

ADDITIONAL POSSIBILITIES FOR USE OF STANDARD TV RECEIVERS AND TRANSMITTERS

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Abstract: The paper proposes realization of electronic device which provides increased information quantity over standard TV transmitters and standard TV receivers. This device is intended for transmission of the fixed TV picture. Its implementation in TV networks is very simple. The electronic device consists of standard hardware components.

Key words: Television, digital television, teletext, visual services.

1. Introduction

It is well-known that standard TV channel is not used for transmission of the TV program only. For example, teletext information is transmitted during the vertical blanking interval. In this paper a solution based on the use of time multiplex at TV signal transmitting is presented. The suggested solution enables using of all TV pictures lines simultaneously. The teletext technique enables using of only few lines (in U.K. standard only four lines). It means that the new technique provides simultaneous transmission of fixed TV picture and teletext lines.

Statistical analysis of the TV picture redundancy reveals the fact that there is a significant number of the consecutive TV pictures which are with identical or negligibly different contents. This fact can be used for the transmitting the new content with some special information instead of the transmitting the consecutive TV pictures with, practically, the same content. It means that the fixed TV picture can be inserted in the array of the TV pictures of a standard TV program. The fixed TV pictures can content some service information or information for special subscribers.

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Considering that standard TV receiver does not have a memory, the minimum time interval between insertion of two consecutive fixed pictures must be taken into account. The minimum time interval must be determined so that the insertion of the fixed TV pictures does not significantly degrade the reception quality of the standard TV program. There are only subjective methods for estimation of the TV picture degradation. It means it is necessary to have groups of significant number of TV spectators for subjective judging of TV picture degradation. It means that with a standard TV receiver an average spectator can not notice any disturbances in standard TV program receiving. Moreover, when the receiving module of the proposed device is built in a standard TV receiver it will prevent disturbances at all, due to the memorizing of the TV pictures of the standard TV program. Namely, during transmitting of the fixed TV picture the last TV picture of the standard TV program will be repeated in TV receiver. Furthermore, the device increases the receiving quality of the standard TV program in cases when disturbances cause the loss in TV picture content. In these cases the lost TV picture can be completely recovered by the last memorized TV picture.

The electronic device can be realized digitally. It consists transmitting and receiving module which are integrated with TV transmitter and TV receiver, respectively. The transmitting module should provide real time TV picture processing. The receiving module should provide memorizing of the TV picture content.

The paper presents realization of the electronic device at a block level. Similar problems are discussed in references [1,3,5,6,7].

2. Realization of the proposed electronic device

The device consists of two functional units which will be presented separately. A digitalization of TV picture is based on the well-known hardware solutions in digital television [2,4]. This is done at the level of RGB components using standard flash converters and dual-port video ram memories. Recognition block is realized with a signal processor manufactured by Texas Instruments.

2.1 Realization of the transmitting unit

The transmitting unit is shown by the block diagram, Fig.1. The description of its operation is following:

The two TV signals are led to device inputs. The composite video signal of the standard TV program is led to input A. The composite video signal

of the fixed TV picture is led to input B. The signal from input B will be led to the input of the attached TV transmitter if and only if the following two conditions are simultaneously satisfied:

- 1) when the analyzed TV picture of the standard TV program is negligibly different from the previous one and
- 2) when N consecutive TV pictures from standard TV program are transmitted after the last fixed TV picture has been transmitted.

N is determined on the basis of the statistical analysis of subjective judgment of a great number of TV spectators. It is anticipated that $N=50$. The fulfillment of 1) and 2) is detected by the following functional blocks, Fig.1.

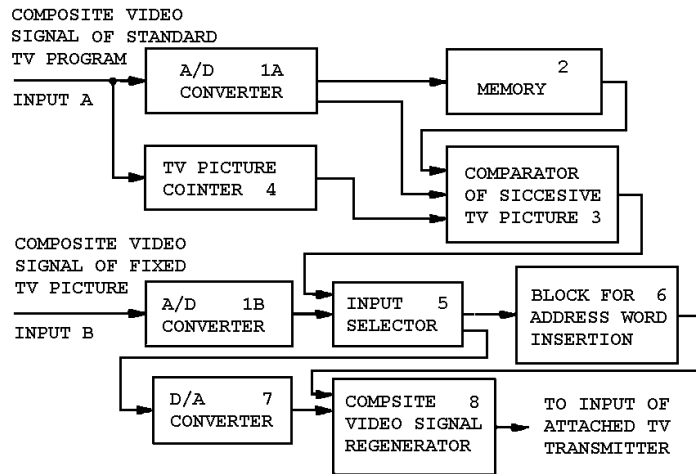


Fig. 1 Block diagram of transmitting unit

Analog to digital conversion of the video signals of the standard TV program and the fixed TV picture is performed in blocks 1A and 1B, respectively. The video signal converted into digital form is led from block 1A to block 2 where it will be stored in the memory. Whole content of one fixed TV picture can be stored in the memory.

In block 3 the current TV picture is compared to the previous one. It is done by comparing corresponding TV picture elements of the two TV pictures converted in digital form. If condition 1) is fulfilled then the counter value in block 4 is tested. A fixed TV picture is not going to be sent if the counter value is less than N. It is because of the fact that condition 2) is not fulfilled. That is why the signal from input A will be distributed at the

output of the video signal source commutation block (block 5). If conditions 1) and 2) are fulfilled simultaneously then video signal from input B is passed out of the block 5.

During the vertical sync pulses which precede the transmitting of the fixed TV picture the address words are inserted by block 6. It is performed similarly to the teletext insertion in standard TV program. It is possible to insert address word information in any TV picture line during vertical sync interval. Our device performs it in line 20. Receiving unit uses address words to recognize the reception of the fixed TV picture.

Block 7 is intended to perform digital to analog conversion of the video signal.

In block 8 the analog video signal is converted in composite video signal.

2.2 Realization of the receiving unit

The receiving unit is shown in the block diagram, Fig.2. In block 1 the analog to digital conversion of video signal is performed. Decoding of the address word is performed in block 2. If the presence of the corresponding address word is not detected, the TV picture in digital form will be stored into the memory for storage of one TV picture (block 4A). It is provided by selector (block 3). In block 5 digital to analog conversion of video signal is performed. In block 6 conversion of video signal to composite video signal is performed. The composite video signal from block 6 is led to the attached standard TV receiver (block 7).

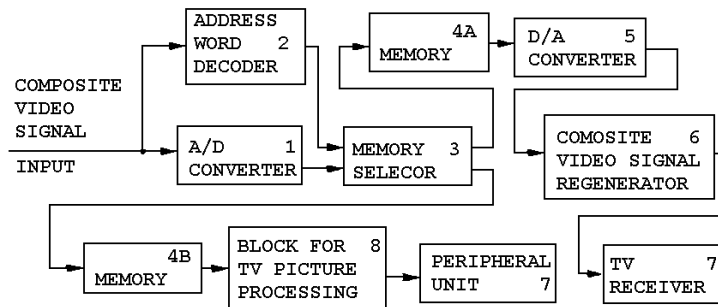


Fig. 2 Block diagram of receiving unit

If the presence of corresponding address word in TV picture is detected (block 2) then the digitized TV picture will be led to the block 4B by memory selector. The blocks 4A and 4B have the similar function. The block for

video signal processing (block 8) performs digital filtering. Finally, from block 8 signal of fixed TV picture is led to a corresponding peripheral unit (block 9). This peripheral unit provides recording and/or monitoring fixed TV picture by intended user or subscriber.

3. Organization of the fixed TV picture distribution

Transmitting of the fixed TV pictures can be organized for the various groups of users by application of the address words. The address words in fixed TV pictures are coded for each group of users. Decoding of the address word is performed at the receiving unit. The receiving unit will accept fixed TV picture if the decoded word is identical to the address word of the corresponding group of users. It enables every user to accept information intended just for him and to reject unintended information

It is evident that scrambling can prevent the fixed TV picture reception by non authorized users or subscribers.

4. Conclusion

The proposed electrical device consists of two functional units. The transmitting unit is attached to the TV transmitter station. Its integration is very simple. The receiving unit is needed for the reception of fixed TV pictures. Its integration into the standard TV receiver, as well as into the digital TV receiver is very simple.

The receiving unit can improve the reception quality at the TV receiver.

The proposed electrical device can be useful for public service as well as for special users.

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