



A 41MP Smartphone Camera

What's Stopping a Similar-featured Surveillance Camera?

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Introduction

Nokia recently announced a 41MP (Megapixel) camera on a smartphone, the Nokia 808 PureView. The first response of consumers is “Amazing!”, while that of camera cognoscenti is “Marketing hype!” The fact that a smartphone with a retail price of less than Rs.30,000 can boast of a sensor with as many pixels as an entry-level, medium-format digital SLR (DSLR) camera which can cost anything upwards of Rs.4,00,000 is baffling, to say the least; especially given the difference in size between a typical smartphone and a typical DSLR.

So, where's the catch? And, if there isn't a catch, why can't security professionals have access to IP surveillance cameras featuring such high resolutions, at a similar cost and in as compact a package? This technology brief looks at the technical details behind the Nokia 808 PureView and the implications for mid-level image capture devices in future.

Deciphering 41MP

Until a couple of years back, there was a megapixel race among compact digital camera vendors to deliver the highest megapixel count in a camera. Thankfully, that race is no longer taken seriously, what with the realisation that “... 6 megapixels is widely quoted as the resolution beyond which viewers fail to register a significant improvement in image quality.” An October 2009 technology brief – The Megapixel Myth: More is Always Better [Part I & Part II] – details the reasons why more megapixels do not necessarily translate to better quality images.

Under the circumstance, the utility of Nokia's 41MP camera on the Nokia 808 PureView needs to be questioned.

There are three novel components to the 41MP camera:

Large sensor

The Nokia 808 PureView uses a 1/1.2” sensor, extremely large when compared to sensors used on smartphone (typically 1/3.2”), and relatively large even when compared to sensors used on megapixel surveillance cameras (1/3” and 1/2”).

The 1/1.2” sensor translates to a size of 10.67 mm x 8.0 mm, and an area of 85.3 mm² – an almost 6-fold increase over traditional smartphone camera sensors and 4 to 5-fold increase over megapixel surveillance camera sensors.

High resolution

On a sensor area of 85.3 mm², a resolution of 41MP translates to a pixel size of approximately 2.0 μm (the pixel size is actually 1.4 μm) – not quite the favoured thumb-rule (for threshold pixel size, for good quality images) of > 3.0 μm; but, then again, not too bad either, for all those extra megapixels. In comparison, the pixel size on the well reviewed iPhone 4S camera sensor is 1.4 μm, while the pixel size on the sensor of a WDR megapixel surveillance camera is in the region of 4.2 μm.

Related accessories

Large sensors require large lenses, and the Nokia 808 PureView comes with a relatively humungous (by smartphone standards) lens. In addition, the flash on the Nokia 808 PureView is a bulky xenon flash tube.

The total package translates to significant smartphone real-estate, as can be seen from figure 1. What is interesting is

how Nokia uses the 41MP available on the sensor.

There are two facets to the unique use of the sensor:

Oversampling

The Nokia 808 PureView is a 5MP camera by default. In this default setting, each pixel in the image derived from approximately 8 pixels in the sensor. This feature, called oversampling (or pixel-binning), helps reduce noise, and increase sharpness and colour accuracy, thus making up for the relatively small pixel size on the sensor. But if a bigger pixel size could deliver the same visual results, why not just keep the resolution permanently at 5MP and always exploit the advantages of oversampling?

Lossless digital zoom

The reason for that is a feature called lossless digital zoom. Digital zooms on cameras 'crop and resize' the image, typically resulting in blurry and pixelated images. This is because interpolation is used to fill in the extra pixels, required when a smaller part of the image is made larger. In the case of the Nokia 808 PureView, given that the sensor's native resolution is 41MP, at a default 5MP resolution, the image can be digitally zoomed to 3x without loss of detail, since the camera is now recording images without any oversampling. Effectively, the Nokia 808 PureView camera delivers the visuals of a camera with a 3x optical zoom.

Lessons for surveillance cameras

Nokia's rather unique implementation of a high resolution sensor on a smartphone camera – all the while trying to stay within the budgetary and real-estate expectations of smartphone users – has lessons and cautions for surveillance camera users and vendors.

Mid-fidelity and High-resolution, instead of High-fidelity and Mid-resolution

Like CPU cores, other silicon too is getting cheaper and simpler to produce; provided it isn't at the cutting edge of technology (high speed-low power, high pixel size, high dynamic range etc). Surveillance camera vendors will need to look at using sensors produced for smartphones (mid-fidelity and high-resolution) instead of designing products around surveillance-specific sensors (high-fidelity and mid-resolution).

A mid-fidelity smartphone sensor SKU will have sufficiently high volumes to ensure economies of scale, and thus enable a surveillance camera vendor to design a megapixel in-

door surveillance camera at a cost not far off from that of a high-end analog CCTV camera.

Intelligent edge-devices

With mid-fidelity sensors, there is a fair amount of image processing work and optimisation that needs to be done, for which computing power is essential. Computing is getting cheaper too, and surveillance cam-

era vendors should look at going the way of smartphone vendors – churning out dual-core or quad-core hardware, while waiting for software to deliver the fine-tuned image that the sensor is incapable of delivering.

Intelligent edge-devices need to be the norm, as far as surveillance cameras are concerned, and this should be the message users pass on to surveillance camera vendors. Such devices, with built-in storage, preclude the necessity for a back-end VMS (Video Management System) infrastructure, and allow users to directly access the device and view recordings.



Figure 1: The Nokia 808 PureView camera occupies significant smartphone real-estate. Credit: Nokia <http://www.nokia.com>



Figure 2: Shot with a Nokia 808 PureView smartphone. Credit: Nokia <http://www.nokia.com>

Regional Manager for South Asia

Jaiprakash Vappala to support growing demand for ComNet's transmission products

ComNet Europe Ltd of Leeds in the United Kingdom, manufacturer of fiber optic transmission and networking equipment, has announced the creation of a new position in India to support the growing demand for its fiber optic and Ethernet transmission solutions.

Jaiprakash Vappala has been appointed as ComNet's new Regional Manager for South Asia, covering India, Sri Lanka and Bangladesh. Vappala has worked in the security industry for more than 17 years, and has extensive experience with Group4, Tyco and CBC.

The new appointment comes at a time when South Asia is seeing a huge demand for innovative fiber and ethernet transmission equipment in security, communications and toll-roads/infrastructure projects. Jaiprakash will be based at the New Delhi office in India, and will work with distribution and integrators in the region.



“ComNet is built on the solid foundation that prioritises, above all, the importance of delivering exceptional customer service.”

**– Jaiprakash Vappala
Regional Manager for South Asia**

“I am extremely pleased to be working for ComNet, a company that is innovative and progressive, and where quality and value come first. I look forward to working in partnership with new and existing clients,” said Jaiprakash on his new appointment.

Commenting on Jaiprakash's appointment, Managing Director, Steve Clarke said: “I am very pleased to welcome Jaiprakash to the ComNet team. He shares our values and vision, and is well placed to support the continued success in South Asia going forward.”

Jaiprakash holds a degree in Electrical & Electronics Engineering from Mangalore University, Karnataka, India with a focus on strategic management and business development.

ComNet offers an extensive line of fiber optic video and data transmission equipment as well as a line of Ethernet network equipment that is uniquely toughened to meet the needs of the Security and Intelligent Transportation System market. ■

Capability limits

The Nokia 808 PureView camera sensor does not do well in low-light conditions, chiefly because it is a Front-Side Illumination (FSI) sensor. BSI (Back-Side Illumination) sensors deliver superior low-light performance. However, high-resolution sensors featuring BSI are not currently available.

There will always be a market for specialised surveillance sensors – mainly for low-light and high-contrast lighting conditions. A smartphone sensor cannot deliver the level of detail of such a high-fidelity surveillance sensor. Users have to be clear about the capabilities of each category of sensors, so that there are no false expectations when opting for a mid-fidelity (low-cost) sensor solution.

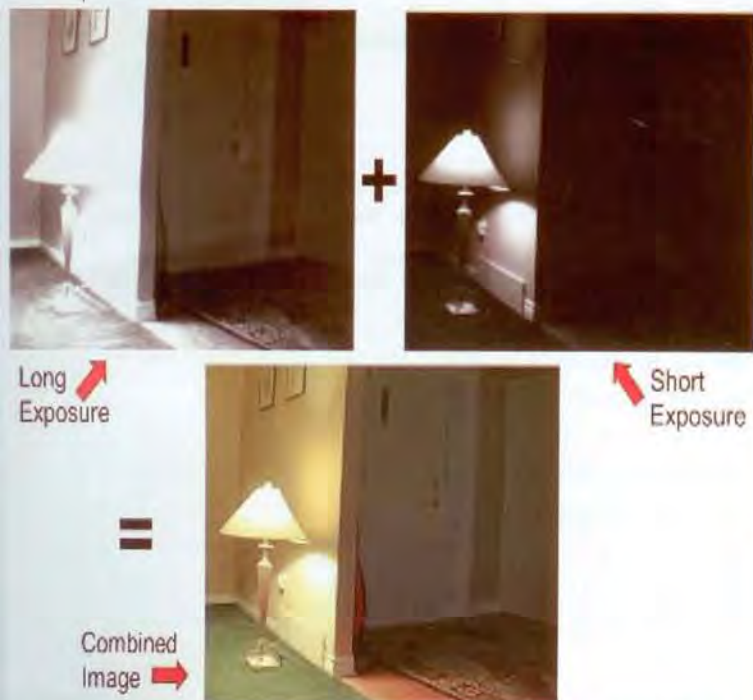


Figure 3: Sensors are more than just lots of megapixels: a WDR sensor

Credit: OmniVision Technologies Inc. <http://www.ovt.com>

Conclusion

Can surveillance camera vendors do a ‘smartphone’ to the traditional IP video surveillance camera, bringing its prices down to the level of analog CCTV cameras? The day when a 41MP IP video surveillance camera will be available for around the price point of a high-end analog CCTV camera may not be far off, looking at the trail blazed by Nokia in its recent smartphone introduction. ■

[Note: This article used inputs from the following site's – <http://www.arstechnica.com> – article: *Innovation or hype? Ars examines Nokia's 41 megapixel smartphone camera*]