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Real time video monitoring system based on ARM

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Abstract-. This paper describes traffic monitoring system that uses H.264 video encoding &decoding for video processing. Real time traffic management system requires real time high quality traffic information. Monitoring facilities are useful for security & controlling purpose. H.264 is best video coding technique compare to MPEG -2 & MPEG-4 in terms of coding efficiency, reference frames& power consumption. System uses S3C2440 processor which is integrated into MFC that uses ARM9 architecture. Its frequency is up-to 433MHz. Linux is use as O.S, which is ported on ARM9. ARM9 uses 12MHz crystal clock. ARM9 has good video processing capability. The system includes video capturing, video encoding, video decoding &n data transmission. H.264 can achieve coding efficiency improvement about 1.5 times or greater for each sequence related to multimedia, HDTV, SDTV.

Keywords: ARM9-S3C2440, real time traffic monitoring, H.264, video encoding& decoding.

I INTRODUCTION

In this system video compression & decompression is perform using H.264 video coding standard. The system is use to traffic monitoring. Monitoring is applied to number of fields such as video conferencing, distance learning, traffic monitoring. In recent years real time video monitoring system has great demand. Previously CCTV'S are use for video surveillance but CCTV's are fail to achieve all activities because of its position CCTV'S are very expensive to install & it is incompatible .MATLAB based video monitoring systems are fail at product level because of its size is large, installation process is troublesome ,development costs are relatively high. Our system is compact as it is embedded system. It is reliable & efficient. Here LINUX is use as operating system because it is multitasking, multiplatform, multithreading & support variety of network transport protocol such as TCP, IPV4, IPV6.

II SOFTWRE DESIGN

1. Create software environment

Software system uses boot-loader, it is piece of code that runs before operating system runs. LINUX 3.0.1 is use as operating system. Camera driver, Nand flash driver, LCD driver are compiled directly on the system kernel.

2. Video capture

In this system video is capture using VGA camera. Camera driver is compiled directly into Linux kernel .The camera supports different data formats such as R.G.B, YUV, YCrVb. YUV is use for digital encoding of colour information that is suited for video compression through H.264.Through SCCB (serial camera control bus) which is serial interface; we can change different parameter such as HUE, saturation, white balance correction. Camera device is initialized to check the camera capability & then frame size which is to be capture is set.

3. Video encoding & decoding

H.264 video encoding &decoding algorithm is use which achieves 50% improvement in bit rate efficiency. H.264 is performing by MFC (multi format codec) which is integrated in Samsung S3C2440 processor.

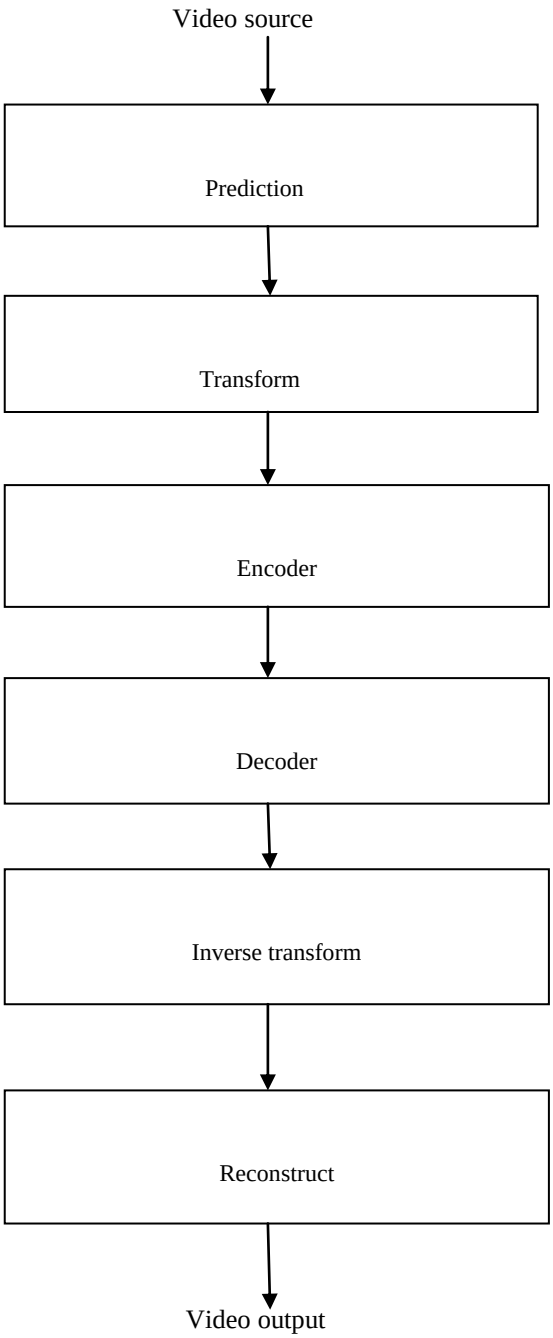

Fig1. H.264 video encoding & decoding.

A) Encoding process

Encoder process a video in terms of macroblock (16*16 displayed pixels). Digitized video signal consist of sequence of images called frame. Each frame consist of two dimensional array of pixel, pixel data is converted from RGB to YUV, to compress macroblock prediction, transformation, quantization & entropy coding is use

1. Prediction

It forms a prediction of macroblock based on previously coded data either from current frame or from other frame. That other frame has been already coded & transmitted. Encoder subtracts prediction from current macroblock to form residual.

2. Transform

The difference between current macroblock & its prediction called residual is transformed from spatial domain to frequency domain. D.C.T transform is use because it has strong energy compaction & speed of operation is fast. The output of transform coefficients is quantized; each coefficient is divided by an integer value

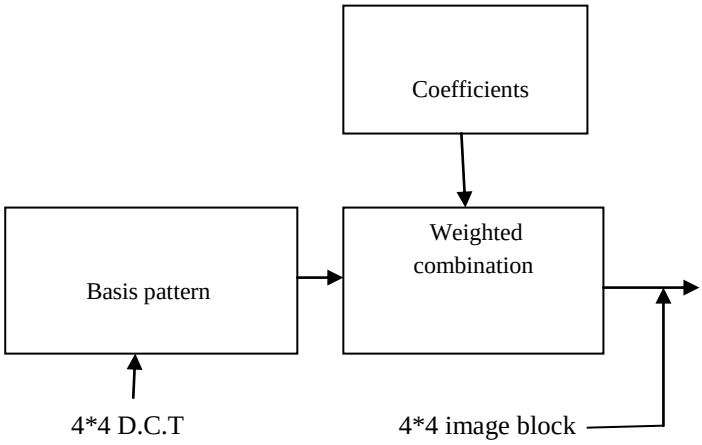

Fig2. Transform procedure

3. Encoder

The video coding process produces a number of values that must be encoded to form compress bit stream. The values include quantized transform coefficients, information about the complete video sequence, and information about the structure of compress data. These values are converted into binary codes using variable length coding or arithmetic coding. Arithmetic coding achieves up-to 7% bit rate saving compare to variable length coding. Arithmetic coding encodes a symbol by its appearance probability. So it can represent symbol by its probability. After arithmetic coding, syntax element are decoded to get real syntax element value.

B) Decoding process

4) Decoder

Video decoder receives the compressed H.264 bit stream, decode each of the syntax elements& extract the information such as quantized transform coefficients, prediction information. This information is then use to reverse coding process & recreate sequence of video images.

5) Rescaling & inverse transform

The quantized transform coefficients are rescaled. Each coefficient is multiplied by an integer value to restore its original scale an inverse transform combines basis pattern, weighted by the rescale coefficients to create each block of residual data.

6. Reconstruction

A reconstruction filter can be applied to decoded macroblock in order to reduce blocking distortion. For each macroblock, the decoder forms an identical prediction to the one created by the encoder. The decoder adds the prediction to the decoded residual to reconstruct a decoded macroblock which can be display as part of video frame. The filter has two advantages that block edges are smoothed, improving the appearance of image. Second advantage is filter macroblock is used motion compensated prediction of further frames in the encoder, resulting in smaller residual after prediction.

The biggest advantage of H.264 video encoding & decoding is its compression performance. It gives better image quality at lowest bit rate .H.264 video coding technique is now widely use in high definition internet video, video conferencing, mobile T.V broadcasting .

III HARDWARE DESIGN

ARM 9architecture is use .It has 12 MHz crystal clock frequency. Samsung S3C2440 processor is use whose frequency is up-to 400Mhz.The board has inbuilt CMOS camera interface it can accessed via CON20.The board has got 41 pin display connector. It uses 5 volt supply.

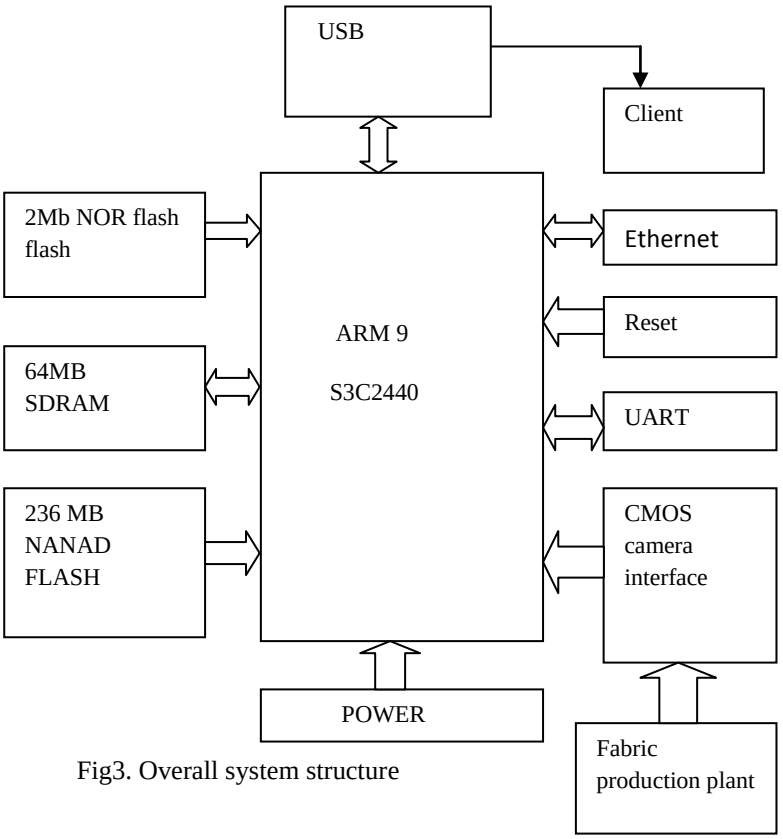

Fig3. Overall system structure

S3C2440 integrates multimedia encoding &decoding. Its size is small having greater interface capability. Samsung S3C2440 is cost effective, having low power consumption. ARM platforms are easily available in market it has high speed & good video processing capability. For supporting boot loader in the NAND flash is load to SDRAM & it is executed. The content of NAND flash is copied into SDRAM. S3C2440 UART provides 3 serial input & output port having baud rate of 1152 kbps. Camera continuously captures video of fabric production plant .video will be transferred to S3C2440 processor for video coding & decoding .The main goal of the system is to provide efficient & good quality video.

IV CONCLUSION

In this ARM core unit for real time traffic monitoring is designed. H.264 video coding & decoding offers greater flexibility in terms of compression. The system will perform stably having low poor consumption .The video quality is best compare to MPEG-2, MPEG-4.This proves a small plug &play system that we can connect to LAN & WAN. The systems web server can directly connected to the network without cable length & signal attenuation. This system will have bright future in different real time video monitoring systems such as family security, video conferencing.

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