Business Day

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WEDNESDAY, SEPTEMBER 21, 1994

The New York Times

A Rough Start for Digital TV

By JOHN MARKOFF

Neil Shapiro, self-described video enthusiast, has seen the future face of television, and it is ... blemished.

During a basketball game, the ball zipping around the backcourt can look like Halley's comet, with a long orange tail. During a football game, as the camera sweeps the field to follow the arc of a pass, the spectators in the stands can turn into solid rectangles of color. And in some parts of the country, a heavy rain during a movie can cause the picture to freeze on a single frame for several minutes, or disappear altogether.

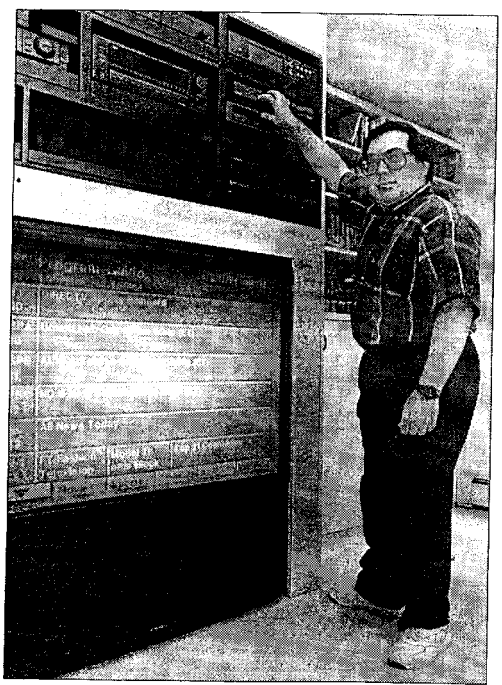
But this is the long-awaited digital television, and when the picture is good it's computer perfect. As of this past Monday, moreover, there are a full 150 channels of the digital programming, available in 23 states now and nationwide by the end of October through consumer electronics dealers.

And even though technical experts say that the video industry, in embracing this particular digital format, is locking into a technological standard it may live to regret, Mr. Shapiro and tens of thousands of other consumers are scrambling to buy the $700 to $900 receiving equipment as fast as Thomson Consumer Electronics Inc.'s RCA division can make it.

"It's far better television than I can get from cable or over-the-air television here," said Mr. Shapiro, who lives in Bethpage, L.I., and happens to do his TV watching on a Pioneer set with a 50-inch screen.

But any regular television will work with the system. What's new is the 18-inch RCA Digital Satellite System dish antenna on Mr. Shapiro's roof that delivers the digital programming through a cable attached to the computerized RCA box on the set top.

The service, delivered via satellites operated by GM Hughes Electronics, began in June in various small cities and towns around the country. Even on this limited scale, an estimated 100,000 subscribers have signed up, paying $22 or more a month. (Mr. Shapiro, who began subscribing two weeks ago, expects to pay about $55 monthly, compared with the $80 or so he has been spending for an array of basic premium services from his local cable company.)



Jim Estrin/The New York Times

Neil Shapiro in his Bethpage, L.I., living room with his 50-inch TV set. An 18-inch RCA satellite dish on his roof delivers digital programming.

Now that the digital television service, known as DirecTV, is about to become available nationally, analysts are predicting sales of one million receivers by the end of the year. That would represent one of the fastest introductions ever of a new consumer electronics product. And if DirecTV attracts three million subscribers by late 1996, as its executives predict, it would be a larger

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Digital Television's Start Is Not Picture-Perfect

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television distributor than all but a handful of the largest companies in the cable industry — the industry with which DirecTV means to compete, market by market and viewer by viewer.

But some video purists and technologists criticize the data-compression format that is being used to squeeze those 150 digital channels onto two orbiting satellites, the second of which went into service on Monday. Were the two spacecraft to use the conventional "analog form of television transmission, they would be able to accommodate only 32 channels of programming. Critics say the technical drawbacks of the digital format portend similar on-screen problems for cable television companies, which later this decade plan to begin using digital signals to transmit their programs.

In analog transmissions, television signals take the form of radio waves that are analogous to the sound and light waves of the source material. But in digital transmissions, sound and light are represented by binary pulses that can be represented by the 1's and 0's of digital computer code.

Digital technology is often discussed in terms of its computerlike precision, which makes it much less subject to the static or other interference that can mar the picture in analog broadcasting and cable television pictures. But analog video images tend to degrade only gradually. With digital, when there's a problem, the picture can break up with a jarring abruptness.

And even at its best, digital television technology reduces the nuances of sight and sound to stark, either/or mathematical choices.

"No matter how good digital gets, it will always continue to be a numerical approximation of an analog world," said Lancelot Braithwaite, technical editor of Video Magazine. "There will always be a time when something falls between a one and a zero."

But Mr. Braithwaite acknowledged that many flaws would be overlooked by consumers who were hunting for video bargains and fed up with cable television. "The U.S. public is so accustomed to settling for less, if it's cheaper," he said, "Joe Average will pick this up and like it."

DirecTV Inc., the programming and marketing unit of GM Hughes Electronics, uses 45 of its 150 channels to provide programming services normally found in the "basic" tiers of cable television — services like CNN, ESPN and the Disney Channel. It also offers regional sports networks. And as many as 60 of its channels are used for recently released movies on a pay-per-view basis, for $2.99 a show.

On one of the GM Hughes satellites, United States Satellite Broadcasting, a marketer based in St. Paul, has purchased five of the send-receive "transponders" that USSB is using to offer some 20 channels of "premium" programming like HBO, Showtime, MTV and Nickelodeon.

Most previous satellite television services have needed receiving equipment that costs several thousand dollars, including an ungainly dish antenna — usually six or more feet in diameter — for pulling down analog signals transmitted on a portion of the radio-frequency spectrum known as the C-band. DirecTV uses the much higher-frequency Ku-band, which can be received on a pizza-size antenna, small enough to conform with zoning requirements even in the most urban areas.

Ku-band's high-frequency signals, however, have a drawback not common in C-band television. A heavy rainstorm can disrupt the signal, although DirecTV executives say that the problem is infrequent and restricted to only the rainiest parts of the country, like the Southeast.

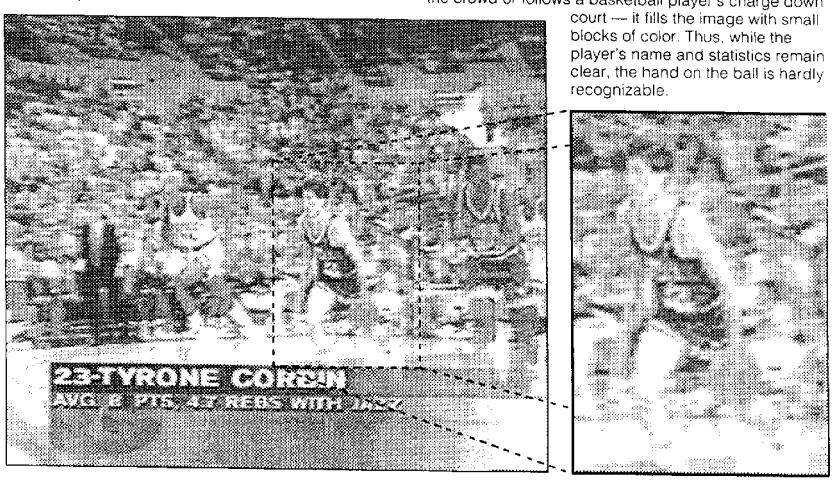
A service similar in many ways to DirecTV, called Primestar, is also digital and also uses Ku-band frequencies. It is starting to be rolled out nationally by Primestar Partners, a group of the nation's six

The Digital TV Trade-Off: Quantity vs. Quality

Using a digital compression standard known as MPEG, DirecTV can deliver up to 150 channels of programming to homes equipped with small satellite dishes and specialized set-top boxes. But, the upstart cable alternative also has to contend with the inherent limitations of MPEG, which processes images and sounds in a digital format corresponding to the 1's and 0's of computer code.

With MPEG, rather than retransmit all of the data in each video frame, the satellite sends only the data that has changed between frames. But the signal is only 8 frames a second, compared with the 30 frames a second used in conventional TV.

When the MPEG formula can't keep up with the frame-to-frame changes — as when a camera sweeps the crowd or follows a basketball player's charge down court — it fills the image with small blocks of color. Thus, while the player's name and statistics remain clear, the hand on the ball is hardly recognizable.



largest cable companies and the General Electric Company. But because of the orbital location of its satellite, Primestar requires a dish antenna with a diameter of 2.5 feet or larger. And while the 67-channel Primestar system also has about 100,000 subscribers so far, its cable owners are aiming it primarily at rural areas and other places not served by cable television systems.

Most significant, perhaps, is that while Primestar currently uses an older nonstandard digital transmission format, DirecTV represents the largest television use to date of an international digital standard known as MPEG. And therein lies the rub — or the streak, smear or geometric blot, depending on one's viewpoint.

The standard, named for the Motion Picture Experts Group, an international organization of computer and broadcast engineers, has been under development since the mid-1980's and is being promoted for a broad range of applications. MPEG is already the standard for compressing video files for storage and playback on CD-ROM computer disks. And it has been touted as the standard for the "interactive" television programming of the 500-channel cable systems of the future.

But computer designers and television technologists have argued against widespread adoption of MPEG because it remains too closely bound to the state of technology in the mid-1980's, when digital-compression computer chips were much slower than today's. Indeed, in order to keep compression technology from being tied to any generation of hardware, some computer-technology companies, including Microsoft and Intel, are at work on software-based compression systems that could be more easily upgraded as new technology is invented.

With MPEG, in order to squeeze the digital signal so as to get more video onto a smaller portion of a computer disk or television channel, the standard 30-frames-a-second television signal is reduced to 8 frames a second.

This works well enough for video programming that does not involve a lot of fast movement. But for live action, especially sports, the MPEG mathematical formula cannot always keep up. And so it leaves "digital artifacts" like the comet's tail on the moving basketball, or it substitutes random blocks of color for faces in the crowd.

MPEG "tries to guesstimate," complained Richard Doherty, an engineer who is president of the Envisioneering Group, a Seaford, L.I., consulting group that has conducted extensive tests of DirecTV's broadcast signals.

DirecTV, for its part, contends that the picture will be soon be getting better. By the end of the year, the company plans to switch to a more advanced compression format, MPEG 2, which contains various refinements tailored to the special needs of television — as opposed to computers. DirecTV also intends to deploy a technology called statistical multiplexing, which will allow higher data-transmission speeds to be allocated for programming with more motion — like sports — and lower data speeds to be allocated for "talking head" news shows.

"These several system improvements will incrementally improve the picture quality," said Eddy Hartenstein, president of DirecTV. "The acid test is to talk to consumers and find out what they think."

And even Mr. Doherty, who may be one of DirecTV's harshest critics, conceded that already "it is a better picture than has ever been available in the living room through broadcast or cable."