

Grand Alliance
ATV Compression System

Presented at NAB '94
March 20, 1994

Grand Alliance nab94

Outline

- Introduction
- Grand Alliance Compression
- GA Encoder Features
- Migration Path
- Conclusion

GA Compression

- The GA System incorporates key features of the previously tested system
 - Source adaptive coding
 - Field/frame coding
 - Adaptive inter/intra coding
 - Flexible refreshing (I frame, progressive)
 - Field/frame predictions
 - Bi-directional prediction (B-frames)
 - Forward analyzer and perceptual selection

GA Compression (con't)

- **Designed to support both progressive and interlaced formats**
 - 720/1:1/60 progressive
 - 1080/2:1/60 interlaced
- **Uses MPEG-2 syntax (MP/HL)**
 - Enhances interoperability
 - Helps worldwide adoption of the US HDTV Standard
 - Lower decoder cost
- **Migration path towards 1080-line progressive format**

Source Adaptive Coding

- The GA system can accept a variety of materials including
 - 720-line progressive
 - 1080-line progressive/interlaced
 - 24/30/60 frames/sec
- The GA system can process film material originated 24 or 30 frames/sec
- The GA system can incorporate prefiltering and/or subsampling to enhance the compression efficiency

Refreshing Options

- Intra-frame refreshing
 - Large latency/acquisition delay
 - Easy editing/commercial insertion
 - Little refreshing artifacts
- Progressive refreshing
 - Low latency/acquisition delay
 - Slight loss in performance due to MV Restriction

B-Frames

- Verified noticeable performance improvement with B-frames (SNR improvement up to 1.96 dB)
- Increases the receiver cost due to additional memory requirement
- Increases the overall latency and channel acquisition time
- Techniques such as dual prime are not available for progressively scanned formats

Forward Analyzer/Perceptual Selection

- Use of ideal motion compensated frame for improved buffer management
- Use of perceptual model for selection of non-zero DCT coefficients
- Improved performance with noisy scenes and scene changes

GA Encoder Features

Bullets

Original frames will be used for coarse motion estimation and reconstructed frames will be used for fine motion estimation

The GA prototype will have +63.5/-64 horizontal and +31.5/-32 vertical motion estimation range

Combination of a priori and a posteriori decisions for inter/intra, field/frame DCT, and bi-directional motion

Film originated material will be automatically detected and processed at 24 or 30 frames/sec.

Programmable gamma and color matrix will be used for added flexibility

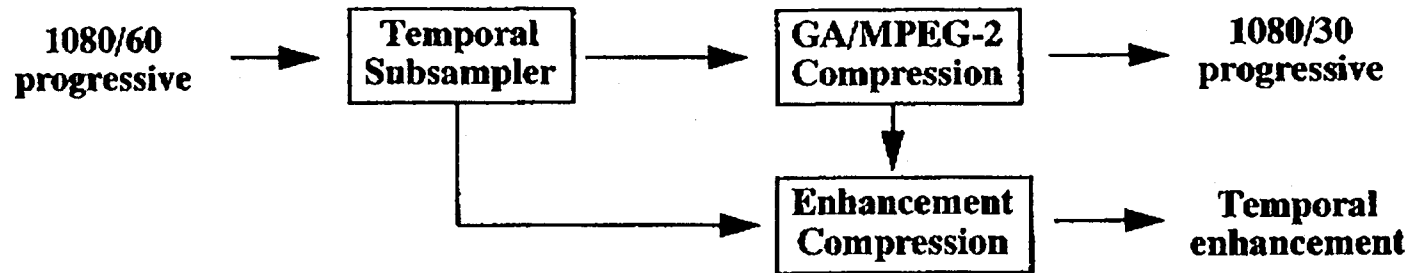
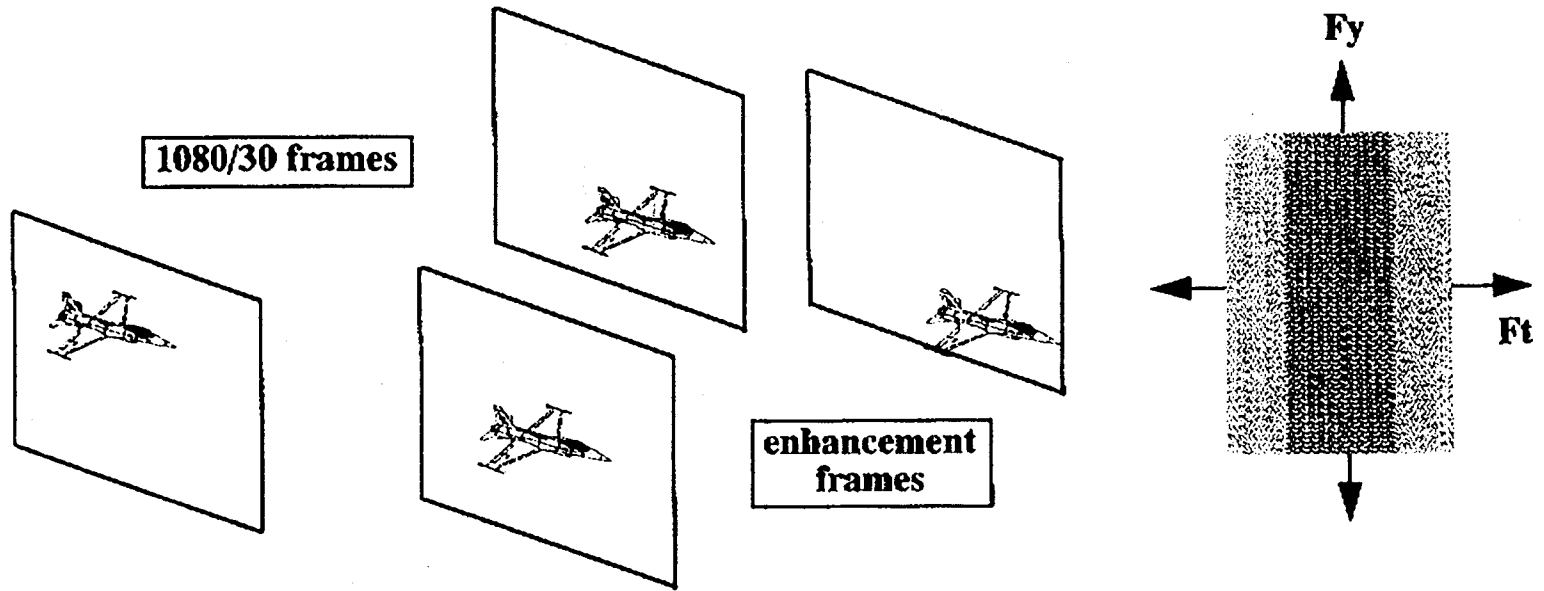
Migration Path to 1080-line Progressive Format

- Long term goal is 1080-line progressive scan at 60 Hz
- Migration to this goal is enabled by extensibility features that are built into the GA system
- Packet-level extensibility is a fundamental enabler
- Enhancement coding can be based on any of several initial transmission formats

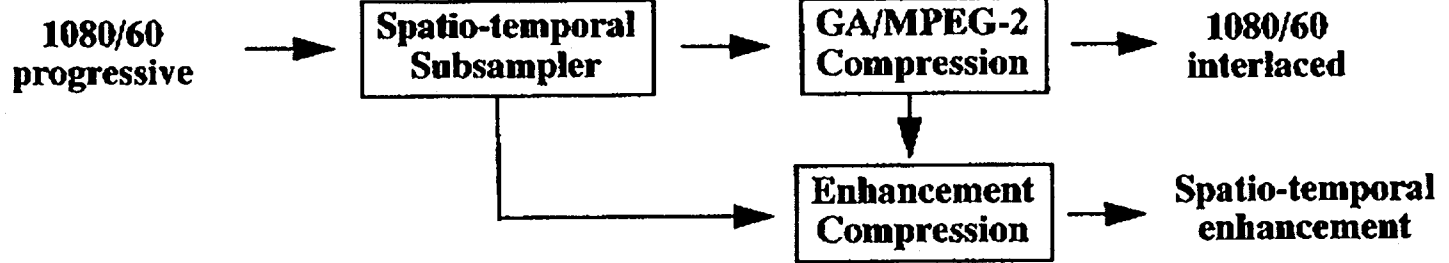
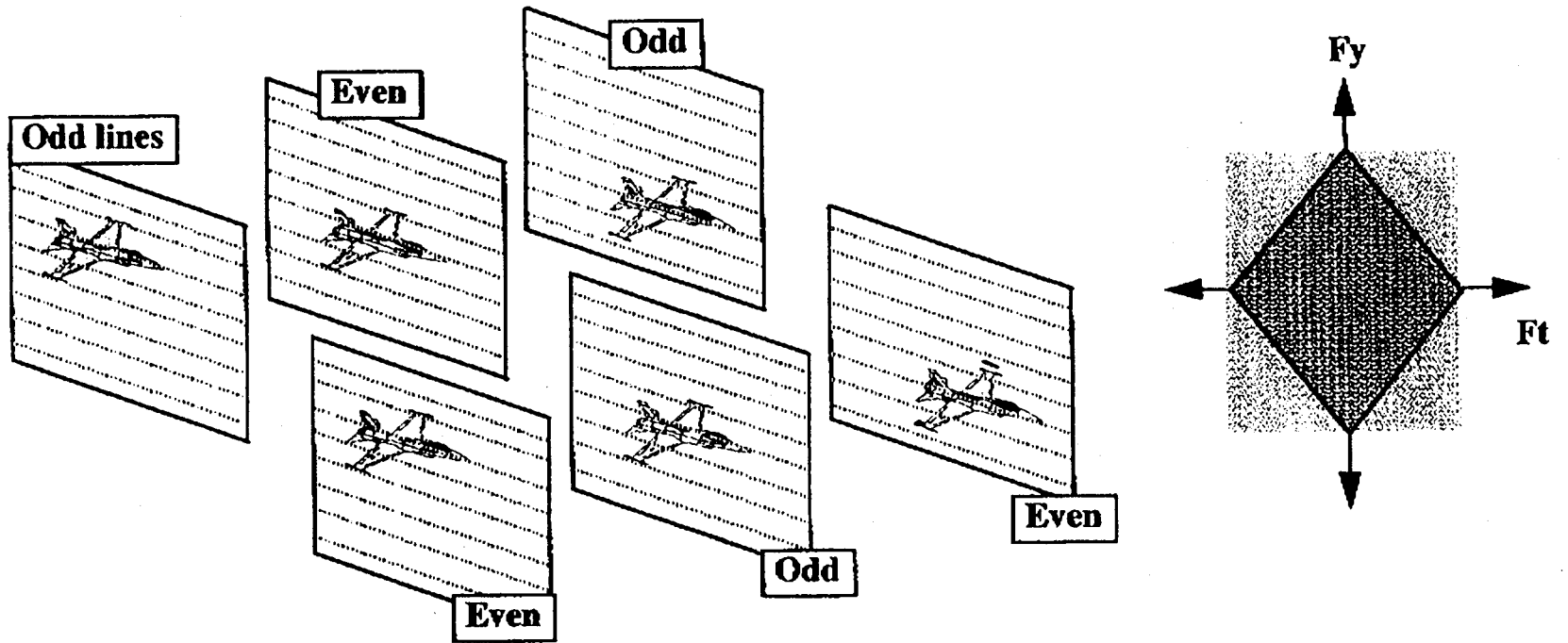
Conclusion

- The GA system will be designed to provide excellent HDTV picture quality by incorporating key features of the previously tested systems
- The GA system supports both progressive and interlaced formats
- The GA system uses MPEG-2 based system syntax for worldwide acceptance and interoperability
- The GA prototype system will be developed jointly by GA members
- The GA system will provide migration path to 1080-line progressive format

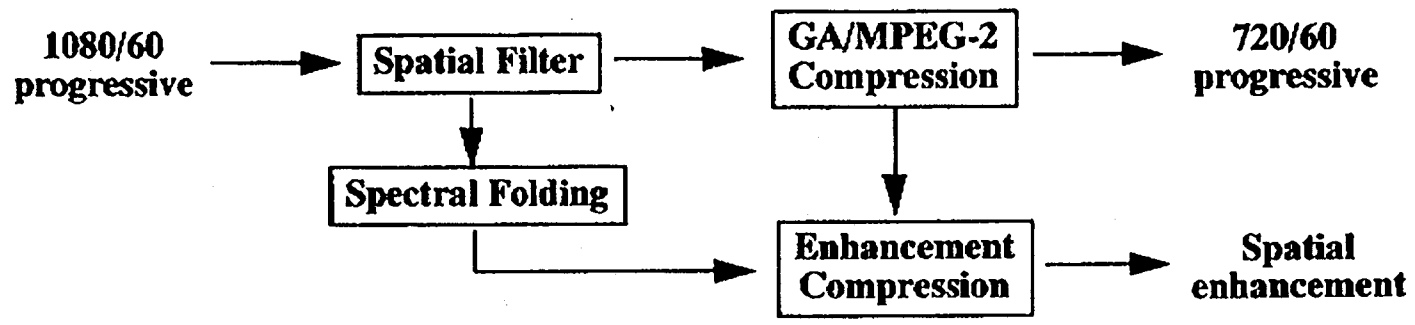
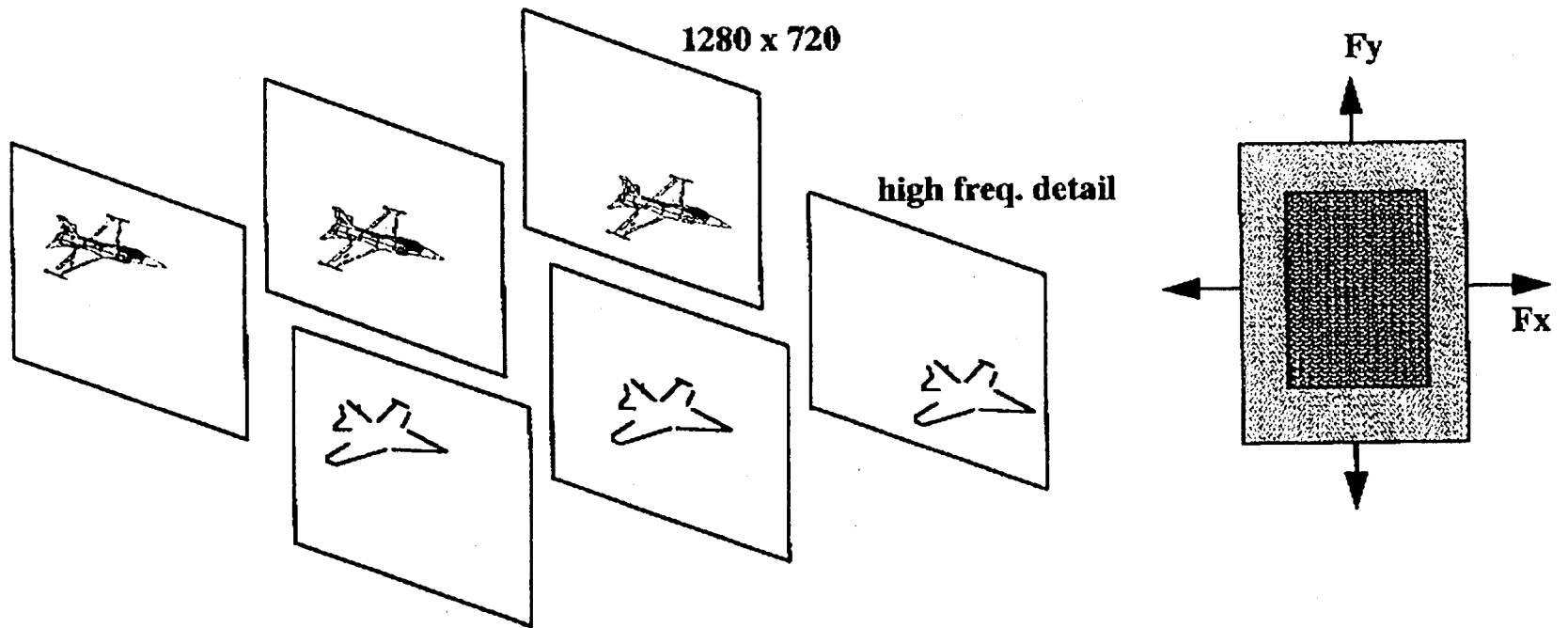
1080/30 Enhancement Example



1080/60 Enhancement Example



720/60 Enhancement Example



Grand Alliance Video Encoder Block Diagram

