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DESIGN OF A 16.5 MEGAPIXEL CAMERA LENS FOR A MOBILE PHONE

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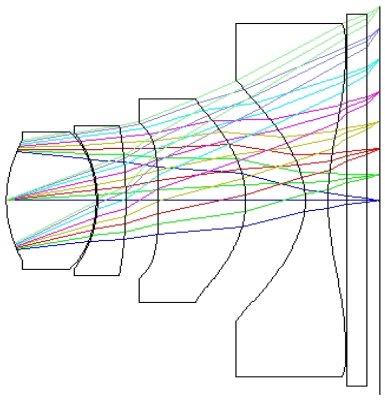
A digital camera (or digicam) is a camera that encodes digital images and videos digitally and stores them for later reproduction. Most cameras sold today are digital, and digital cameras are incorporated into many devices ranging from PDAs and mobile phones (called camera phones) to vehicles. 15 years ago, phones with cameras inside seemed pointless, heavy bricks that gave you grainy approximations of images.

Some phones feature a camera that gives them the ability to work as a digital camera. Often the camera is also able to shoot video. November 2000 saw the first phone with camera hit the market, the Sharp J-SH04, but it failed to make much of an impact. In fact the J-SH04 never made it out of Japan - we could go as far as to say the first camera phone was actually a bit of a flop. A 0.11MP snapper adorning the rear and a 256 color display is enough to make you weep, but at least it was lightweight at just 74g. Fast forward to today, and we now have a phone with a 16MP camera, the Samsung GALAXY S6.

The most important characteristics of a camera are the resolution (measured in megapixels), lens focus type (either fixed or automatic) and the presence of a flash (Pic.1).



Pic.1 – Mobile phone camera lens

To design a 16-megapixel camera lens in a compact size (total optical length<6mm) is a hard work. A sensor pixel size of 1.12 micrometer means a high Nyquist sampling frequency of 446 lp/mm. A sensor diagonal length of 6.95mm and a compact size demand a camera lens of an effective optical length of 4mm and a large field of view (FOV) of 76 degree as typical values. All of these parameters imply all of the optical aberrations of the lens are large. It is very difficult to reduce and balance all these aberrations.

The authors used a 1P1G2P lens configuration to design a 16.5 megapixel camera lens. It is the smallest number of pieces of lens to design such a camera lens for a mobile phone over 16 megapixels.

The design results show that the lens is diffraction limited behaved.

Key words: mobile phone camera lens, 16.5 megapixel sensor, Zemax.