

Emerging 3D Video Communication Over wireless Networks & Applications

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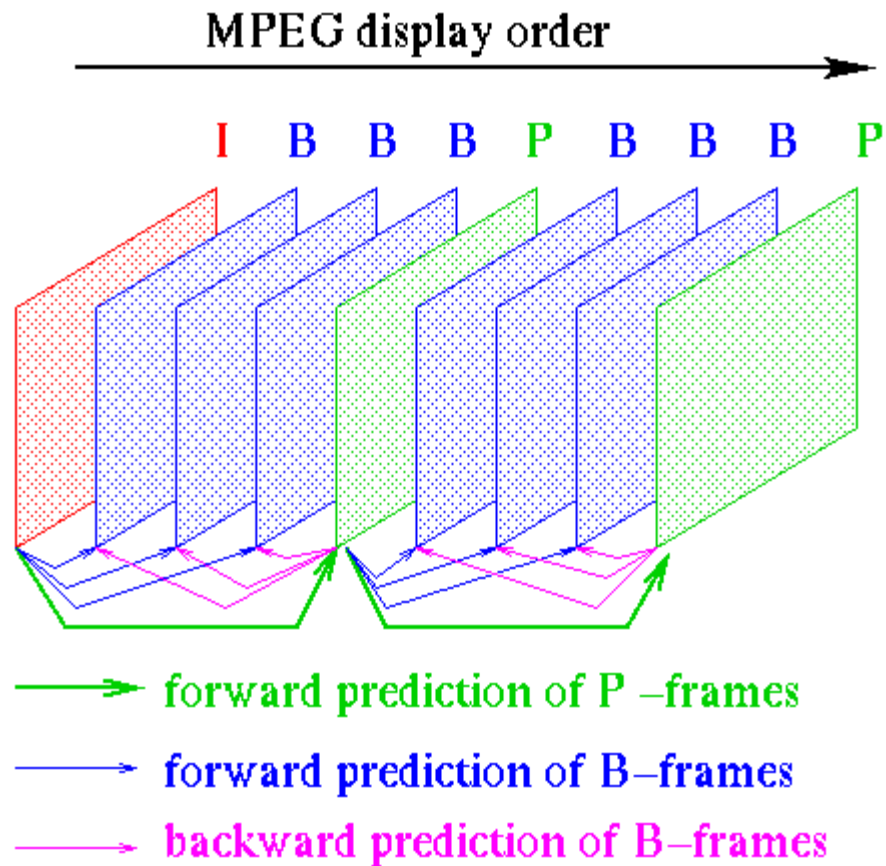
Outline

- Introduction
- 2D Video Coding
- Stereo Video Coding
- Multi-view Video Coding
- Transmission Error & effects on 3D video
- Techniques to combat transmission errors
- 3D Display Systems
- Applications
- Challenges
- Conclusions

Video Coding & Standards

- ❖ Basics
- Video sequence (series of pictures)
- Large amount of spatial & temporal redundancies
- Intra & Inter Coding (I, P and B frames)
- ❖ Int'l & state of the art Standards
- MPEG-4 part 10, H.264/AVC & HEVC
- ❖ Scope of Standardization
 - Only the syntax & Decoder are standardized
 - Permits optimization, complexity reduction and allows standardized implementation.

Coding technique in video sequence



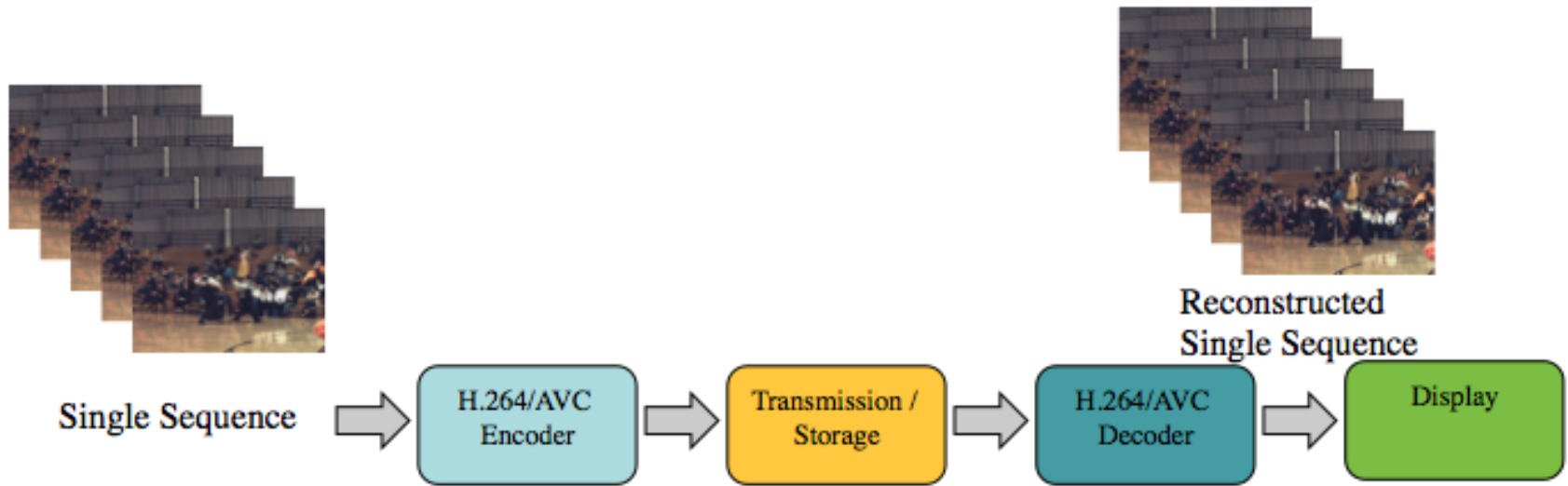
Why coding a sequence?

- Storage :- tapes, CDs, memory cards, flash drives, hard drives/disc etc.
- Streaming :- wired or wireless networks.
- Transmission & live Broadcast
- ❑ A typical movie video without compression @ 720x480 pixels per frame and 30 frames per with full colour can have a duration of 90mins.

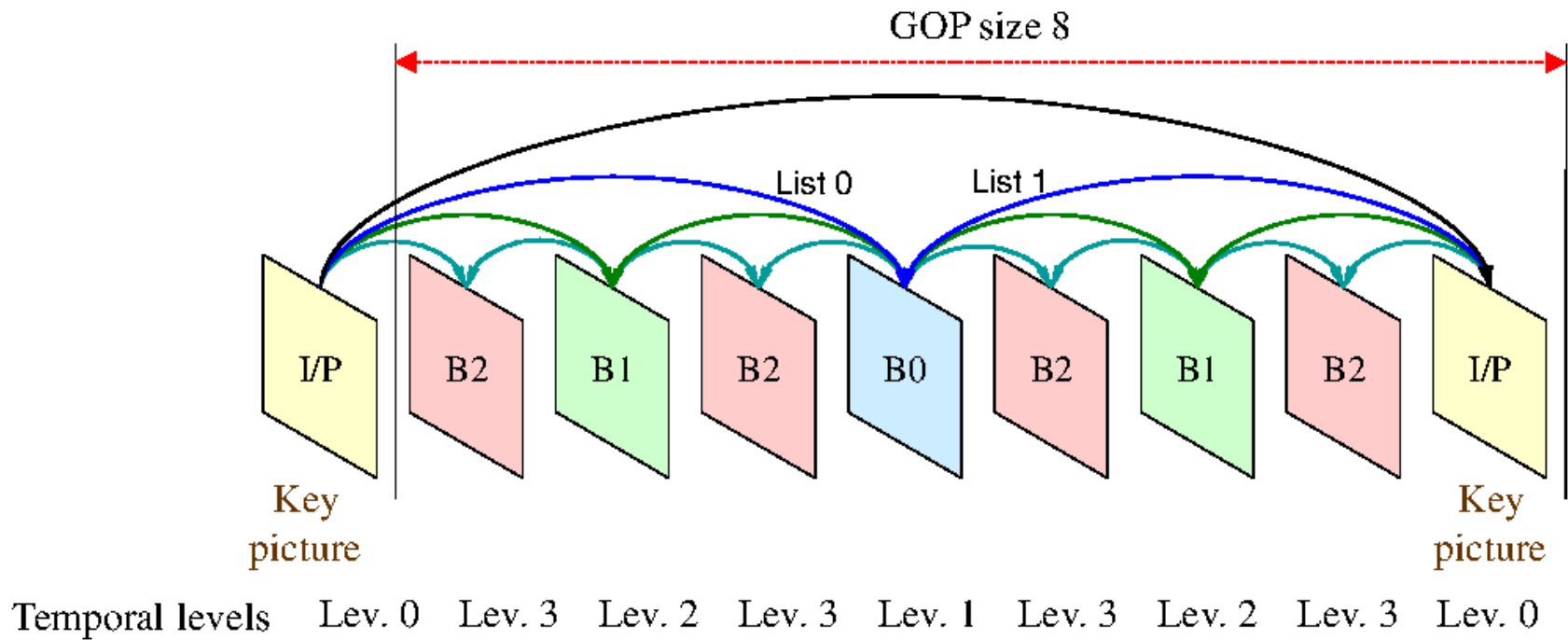
The total quality of data = 167.96 Giga Bytes !!!

Note: without coding technique, multimedia as we know it today would not have been possible.

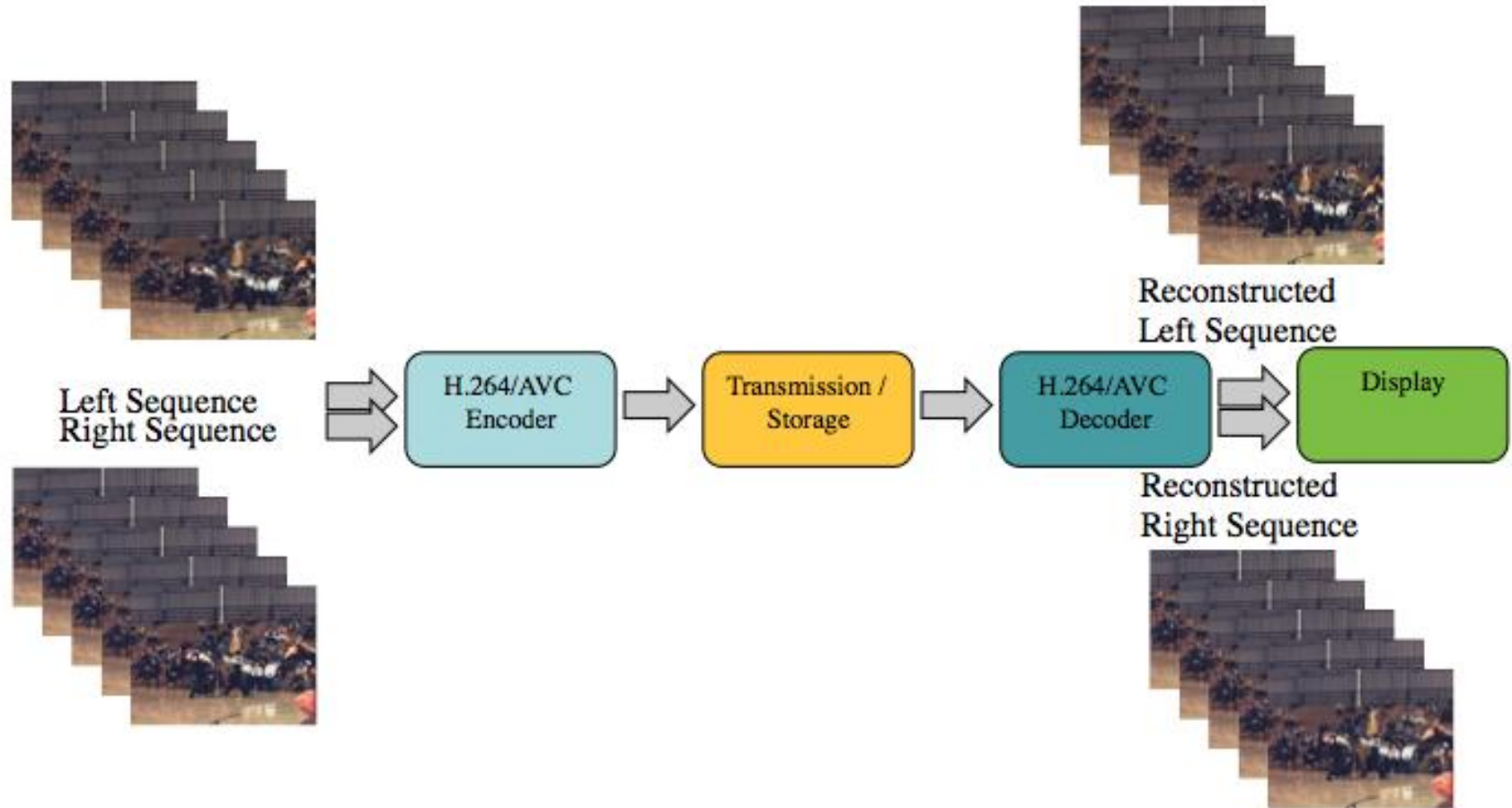
2D Video Coding



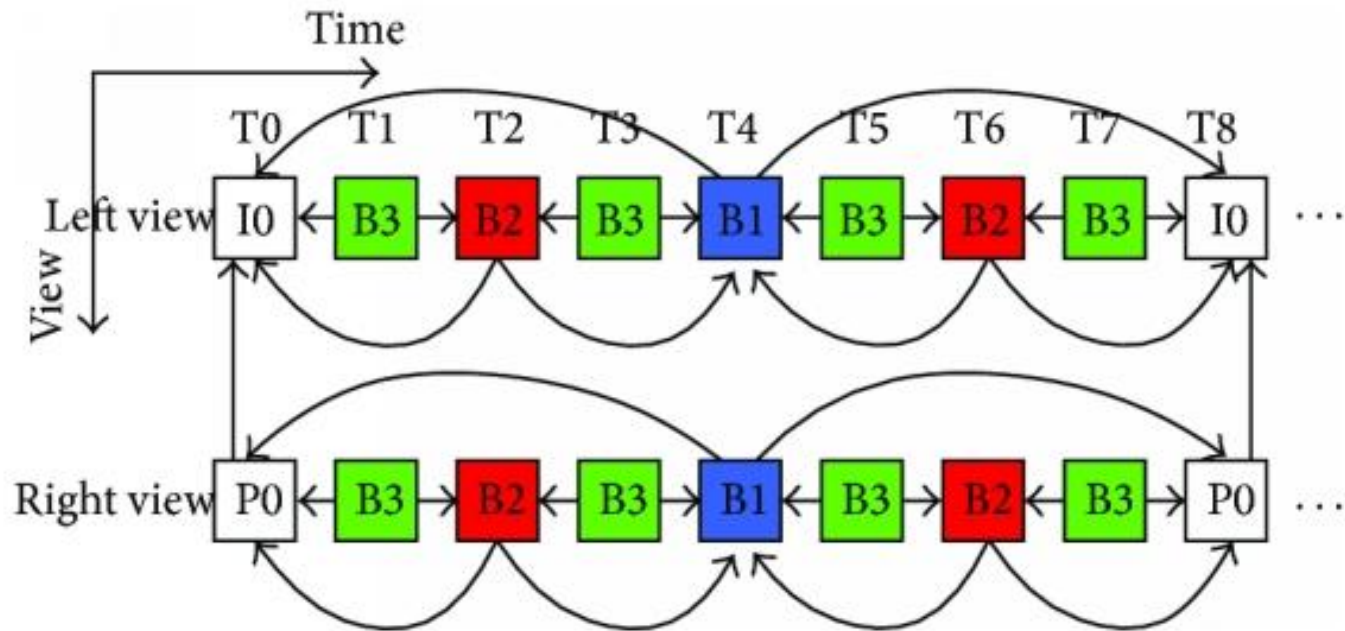
2D Prediction Structure



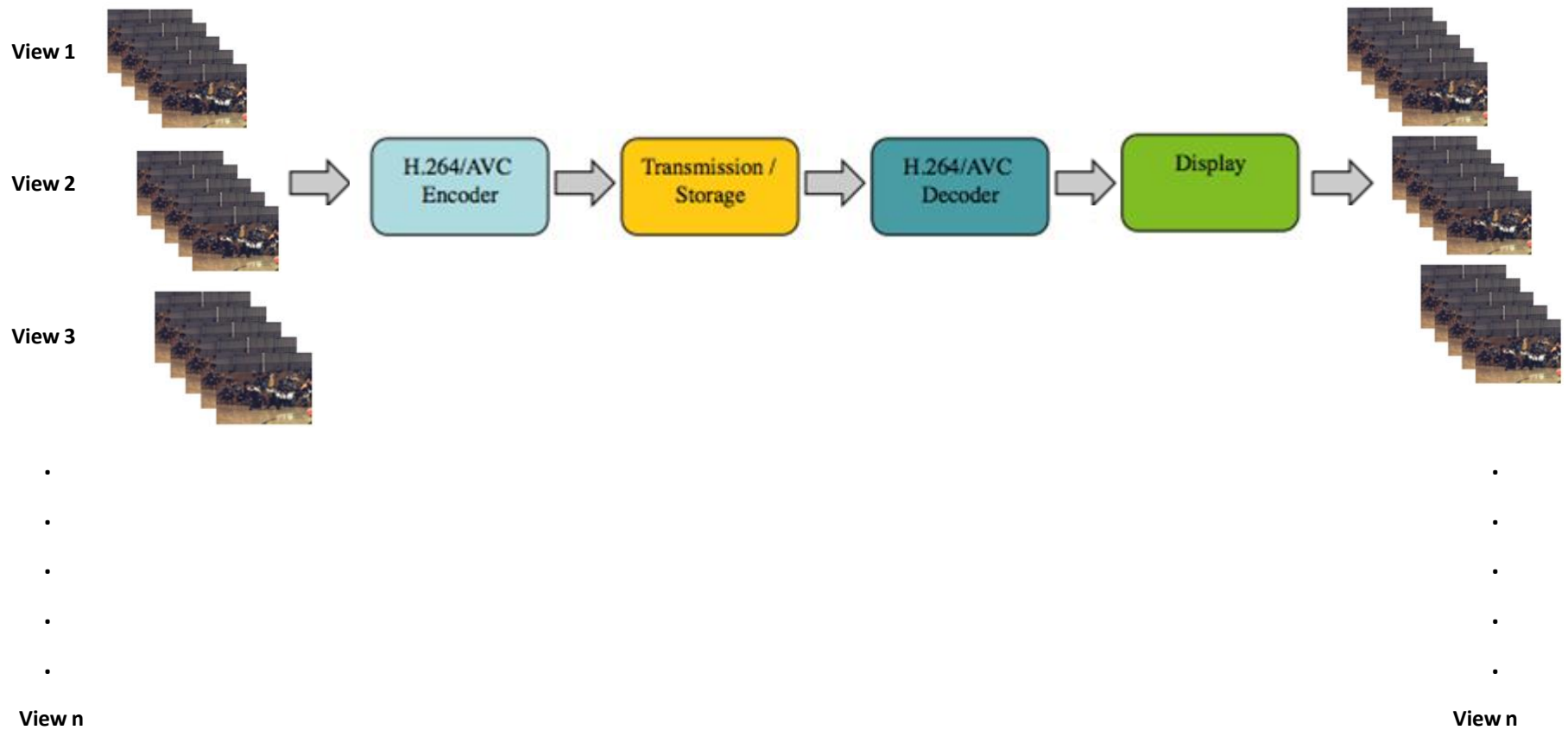
Stereo video coding



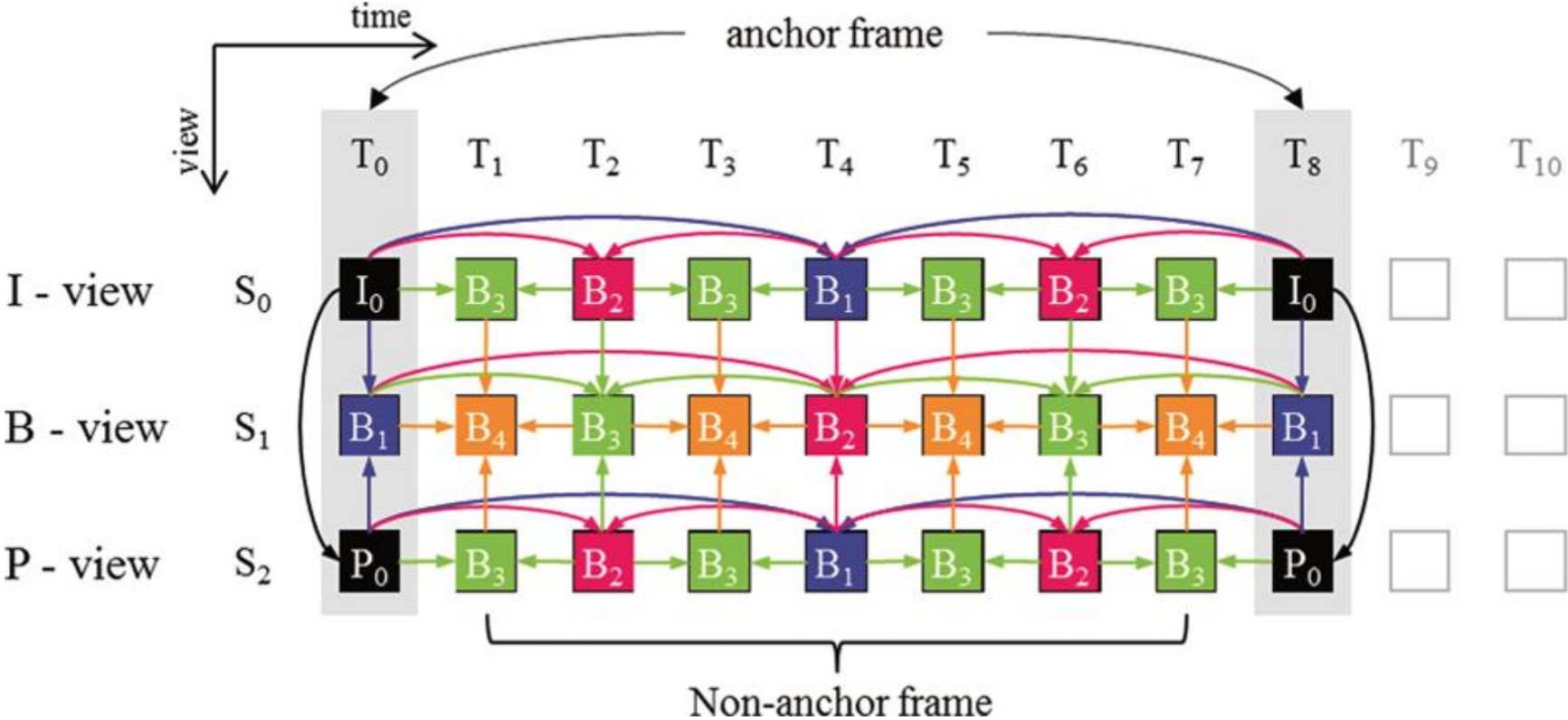
Stereo prediction structure



Multi-view video coding



Multi-view prediction structure



Transmission Errors

- Channel introduces bit/burst errors.
- Bit-stream is highly sensitive to error.

Effects on MVC Bit-stream

- Error propagation due to temporal/spatial & interview dependencies.
- Affects Encoder-Decoder synchronization.
- Erroneous bit-stream can lead to packet loss.
- Severe degradation in reconstructed video quality.

Techniques to combat errors

- There are two different techniques to combat transmission errors namely; error control and error resilience.
- Examples of error control :- Automatic Repeat Request, Forward Error Code, Error Concealment and parity check etc.
- Examples of Error resilience:- Data partitioning, redundant slice, intra coding, flexible macro-block ordering and Error concealment.

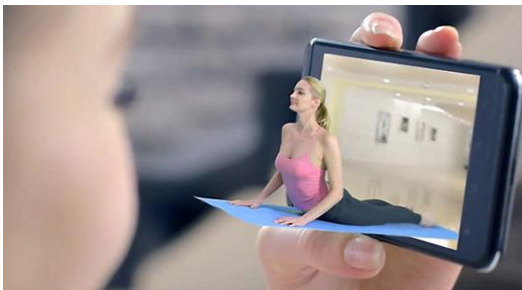
Trade-off is required between compression and ER in most cases.

Usually different techniques are combined to give the much desired quality.

3D Display systems

- The 3D display systems are readily becoming available in homes and public places . Movies (home & theatre), games, laptops and handheld devices. By 2025, it is forecasted that every screen will be 3D.
- There are basically two categories of viewing 3D video namely; Stereoscopic and auto stereoscopic screens
- Free view video technology – not fully commercialized.

Stereoscopic glasses, auto-scopic screens & 3D for handheld devices



Applications of 3D technology

- Entertainment and gaming
- Advertisement
- 3D graphics and design
- Flight simulators and navigation
- Geology and mapping
- Military and defense
- Real estate
- Medical imaging
- Tele-presence

These applications represent distinct multi-billion dollar markets.

Challenges

- Cost – Alio-scopic screen are costly.
- 3D content delivery requires higher bandwidth for efficient transmission.
- A single bit error can cause visual impairment.
- Less public awareness – 3rd world countries.
- Medical consequences – few reported cases of eye fatigue and head ache

Conclusion

- Popularity of the 3D video technology has been on the rise – especially in advanced countries.
- The technology has its major impact in the entertainment industry.
- The technology was designed to deliver a different viewing concept with improve visual quality.
- Existing 2D video infrastructure for transmission can be used to deliver 3D video content with little modification
- Error control techniques used to combat errors in 2D video are imported to 3D video technology.
- Most 3D display systems have inbuilt 2D & HD facilities in it.

Thank you!