David
Sarnoff
Research Center

Digital Hierarchy

Project Update for E. Geiger

Glenn A. Reitmeier
July 5, 1990

David Sarnoff Research Center
Informations Systems Research Laboratory
Princeton, NJ

David Sarnoff Research Center

Outline

- **ATRC and Other Activities**
- **Data Compression**
- **Digital RF Transmission**
- **Summary and Discussion**

David
Sarnoff
Research Center

ATRC Collaboration

- **We've had two all-day meetings with NAP**
- **We've agreed to have "expert group" meetings bi-weekly and plenary meetings bi-monthly**
- **We've agreed that basic data compression and RF approaches must be decided in 1Q91**

David
Sarnof
Research Center

ATRC Data Compression

- There are initially seven parallel efforts:
  - Block-match DCT (LEP)
  - Predictive SBC (Briarcliff)
  - Hybrid SBC/VQ (Briarcliff)
  - Block-match DCT with frame drop (TCE-DTB)
  - Flow-field QMF (Sarnoff)
  - Adaptive SBC (Sarnoff)
  - 3-D VQ (Sarnoff)

- The "coding expert group" will attempt to cross-fertilize ideas and combine efforts

- It is very important to achieve concencus on technical approaches, and to avoid NIH battles

David Sarnoff Research Center

Data Compression Recent Advances

- **Flow Field Frame Dropping: The Flow Field motion prediction is good enough, or matches human perception well enough, to allow dropping alternate residue frames for many scenes. Although there are details of the scene that are distorted, they are hard to see.**

- **Transform encoding (DCT) of Flow Fields has been implemented, and seems to give better compression than geometric encoding (Split & Merge) with improved hardware cost as well.**

- **Adaptive QMF bin allocation: Algorithms to optimally select individual QMF quantizing bins, based upon variance of the values to be quantized, have been implemented. Given a desired picture quality, the "best" quantization is chosen. This approach does about 25% better (less data to be sent) than previous manual bin size selections.**

David
Sarnof
Research Center

Data Compression Recent Advances

- **Previously developed Huffman encoding and table optimization routines have been folded into the compression algorithms. This brings the programs closer to a "bit stream" hardware simulation.**

- **A novel 3-dimensional vector quantization encoding algorithm has been conceived and is being implemented. This approach involves selecting vectors as a subset of a 4 by 4 by 8 super-vector block. Static pictures with high detail content may be effectively encoded by the 8 field temporal sub-vectors, while moving pictures are encoded by combinations of 8 component vectors that fill the super-vector block.**

David
Sarnoff
Research Center

ATRC RF Transmission

- **There are initially three parallel efforts:**
  - **QAM (Sarnoff)**
  - **OFDM (LEREA)**
  - **CPM (Briarcliff)**
- **NAP has good Comdisco communication simulation software, which we will soon evaluate**
- **The "RF expert group" will attempt to cross-fertilize ideas and combine efforts**
- **It is very important to achieve concencus on technical approaches, and to avoid NIH battles**

David
Sarnof
Research Center

RF Modem Progress

- **Receiver clock recovery demonstrated using error signal from adaptive equalizer**
- **BER vs. S/N for QPSK at 10 Mbps and 16 QAM at 20 Mbps within 1 db of theoretical curves**
- **Macintosh PC now used to monitor performance of adaptive equalizer**

David Sarnoff Research Center

Other Collaboration Possibilities

- **Bellcore**
- **COHRS (IBM, DEC, HP, Apple, etc.)**

David
Sarnoff
Research Center

Discussion

- **We desperately need more high-resolution pro-scan sequences for simulation**
- **How do we obtain cameras and displays for demonstrations in '91 and '92?**
- **What do we do about the formats supported by ATTC? - 1125i, 1050i, 787p**
- **When can OFDM hardware be available at Sarnoff?**
- **NAP seems to be stuck on interlace...??**