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1 *A smartphone spectrometer– made possible without additional hardware by HawkSpex® Mobile.*

HawkSpex® Mobile: SMARTPHONE SPECTROSCOPY

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Smartphones Can Do Even More

Modern smartphones are veritably ubiquitous. Many users count on using their smartphones for more than just communication. Integrated sensors (e.g. camera, GPS, gyroscope) play a crucial role. Typically, specially developed software, an app, provides more extensive functions to users. A whole group of such added features are transitioning toward low-priced, easy-to-use and constantly available meters and monitors.

Many apps base their assessment of the properties of a scanned object, in the broadest sense, on its chemical composition and thus scan far more than just size, shape, color, texture, etc.. In other words, they require a hyperspectral camera. Some apps scan foods for freshness, ripeness or treatment, personalize recommendations for cosmetic care products, detect forged documents, counterfeit medicines or fake luxury apparel as well as concealed touch-ups of car paint damaged by an accident.

"Professional" apps frequently employ hyperspectral scanners with special and usually expensive sensors. The cameras installed in smartphones are equipped with three-channel color sensors (red-green-blue), making them unsuitable for such tasks.

Display, Front Camera and Artificial Intelligence

HawkSpex® Mobile takes an entirely different but surprisingly simple route. A combination of adjustable illumination and a color camera, a kind of inverse spectroscopy, disperses light in narrowband spectral channels. This is fundamental to the implementation of hyperspectral scanning.

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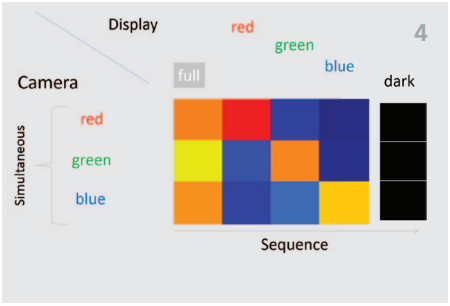
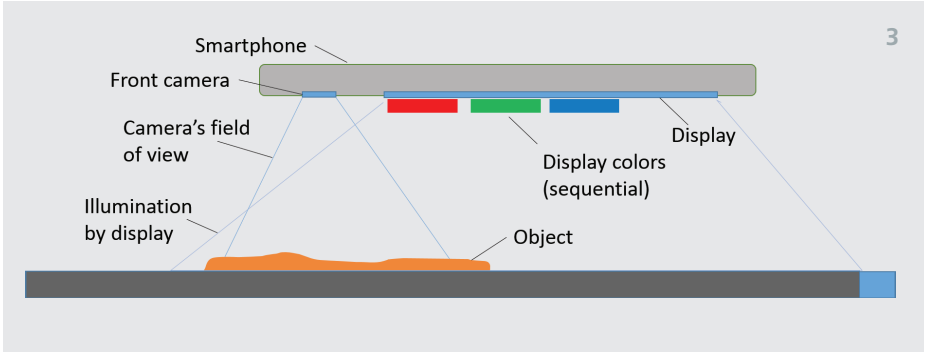
To do this, the smartphone's display switches to a sequence of different colors in rapid succession on its entire display and synchronously takes pictures with the front camera, thus measuring the light reflected by the defined illuminated target object. The sequence of lighting colors produces a spectral image in fractions of a second.

Specially developed methods of artificial intelligence convert the recorded raw spectral data into information in the context of the concrete application. An app enables user interaction, synchronizes illumination and picture-taking, and establishes a connection to a spectral application database.

From the Basic Solution to Power User

Numerous applications can be implemented with this system. Ambitious users can disconnect the basic solution described from their smartphones and use it as HawkSpex® Gadget with enhanced spectral capabilities. The LED illumination and photosensors employed make it possible to configure the spectral bands for applications beyond the smartphone while basically retaining the sequential scanning principle. HawkSpex® Gadget can be controlled by the same app or operated as a separate device.





2 *HawkSpex® Gadget.*

3 *Schematic of a spectral scan with HawkSpex® Mobile. The display is successively illuminated with the three primary colors, separately and together, while the front camera synchronously takes color pictures. This combination produces a twelve channel spectral effect. When the display is dark, an image is used to compensate ambient light.*

4 *HawkSpex® Gadget produces virtually any spectral bands and thus not only a larger potential number of bands but also the ultraviolet and infrared spectrum. Its retention of the principle of HawkSpex® scanning along with its universal usability, energy consumption and price make it superior to conventional spectrometers.*

Experience HawkSpex® Mobile first hand

Scan the 3DQR® code on the right and use the 3DQR® app (available from Apple App Store and Google Play Store) to see an animation of HawkSpex® Mobile in action.