ALMALENCE
SUPER SENSOR

A software component with an effect of increasing the pixel size and number of pixels in the sensor
MOBILE CAMERA:
SMALL SENSOR AND TINY LENS

Insufficient resolution, low light performance, dynamic range
LIMITS AND HOW TO GET OVER

Mobile camera quality is limited by:
- Size
- Cost

Solution:
Improve the quality with computational imaging
- Non material
  - No additional size or weight
- Cost effective
  - Drastically cheaper than HW improvement
- Short time to market
  - Can even be delivered to users’ devices over-the-air
SUPER SENSOR: INTEGRATED IMPROVEMENT OF A CAMERA

Software with an effect equivalent to replacing 1/4” sensor with 1/3”

Top: mobile phone camera (Google Nexus 5)

Bottom: same camera with Almalence technology
## SUPER SENSOR: INTEGRATED IMPROVEMENT OF A CAMERA

### General effect:
- 1.5-2x resolution increase
- +2..3Ev dynamic range
- Superior low light sensitivity
- Better performance in most challenging use cases for mobile photography
- Better visual appeal of the images

### Features:
- Extended dynamic range makes traditional HDR unneeded in most of cases
- Equivalent of optical zoom due to resolution increase
- Radical noise reduction in low light
- Recovery of details in shadows
- Backlight scenes recovery
- Highlights clipping reduction
- Reduction of side illumination haze
SUPER SENSOR: INTEGRATED IMPROVEMENT OF A CAMERA

Patents granted and pending.

Inquiries:

info@almalence.com

Note: All images in this presentation were taken with stock Nexus 5 device (with and without SuperSensor) and are unaltered except for cropping. Original images are available at: almalence.com/doc/super-sensor-demo
Super Sensor addresses most of the typical problems in mobile photography:

- Low light (noise and blur)
- Zoom (insufficient resolution)
- Backlight (details lost in shadow)
- HDR scenes (detail loss in highlights and shadows)
- Bright objects and areas (clipping)
- Side illumination (haze)
- Document scan (insufficient resolution and contrast)
- Handshaking (motion blur)
LOW LIGHT

- Radical noise reduction without losing image details
- Resolution improvement
- Recovery of details in shadows
Digitally zoomed photos look bad due to lack of details.

With Super Sensor zoomed photos have higher resolution. Zoom becomes a useable function on mobile camera.
BACK LIGHT

- Automatic and noise free recovering of details in the area of interest
HIGH DYNAMIC RANGE

- Due to up to 18dB dynamic range enhancement and local tone mapping, high dynamic range are captured without loss of details in highlights and shadows, making traditional HDR unneeded in most of the cases.
Higher dynamic range allows to avoid clipping in highlights
Strong side illumination typically causes hazy mobile shots.
With Super Sensor the haze is automatically reduced.
Perfect for taking photos of documents: increased resolution and enhanced contrast.
PROTECTED GOLD

Gold coatings are effective for applications requiring NIR and IR regions. Since a durable coating is necessary, we offer gold with a protective overcoat. The reflectivity from 750nm - 1500nm is maintained, with a durable finish.
HANDSHAKING BLUR

- Super Sensor provides effect similar to optical stabilization
SNOW

- Typical problem with snowy scenes: the snow is gray due to auto-exposure failure, the details are lost due to low contrast
- SuperSensor makes the snow white and reveals low contrast details
COMPARISON WITH GOOGLE HDR+ FEATURES

• Both solutions:
  • Improve overall image quality

• Super Sensor advantages:
  • Much better performance in extreme low-light conditions
  • Resolution increase
  • Processing speed

• HDR+ advantages:
  • None
## COMPARISON WITH GOOGLE HDR+ FEATURES

<table>
<thead>
<tr>
<th>TIME*</th>
<th>HDR+</th>
<th>SUPER SENSOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPTURE</td>
<td>1.2 SEC</td>
<td>0.3 SEC</td>
</tr>
<tr>
<td>PROCESSING</td>
<td>2.7 SEC</td>
<td>1.0 SEC</td>
</tr>
</tbody>
</table>

* Measured with Google Nexus 5 mobile phone, Qualcomm Snapdragon 800, @2.3GHz, 8 Megapixels
EXTREME LOW LIGHT

- HDR+ failed to capture of the scene
- Super Sensor captured details in shadows with no noise amplification
Notice loss of details in highlights (window) and high noise level
Zoomed image captured with Super Sensor has more details as if it was captured with a higher resolution camera.
REFERENCES

All illustrations are unaltered, except for cropping. The images taken with a stock Google Nexus 5 device.

Full original images and a demo app are available: almalence.com/super-sensor-demo

Patents granted and pending.

Inquiries: info@almalence.com