Digest of Tech. Papers The 8th Conf. (1976 International) on Solid State Devices, Tokyo

A-5-1
(INVITED)

Solid state imagers using the charge transfer concept

J.G. van Santen
Philips Research Laboratories
Eindhoven - The Netherlands

During already quite a number of years a large amount of work has been carried out on the investigations of selfscanned solid state imaging devices. The function of all imaging devices can be divided into three distinct parts : 1) the conversion of the space divided information present in the optical image in the form of quanta into a charge pattern 2) the integration and storage of the charges generated by the quanta absorbed in the picture elements, 3) the conversion of the information present in the picture elements as a space divided charge pattern into a time sequential video signal at the output. In self scanned imagers the three mentioned functions are combined in one device.

The first solid state imagers utilized intersecting XY address lines connected to each picture element for scanning. By application of successive scanning pulses to the address lines the response at each picture element was measured in sequence leading to a time varying video signal. In these solid state imagers different types of photosensitive materials were used like cadmiumsulfide, cadmiumselenide and silicon. However in the latest solid state imagers the work has been concentrated exclusively on silicon although silicon as a sensor for visible light has its drawbacks.

One aspect of this switch over to silicon is the fact, that for the realisation of solid state imagers containing hundred thousands of sensing elements a technology suited for very large scale integration must be available. With the advent of LSI digital circuits this technology will become practicable.

Another important reason was the discovery of the charge transfer principle which permitted a new approach to solid state imagers promising a better signal to noise ratio than attainable with XY scanning.

In charge transfer devices packages of charge containing analogue information can be shifted from potential well to potential well. Thus a charge transfer device can be considered as an analogue shift register and in certain types this transfer can be performed with an extremely low loss of charge. This sort of charge transfer device is very well suited to be used in solid state imagers. Different types of solid state imagers using the charge transfer principle have been realised. The performance of these imagers will be discussed in view of the application in consumer electronic camera's.

A new approach to solid state imaging will be presented which compares favorably to excisting imagers with respect to blue sensitivity, point anti blooming and total Si area needed.