

How imaging a newborn's eye with a smartphone can help identify neonatal jaundice

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ABSTRACT

There are now approximately 6.5 billion smartphones in the world with 85% of the world population owning one. One main function of the smartphone is photography. Increasingly, researchers are exploring new ways to exploit the advance smartphone photography capability beyond its original purpose of taking great photos. We have been investigating the use of the smartphone camera as a scientific instrument to measure colour accurately for clinical diagnosis.

In this talk, I will describe a smartphone imaging technique to screen for severe neonatal jaundice, which affects approximately 5% of newborns worldwide. Although neonatal jaundice is a common condition among newborns with 60% of term newborns having this condition, most newborns can get better by themselves. Those suffering from severe jaundice, however, are at risk of neurological disorder and even death. A timely diagnosis of severe jaundice is therefore crucial so that these babies can be referred to receive phototherapy, or in serious cases, exchange blood transfusion.

Jaundiced babies have yellow discolouration in the skin and the sclera (white of the eye) because of the accumulation of bilirubin in the blood. The higher the bilirubin level, the more yellow the baby appears and the more jaundiced the baby. By capturing an image of the eye and quantifying the yellowness of the sclera, we can estimate the jaundice level of the baby despite the skin colour or ethnicity of the baby. I will report on the latest results on a large scale study involving over 300 newborns in Ghana.

I will also talk about the ambient subtraction technique which minimises the effects of ambient lighting, and how we can calibrate the smartphone camera and the illumination so that the technique can be used in different models of smartphones despite slight differences in their camera spectral sensitivity and the illuminator's emission spectrum.