Computer Assisted SSTV

Jamie Powers G0JNK

In light of the current debate on a new standard for slow scan I couldn't resist having my say. My starting point is the reason for the development of the slow scan mode. This, I believe, was to produce pictures of useable quality but maintain the immediacy of television all within the bandwidth of a phone contact.

The advances in slow scan technology to date have concentrated on improving the picture quality but as a consequence have increased the time for each frame. I feel that with a full colour high resolution picture taking over a minute to send the mode is heading more towards a colour fax system rather than television. So how do we reduce the frame time without increasing the bandwidth. I came up with the idea of removing the background unchanging information from each frame.

Nowadays most slow scan is generated and received digitally using a frame store at each end of the contact. I thought that by introducing a second frame store at the transmitting end the frame which has just been sent can be retained. The frame about to be transmitted could then be compared with the previous one and only the lines which were different should be transmitted.

The comparison can be done purely by comparing the digital values for each pixel in the line. A certain amount of change will be present purely because of the digitising process. Therefore a only if the changes in a line exceed a preset threshold value would the line be sent to the receiving station.

With this the background information is not being sent at all so I would use a separate counter in the electronics to send say ten percent of the picture regardless of any movement. This guarantees that all the picture information is sent within ten consecutive frames.

The receiver then needs to know which lines are being sent so that it would then only overwrite those lines in its frame store. This can be achieved by sacrificing the first line of the frame. This line can be divided into a serial data stream with one pixel per picture line in the frame. A white pixel would indicate that a line is being sent and a black pixel would indicate that this line is the same as in the previous frame. The amount of time required for each frame is then related to the amount of movement in front of the camera.

A further development might be to divide the lines in half for the comparison. This would use four levels of grey in the control line pixels to indicate whether all of the line, the first half, the last half or none of the line is being up-dated.

This basic idea expanded somewhat with the recent suggestions of using a control data byte in the frame sync pulse and introducing a low resolution (64 X 64) 2 second mode. With these two advances the frame time can become a standard length and the resolution of the picture altered to account for the amount of movement in the picture. Rather like the video conferencing techniques being used commercially.

I see that this system would work as follows: The first frame is sent out in 2 second mode and stored. During the 2 seconds a second frame is stored and compared with the first. If they were the same but for say the centre third the next frame would switch the receiver into 4 second (128 x 64) mode. The first line of the next frame would indicate the lines which have changed then the lines information would follow. To complete the 2 second frame time a sixth of the background information can also be sent to refresh the rest of the picture. These background lines would have been indicated in the control line at the top of the frame.

Whilst the second frame is being sent the third frame should be read in and compared with the second. Assuming only a few lines had changed. The next frame would switch the receiver into high resolution mode send the changed lines and more background information.

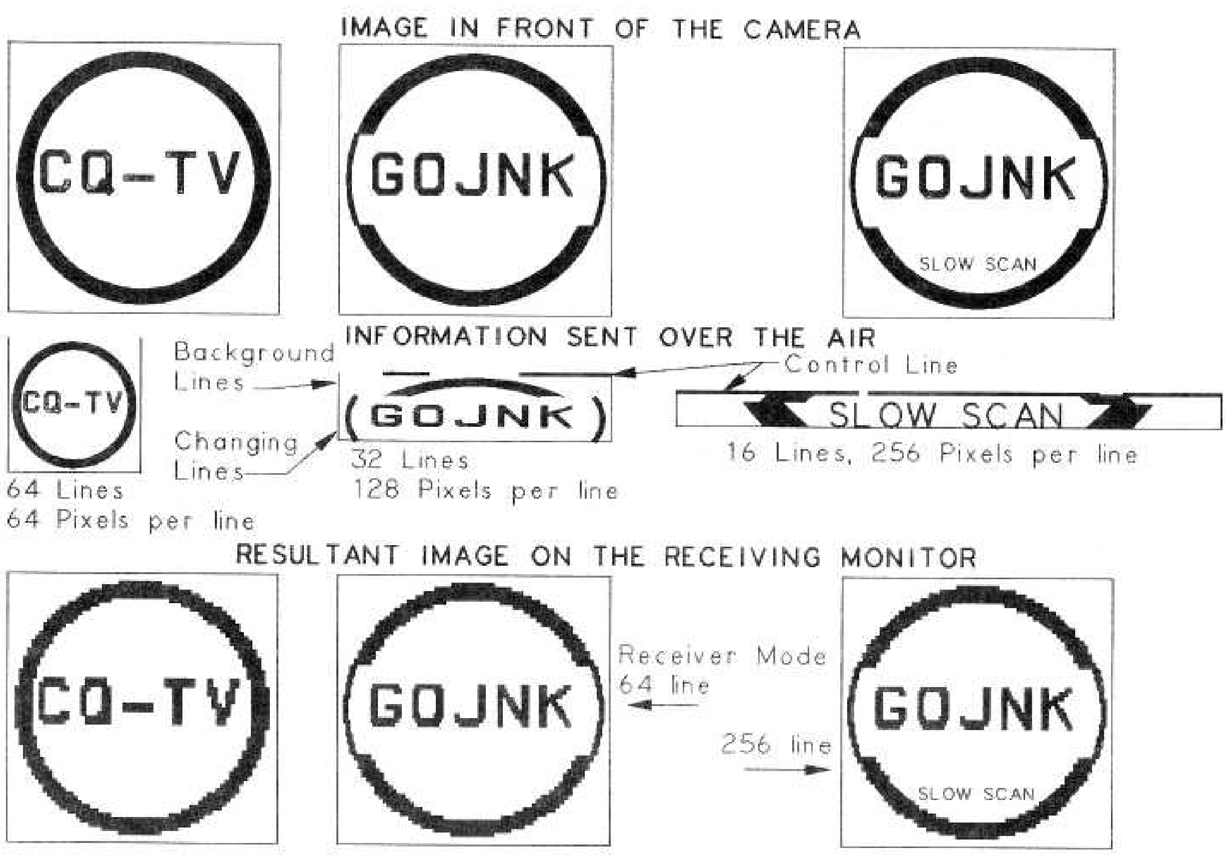

Fig.1:Illustration of the Constant Frame Rate System

So if there is much movement then the system will be in low resolution mode with a 2 second frame rate but if you then point the camera at a still image the system will automatically switch into the highest resolution it can and send a full screen image over say 2 minutes.

To explain the principle I have assumed that an increase in resolution is the only improvement of picture quality. However, the system could switch from black and white to colour if the amount of movement in front of the camera permits.

The system, as it stands, gives us a video link with a 2 second frame rate within an audio a bandwidth of about 2.5 kHz. For the larger amateur bands such as 10m, 6m, 2m, 70cm and higher we could allow the luxury of using a 75 kHz band width. This would allow the frame rate to increase to 15 frames/second; near to continuous movement.

For a 75 kHz system I would remove the audio tones and directly modulate the RF carrier. I realise that the computing would also have to be done 30 times faster so this is probably an advance for the future.

Imagine how that would change the popularity of ATV if instantaneous moving or high resolution pictures could be sent long distances on 10m.

I would like to think that people with the computing skills could answer this suggestion as to whether it is achievable and then perhaps this could be considered as a new mode for video over the air.