

REAL-TIME DIGITAL VIDEO RECORDING WITH APPLICATIONS TO DIGITAL SUBTRACTION ANGIOGRAPHY

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Real-time digital subtraction imaging requires a data storage device capable of recording 60 fields per second to fully accommodate the digital image processor. In the past this need has been met with analog storage devices. Chapter 1 compares analog and digital magnetic recording, and finds digital storage to possess some advantages over analog.

Digital recording of 60 fields per second has been possible for quite some time using tape storage. However, as discussed in Chapter 1, disc storage has several advantages over tape. Chapter 2 describes the achievement of real-time (60 fields per second) recording with a digital magnetic disc drive via parallel data channels. Included are descriptions of a disc controller dedicated to operation of the disc in a digital subtraction angiographic system. The interface of the disc and image processor is described. In addition, the required number of digital levels for digital recording, and the related number of levels for the image processor is calculated.

The remainder of the thesis discusses two imaging tasks. Chapter 3 describes a "Hybrid" temporal-energy subtraction technique. Treated are the implementation of the hybrid algorithm on an image intensifier based system, and optimization of the technique in terms of data storage, artifact reduction, and iodine signal-to-noise ratio. To aid in the improvement of signal-to-noise a computer program has been developed.

Chapter 4 discusses the use of digital subtraction angiography for the study of the coronary arterial tree. Image display considerations are discussed. The physical limitations to coronary artery visualization are illuminated. One of the major limitations to artery visualization is the low iodine concentration in the coronary vessels. Iodine concentration is dependent upon injection site. Two contrast injection techniques, both less invasive than the selective injection technique presently in use, are considered: (1) injection into the aortic root; (2) intravenous injection. The results obtained with these two techniques are presented.