Design and Realization of Wireless Video Monitoring System

Sunil Kumar G
Overview

- CDMA technology
- Embedded Linux
- H.264 Digital Video Compression
- Wireless Transmission
- Video Surveillance
Introduction

The video monitoring system needs the following technologies:

- Digital Signal Processing
- Video compression encoding and decoding
- Video transmission
- Video storage
- Networking
History of video monitoring systems

The main drawback of most of the previous video monitoring systems:
  - No Mobility

The simple solution for the above problem is designing a Wireless Video Monitoring System.
Wireless Video Monitoring System

Advantage of Wireless monitoring system:

- Long Distances
- Low maintenance cost
- Compatibility of transmission
- More efficiency
Design of Remote Monitoring Equipment

Hardware used in the design

- Video Compressed Module – JM718M
- ARM7 processor – S3C4BOX
- CDMA communication module – GTS-800
- Ethernet Interface – RTL8013AS
- CCD camera
- Flash RAM (16M bit)
- SDRAM (256M bit)
H.264 Video Compression Module

- Video compression module -- JM718M converts the video from the CCD camera into H.264 signals.
- H.264 signals are processed by the ARM processor.
- Processed data is sent to a CDMA module through a serial interface.
- Data is modulated and transmitted by the CDMA module.
ARM processor

- S3C44B0X ARM processor manufactured by Korea SAMSUNG company
- TCP/IP protocol
- HTTP protocol
CDMA module

- Two DTGS-800 as CDMA1X modules
- RS-232 interface
- Two modules for better transmission rate
- Multi-channel scheduling strategy for wireless channel transmission
Software Design

The software architecture consists of three layers:

- The Application Layer
- The Operating System Layer
- The Hardware abstract Layer
Design of Local control terminal

- Real-time Transport Protocol
- Multi-Threading Model
Communication between remote equipment and local terminal

- Static Internet IP address in the local terminal

- Dynamic Internet IP address in local terminal
  - IP address resolution by DNS server
  - Short message to tell the Dynamic IP address
Dynamic IP address

Address resolution Method:
Multilink scheduling poll mechanism

Advantages of Multilink parallel transmission method:

- Improve the actual output
- Avoidance of congestion
- Increase in bandwidth
- Increase in sending rate

Design of Multilink scheduling

- 50% - 80% of channel actual sending rate
- Reduce probability of congestion
Simulation Experiments

<table>
<thead>
<tr>
<th>Test time</th>
<th>Last time</th>
<th>Receive frame rate(f/s)</th>
<th>Transmit rate (Kbps)</th>
<th>Packet lost rate of link 0</th>
<th>Packet lost rate of link 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007-4-12 10:00</td>
<td>30 min</td>
<td>5.3~8.1</td>
<td>60~80</td>
<td>2.16%</td>
<td>2.01%</td>
</tr>
<tr>
<td>2007-4-17 10:00</td>
<td>62 min</td>
<td>4.7~7.8</td>
<td>58~80</td>
<td>2.57%</td>
<td>2.11%</td>
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<tr>
<td>2007-4-18 10:00</td>
<td>35 min</td>
<td>4.9~7.8</td>
<td>60~80</td>
<td>2.13%</td>
<td>2.25%</td>
</tr>
</tbody>
</table>

The transmission rate of double links fixed at 58Kbps to 80Kbps, receiving frame rate from 4.7 f/s to 8.1 f/s.