Light to Frequency Sensor Topology for Practical CMOS Color Sensor.

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Abstract:

An CMOS Sensor is electronic chip that converts photons to electrons for digital processing. An Image Sensing Optical Receiver such as a CMOS Image Sensors (CIS) is made of Photodiode, Analog Circuits, Mixed Signal Circuits to amplify small photocurrents into digital signals. CMOS Sensors are used to create images in digital cameras, digital videos cameras and CCTV.

Keywords: CIS, CCD, CMOS.

INTRODUCTION:

There are two topologies mainly used for Practical CMOS Color sensor, which are namely:

1. Transimpedance Amplifier based Color Sensor.
2. Light to Frequency Sensor.

A typical design flow of CMOS Image Sensor is:

Optics Simulation -- >>
CMOS Process TCAD Simulation -- >>
Pixel Electrical Simulation -- >>
System Simulation.

Even though their sensitivity does not reach one of the best actual Charge Coupled Device's CCD's (whose fill factor is 100%), they are commonly used because of their multiple functionalities and their easy fabrication.

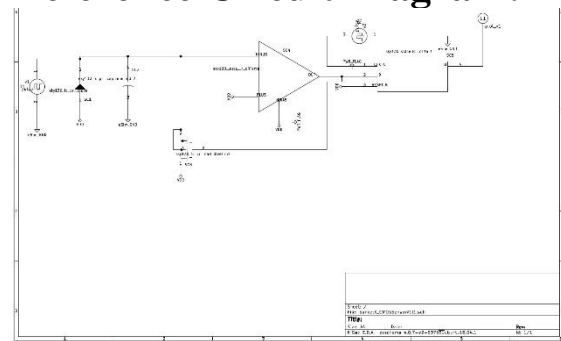There are three types of topologies of CMOS Color sensors, which are namely:

1. Transimpedance Amplifier
2. Light to Frequency Converter.
3. Light Integrating.

There are four types processes used to manufacture a CMOS Image sensor, which are namely:

1. Standard CMOS.
2. Analog Mixed Signal CMOS.
3. Digital CMOS.
4. CMOS Image Sensor.

Reference Circuit Diagram:

Reference Circuit Details:

Several digital color sensors employ light to frequency technique and photodiodes, which is similar to other studies. These frequency – based digital sensors require an advanced processor, such as digital signal processor or personal computer to measure or calculate the frequency. Figure 1 shows an sensor. The time or duration of the ramp signal is:

$$\blacktriangle t = Cint * \blacktriangle V / Iphoto.$$

Reference Waveform and Area Estimation:

Reference Papers and Journals:

1. CMOS Analog and Mixed Signal Circuit Design, Practices and Innovations by Arjuna Marzuki, Pg. 212.

Acknowledgements: