

## **Licensing and Technology Transfer Opportunity: Manipal University**

### **Title of Technology Available: A SYSTEM AND METHOD FOR AUTOMATIC BLOOD SMEAR ANALYSIS BASED ON IMAGE ANALYSIS**

#### **Brief Description of Invention:**

The present invention is a screening tool acting as a decision support system by automating the analysis of images of blood smears. It checks if the smear represents a normal or an abnormal sample, and picks the abnormal regions from all views of the smear to facilitate remote consultation. In the case of abnormality, it also detects some of the diseases such as anemia, thrombocytopenia, sickle cell anemia, bacterial infection etc. This invention is designed to have 100% sensitivity so that the cases which are classified as normal need not be evaluated by a pathologist. Only those classified as abnormal cases need to be evaluated by a pathologist, thus lowering the burden on a pathologist. In the case of unavailability of a pathologist, only the abnormal regions are picked up from various views of the sample so as to facilitate communication over a telecommunication channel for remote consultation.

- Can be used for screening in rural health centers.
- Can be used as decision support system in laboratories.
- Can be used for diagnosing count related disorders.

#### **Brief Background of Invention:**

American Medical Association (AMA) has reported that 41.5 million complete blood count and differential count tests were conducted in the year 2015. Globally, anemia affects 1.62 billion people and in India level of public health significance is severe according to WHO report 2011. Many deadly disorders such as anemia, leukemia, malaria, thrombocytopenia, sickle cell anemia, bacterial infection, etc. are diagnosed using peripheral blood smear analysis and blood count. Evaluation of peripheral blood smear needs laboratory infrastructure and skilled personnel. Microscopic evaluation of blood smears is time consuming, tiring and is subjective. In India, many rural health centers lack these facilities. However, equipping a laboratory with required infrastructure is not the main challenge, unavailability of skilled personnel is the main problem. This invention provides a decision support system for detecting abnormality in the peripheral blood smear.

#### **Describe the final product:**

A method is provided for automating analysis of a peripheral blood smear. The method includes analysing an RGB image of the peripheral blood smear. The method identifies the type of blood cells in the image of the peripheral blood smear based on a plurality of features of the blood cells such as size, shape, color and texture. Further color score of the image is identified using TissueQuant method for enabling identification of the type of blood cells. The method further classifies the identified cells into normal blood cells and abnormal blood cells using Support vector machine and convolution neural network. Further, regions of the image with abnormal

cells are utilized to detect some of the disorders in the blood. The regions of the image with abnormal cells are further transmitted over a communication network for evaluation by a pathologist.

**Technological Domain (Keywords):** Peripheral blood smear, WBC analysis, RBC analysis, Platelet analysis, normal, abnormal, screening, diagnosis, decision support system

**Proof of Concept:** A robust image processing algorithm which can accurately classify normal and abnormal blood cells in peripheral blood smears has been developed.

**Stage of Development:** Prototype

Ideation/Prototype/Advanced Prototype/Ready to Market technology

Provide Information on Competitors who manufacture and/or sell similar products: NA

**What are the unique advantages your innovation has compared to the competition:**

A pathologist has to study around 100 to 300 microscopic views of blood smear images to evaluate and detect any abnormality. Manual evaluation is tiring and time consuming. This invention can be used to automate the analysis which also provides objective results. Also all the cases classified as normal need not undergo manual evaluation since we plan to design the sensitivity to be 100%. This invention is designed to detect and pick up the abnormal regions in images of all the views which would be very useful to limit the manual evaluation to only those regions, thus making it more feasible for telemedicine applications. This would be of great help particularly in low resource settings to facilitate remote consultation and thus compensate for lack of skilled personnel. There are a few solutions such as VisionHema, but they depend on completely automated workflow, which provide standardized images. The present invention is more robust and provides consistent results in case of variations in brightness and color shade variations introduced due to manual processing.

A few potential companies who might be interested in this technology: Bosch, Philips

Intellectual Property Status: Indian Patent application with number filed in (mention year) :  
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