

The Design of Multimedia Emergency Telemedicine System Between Inter-hospital

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Abstract

In this paper, the real-time telemedicine system based on multimedia data was designed. In order to describe patients to medical specialists, the system included multimedia data. The prototype system designed in this paper effectively integrated multimedia components in a single computer, as well as compromise the compression, interface, medical imaging standards and modular software architectures. The mobile bed was manufactured to improve the movement of the system. Two experiments had been conducted to evaluate the technical functionality and clinical usability. Using the data compression and priority control, the telemedicine system transmitted multimedia data in real-time at the internet and the ethernet network. Inter-hospital experiments and Sang-Am World-Cup Stadium experiments demonstrate the feasibility to be effectively used. (*Journal of Korean Society of Medical Informatics 8-4,1~9, 2002*)

Keyword : Emergency Telemedicine, Multimedia, Real-time Transmission

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II.

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(SpO₂),

1-3)

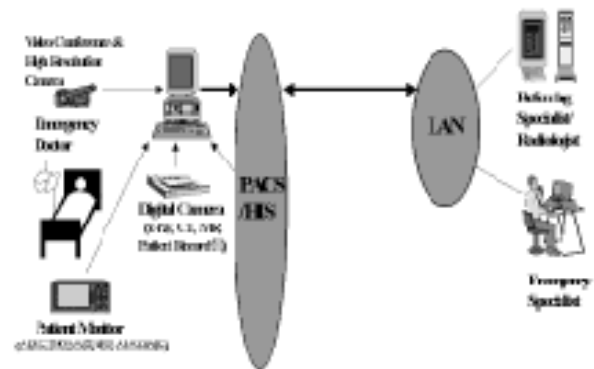


Fig 1. System configuration

Table 1. Multimedia data requirement

Data Type	Priority	Real-time	Remarks
ECG wave	High	Yes	12 bits resolution, 300Hz sampling ratio
Respiration, BP, and SpO ₂ wave	High	Yes	12 bits resolution, 75Hz sampling ratio
SpO ₂ value, systolic pressure, diastolic pressure, temperature, heart rate	High	Yes	Update once per 30 seconds
Radiological images (X-ray, CT, MR etc.)	Low	No	Capture by either DICOM 3.0 or digital camera interface
Medical record	Low	No	Capture by digital camera
Full-quality video	Medium	Yes	640 x 480 resolution, 30 frames/second
Audio in video conferencing	High	Yes	Do not disturb conversation
Video in video conferencing	Low	Yes	320 x 240 resolution

가 ECG (), 가 12bit, 300Hz 12 1 12bit, 75Hz 1 1050byte 8Kbps 90byte

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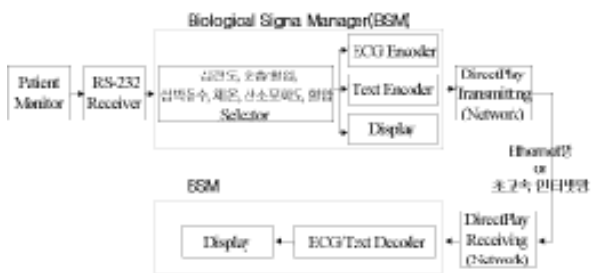
5 6)

DPCM(Differencial Pulse Code Mudulation)

가 가 DPCM

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RS232



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MPEG2 MPEG4 가 MPEG2 MPEG4

Fig 2. Data flow of biological signal

7)

MPEG2
MPEG4
(DirectShow)
6
1 2
MPEG2 MPEG4
MPEG2
(Ligos) MPEG2
MPEG2
(VBV)
MPEG4 Microsoft
MPEG4
(DirectPlay)
(streaming) 가

PACS(Picture Archiving and Communication Systems)

USB(Universal Serial Bus)

PACS DICOM
3.0(Digital Imaging and Communication in Medicine)
PACS DICOM 3.0⁸⁾
PACS DICOM 3.0

JPEG

PACS

DICOM 3.0

DICOM 3.0

DICOM 3.0

JPEG

DICOM 3.0

가

(overflow)

MPEG2 MPEG4



Fig 4. Data flow of biological image

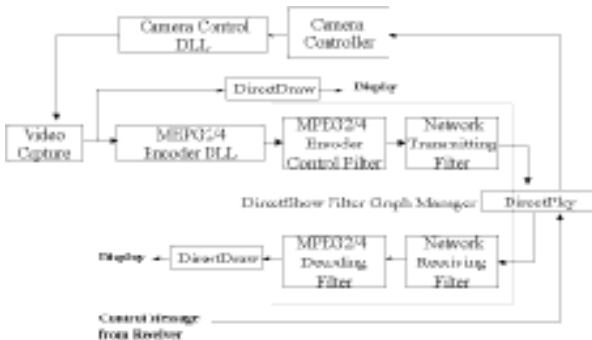
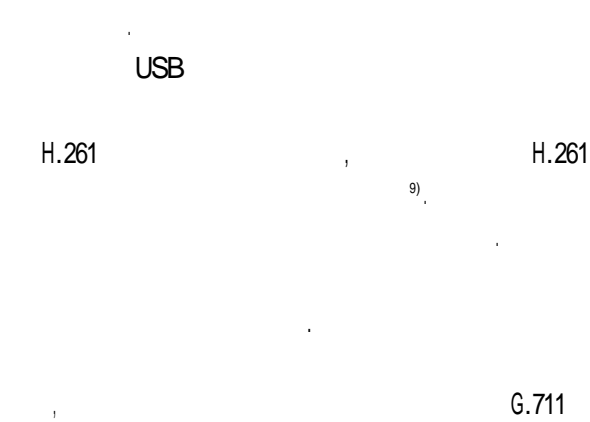


Fig 3. Data flow of high quality video

USB



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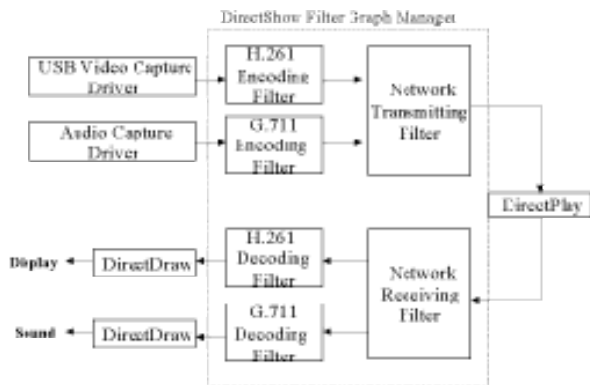


Fig 5. Data flow of videoconferencing

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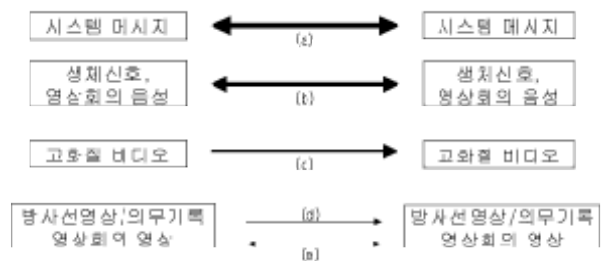
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Priority Control



High priority
 Medium priority.
 Low priority(Not guaranteed).

Medium priority(about 100Kbps).
 Low priority(Guaranteed).

Fig 6. Priority control

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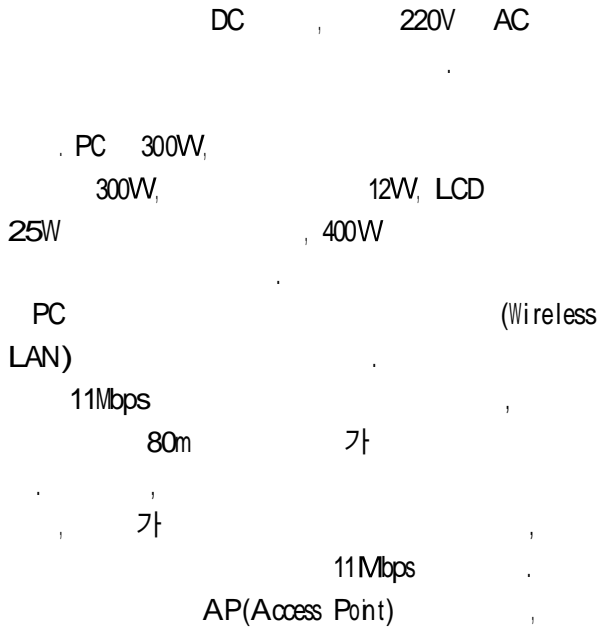
(Mobile Bed)

PC

PC

가

III.



E1 3 3 가 6Mbps 가

2 가

가

(Fig 8)

7

가

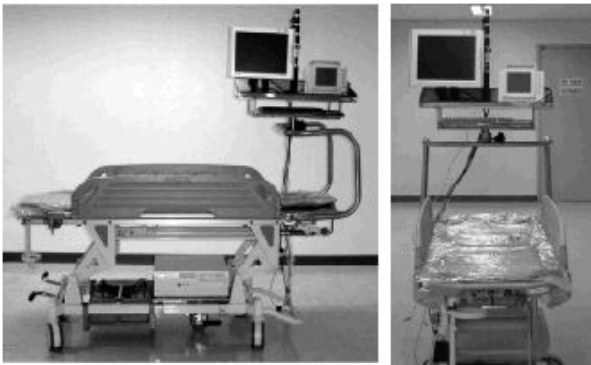


Fig 7. Mobile Bed



Fig 8. Telemedicine service

Table 2. Simulation results of telemedicine

			(8Mbytes)
50 sec	3 min 40 sec		42 sec
45 sec	4 min 3 sec		40 sec
45 sec	4 min 15 sec		45 sec

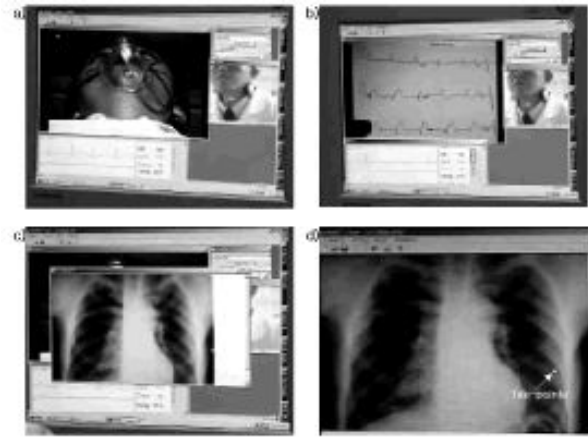


Fig 9. Telemedicine service



- a) Router(6Mbps)
- b) Hardware of receiver
- c) Telemedicine service by monitor
- d) Telemedicine service by projector

Fig 10. Telemedicine service (between Sang-Am World-Cup Stadium and Severance hospital)

(Fig 9)

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ECG 가 (Fig 10)

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45 50

IV.

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PC

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(near-lossless compression)

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(preventable death)

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(near-lossless compression)

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