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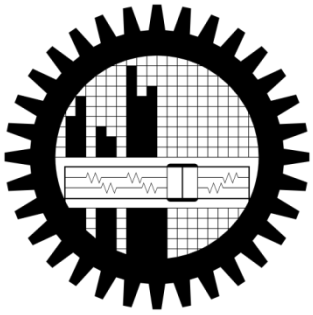

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Infant Jaundice Detection

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Proposed Work

I am mainly working on detecting infant jaundice using a smartphone application. Skin that turns yellow can be a sure sign that a newborn is jaundiced and isn't adequately eliminating the chemical Bilirubin. But that discoloration is sometimes hard to see, and severe jaundice left untreated can harm a baby. My plan is to use a smartphone camera to capture the baby's image and apply image processing to find out the discoloring.

Background

Infant jaundice is a common condition, particularly in babies born before 38 weeks gestation (preterm babies) and some breast-fed babies. Infant jaundice usually occurs because a baby's liver isn't mature enough to get rid of Bilirubin in the bloodstream. In some cases, an underlying disease may cause jaundice.

Two types of jaundice may occur in newborns who are breastfed. Both types are most often harmless.

- Breastfeeding jaundice is seen in breastfed babies during the first week of life. It is more likely to occur when babies do not nurse well or the mother's milk is slow to come in.
- Breast milk jaundice may appear in some healthy, breastfed babies after day 7 of life. It is likely to peak during weeks 2 and 3 but may last at low levels for a month or more. The problem may be due to how substances in the breast milk affect the breakdown of bilirubin in the liver. Breast milk jaundice is different than breastfeeding jaundice.

Currently I am planning onto detect the first type of Jaundice as this is the most common case.

The symptoms of jaundice in babies depend on the cause and severity, but may include:

- A yellow tinge to the white parts of the eyes (sclera)
- A yellow tinge spreading to the skin of the body (in moderate jaundice)
- Palms of the hands and soles of the feet turning yellow (in severe jaundice)

- Unusual drowsiness
- Feeding difficulties
- In some cases, light-coloured faeces (poo) and dark urine.

The most common symptom is the yellowish skin and eye on which I will be focusing on.

Experiment

I have collected some sample images of babies having Jaundice and applied some basic image processing techniques and result was very promising. Every color is composed of 3 basic colors : Red, Green and Blue also known as RGB. If each of these components are presented in 8 bits then each value will have a range from 0 to 255. For white light the value of R, G and B component is 255 while for black light all these values are 0. Now, we are concerned with the yellow color for which the R and G component is 255, but B component is 0.

Figure 1 is a sample image of a baby having Jaundice where figure 2 is a sample baby without Jaundice.

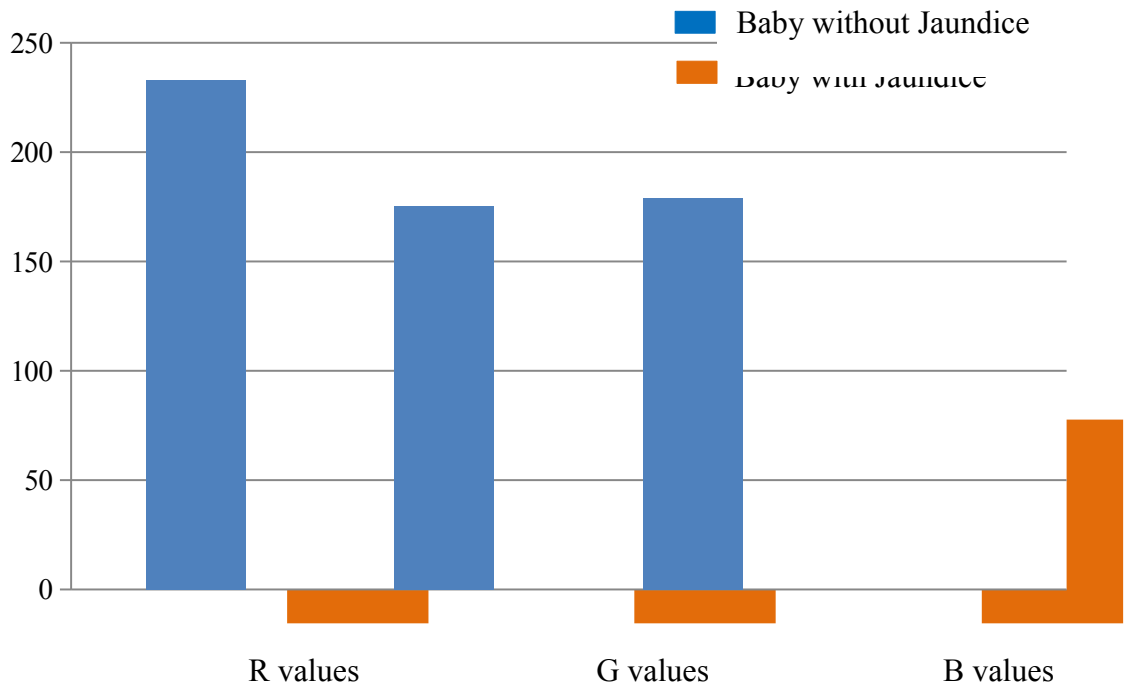
Figure 1 : A baby having Jaundice

Figure 2 : A baby without Jaundice

I analyzed their skin colors and the result was very promising. The first baby has a lower Blue component value comparing with the second baby. However, there are certain issues that have to be taken into consideration. The ambient lighting is a crucial factor for this. As we are heavily relying on image processing the ambient lighting can be a big factor. The skin color of the baby can also play an important role. These things will be studied extensively in the future.

Result

The result is displayed in figure 3. We can see that the R and G values of both the babies are quite close where the B value of the baby having Jaundice is significantly lower than that of the healthy baby. This is just a basic sample case. We will be needing a lot more than just sample to develop the system.



Future Work Plan

As mentioned earlier there are lots of issues that needs to be taken into consideration. To make the application robust, I am planning on to apply machine learning algorithms on the images. So, I will be needing a lot of data(images of babies having Jaundice) for that which will be a huge bottleneck. Currently the next plan is to collect an adequate amount of data to apply machine

learning algorithm. I shall be developing the application simultaneously. After the data collection is complete then I shall focus on designing the algorithm.

Conclusion

Infant Jaundice is a severe problem for our country. A huge number of children is affected by this and in many cases the parents or the physician is not able to detect it at the primary stage. Through this smartphone application the parents or physician will be able to know whether they need to consult a professional doctor. The whole procedure will be very cost effective and non-invasive.