lifestyle of people
- Evolve and converge with the Internet and telecommunications