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# A Non-Invasive Blood Cell Counter for Disease Diagnosis



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# Abstract

Blood cell count enables us to predict the patient's disorder. Blood cell count renders crucial data. Every organ inside the human body functions actively if the

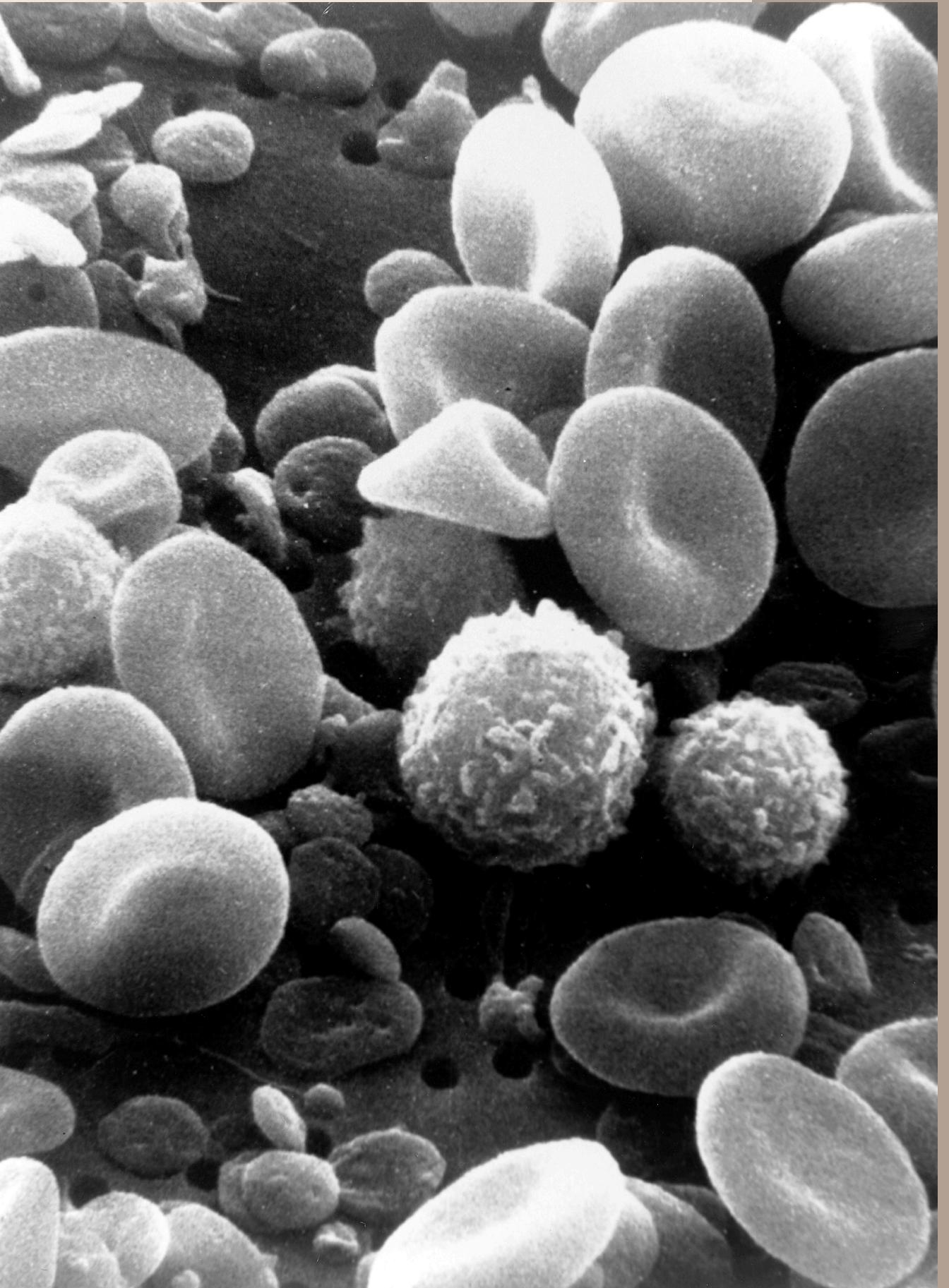
blood cell count is at the appropriate level. To count blood cells utilized conventional techniques is highly priced and consumes lot of time. Disease is predicted based on the result by using Non-invasive technique to assess the number of red and white blood cells. A sensitive device was invented for this method which is formed by phototransistor with a clear casing letting the red light

weight returning from a red LED to penetrate the device. This means, that when

the intensity of the light varies, the quantity of current flowing through the device

conjointly changes this variation in current causes a variation on the free fall across the connections of an electrical device that is scan by a microcontroller that

calculates the amount of red blood cells and white blood cells.



# Introduction

An astronomer Sir Willam Herschel invented infrared radiation in 1800. With the help of thermometer he also invented a sort of unseeable radiation within the spectrum lower in energy than red light. Electromagnetic radiation (EMR) having wavelength greater than visible light. It is normally not visible by our naked eye. Under certain conditions an IR from specially pulsed lasers having wavelengths of 1050 nm may be viewed by humans. IR wavelengths increased from the nominal red fringe of the visible radiation spectrum at 700 nm with frequency with range 430 THz - 1 millimeter. Infrared is mostly emitted in room temperature. Like all EMR, IR behaves both sort of a wave and like its quantum particle because it carries radiant energy, the photon. infrared is employed in industrial, scientific, military, enforcement, and medical applications. A non-invasive technique to evaluate the amount of red blood cells within the blood. A sensitive device was invented for this method which is formed by phototransistor with a clear. casing letting the red light-weight returning from a red LED to penetrate the device. This means, that when the intensity of the light varies, the quantity of current flowing through the device conjointly changes this variation in current causes a variation on the free fall across the connections of an electrical device that is scan by a microcontroller that calculates the amount of red blood cells and white blood cells. Here we are using infrared based blood cell count system. By using the blood cell circulation, we can able to count the blood cells by using infrared waves. And the patient heartbeat is monitored to measure heart rate of the human body. This methodology is Fast and cost-effective blood cell counting has major priority in the medical world. The proposed systems are reliable and acceptable outcome and enforces endurable quantity of strain on the Clinical lab technicians.

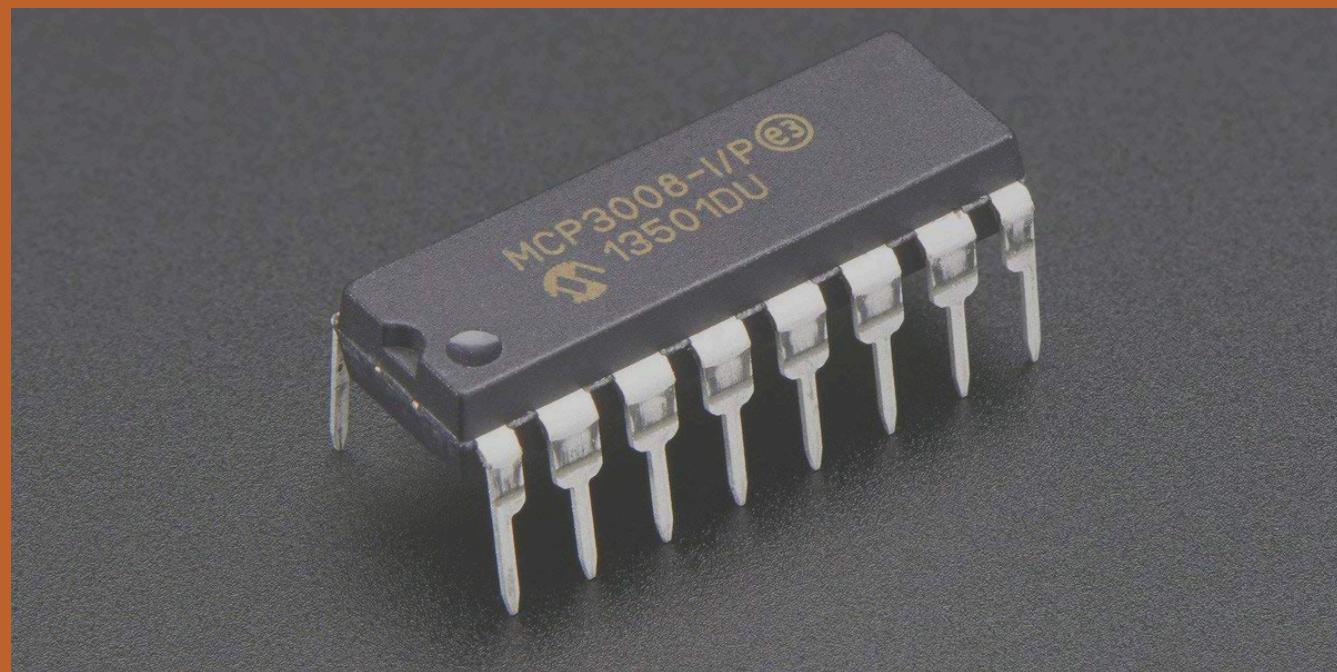


# EXISTING SYSTEM

With the help of developed health industry, the medical laboratory technician detects the blood cell count and renders the precise cell count report. This report will be useful for the physician to get latest report or details by expensive hematology analyzer. Both these methods have its own different drawbacks and limitations. The non-invasive method is used to find the count of red blood cells, glucose and hemoglobin level. Non-invasive methods such as near infrared and Raman spectroscopy, polarimetry, light scattering, photoacoustic spectroscopy, polarization technique, mid infrared spectroscopy etc. are accessible to evaluate the glucose level in blood. To detect the amount of white blood and red blood cells together till now there is no device. Invasive techniques are used to monitor the blood cell count. The invasive method has drawbacks such as risk of infection and measurement inaccuracy. Another disadvantage is discomfort is also caused. But on another side the non-invasive method could avoid the complications. the advantages of non-invasive method are it could avoid the pain and discomfort from frequent finger pricking.

# proposed system

The power supply (5V DC) is given to the raspberry pi. Infrared blood cell counter is used to count the both RBC and WBC and additional a heart sensor is used to measure the heartbeat. And it is connected to MCP3008 which is a 10bit 8-channel Analogue-to-digital converter (ADC). And from MCP3008 it is connected to the raspberry pi 3 which compare with the predetermined database. Monitor is connected to see the number of RBC and WBC blood count and the predicted disease and the heartbeat as normal or abnormal. The non-invasive infrared system is used which is simple and portable,no blood sample from patient is needed are advantages of proposed system and hardware used in proposed technique is simpler in design compared to existing techniques result. The number of people undergoing test is increased and it very helpful



# Infrared Blood Sensor

The blood count sensed by non-invasive bio-sensor. The optical biosensor is consist of Near Infrared (NIR) LED, photo diode, and transducer to response the concentration of glucose which

generally avoid finger puncturing. The wavelength of NIR LED is employed to response the blood that the 960nm optical spectrum of blood count is measured by the spectrometer system.

The concentration of RBC and WBC are obtained by instrumentation amplifier which placed in transducer from photodiode. The alternation of the two-read value of transducer for blood vessel

with blood flow and without flow onto fingertip. The adopted difference method is often excluding an equivalent background tissue of the finger that the accuracy is improved. The measured voltage value is directly proportional to the concentration of blood obtained from the

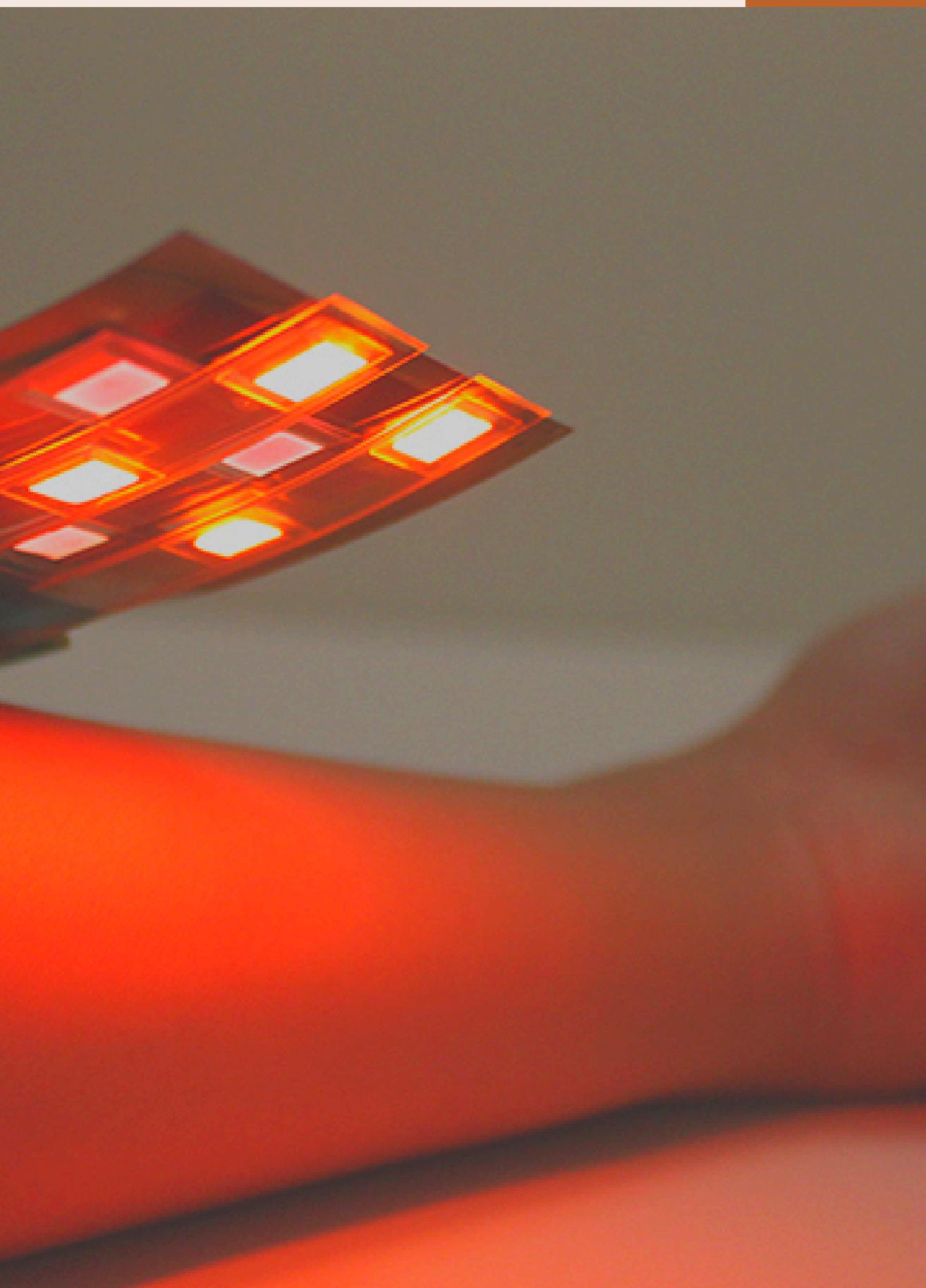
result. In health diagnosis and health care field the proposed bio-sensor are employed and had

greatly increased the potential to offer the human with the higher life.

The recognition element and transducer are placed within the bio-sensor. the popularity element

is used in detecting the bioinformation and transducer is used in transmission of bio-signal. the

popularity element are often processed by enzyme, tissue, antibody, antigen, nucleic acid or receptor. The conversion of bio signal to signal is sensed by the transducer. the sort of sensing



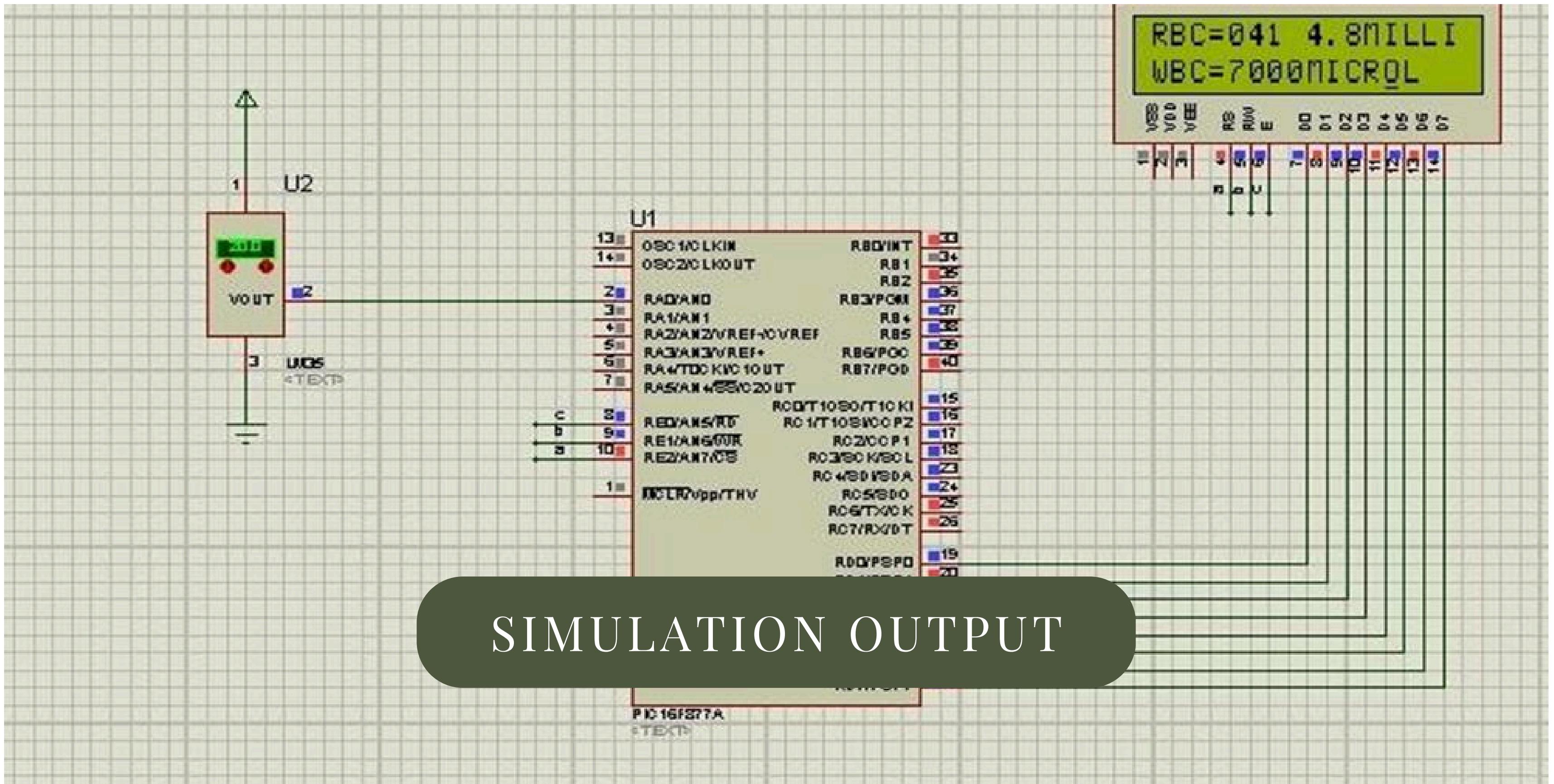
# Heart Beat Sensor

A heartbeat sensor works to evaluate the speed of a heartbeat. The heartbeat is measured in beats per minute or bpm, which denotes the no the heart is contracting or expanding during a minute

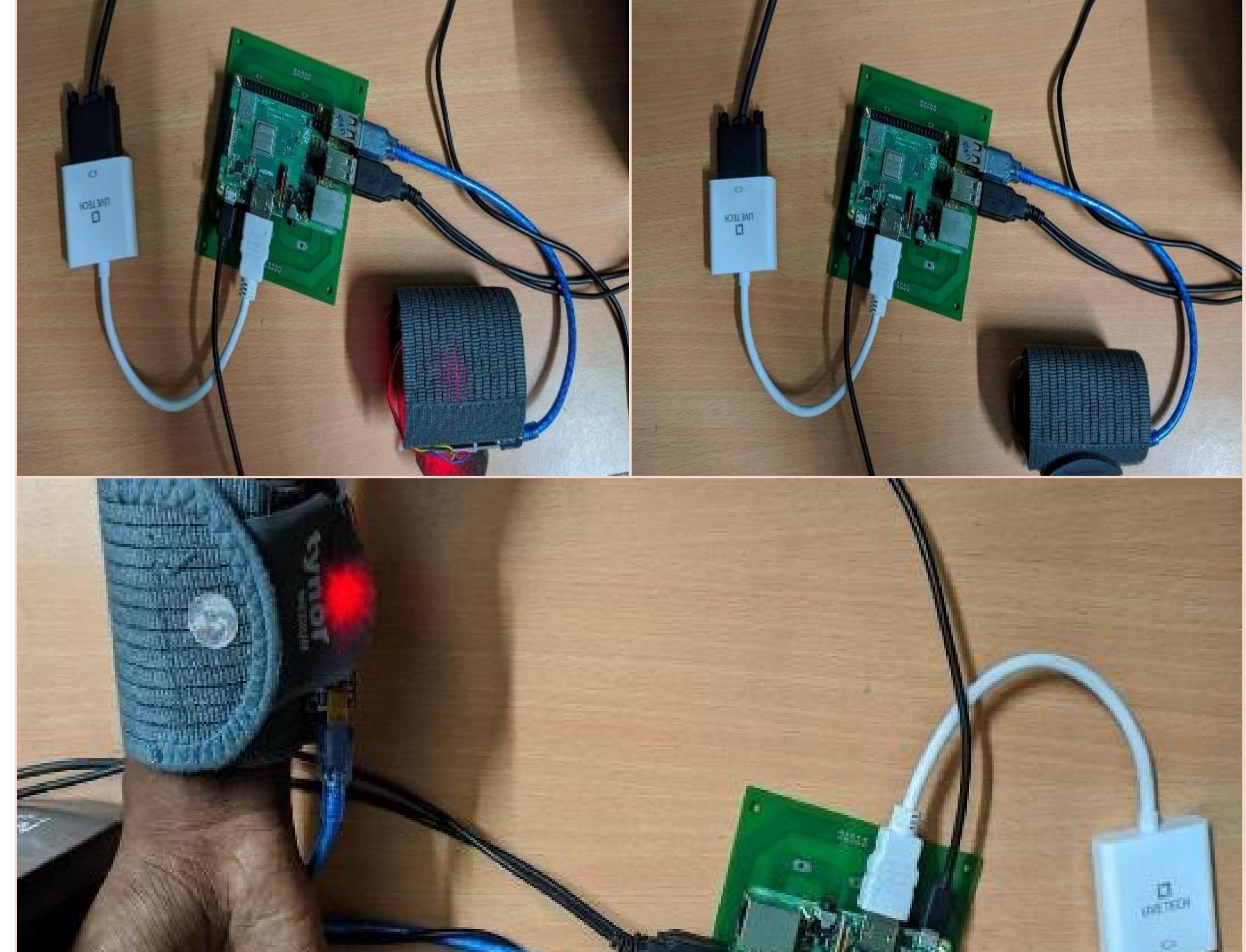
## Principle of Heartbeat Sensor

The photoplethysmography is principle employed in heartbeat sensor. The variation in the volume of blood in an organ is evaluated by the variation in intensity of light passing through that organ. IR sensor is mostly employed as source of light of heartbeat sensor. LDR, photo transistor or photo detector is utilized as detector.

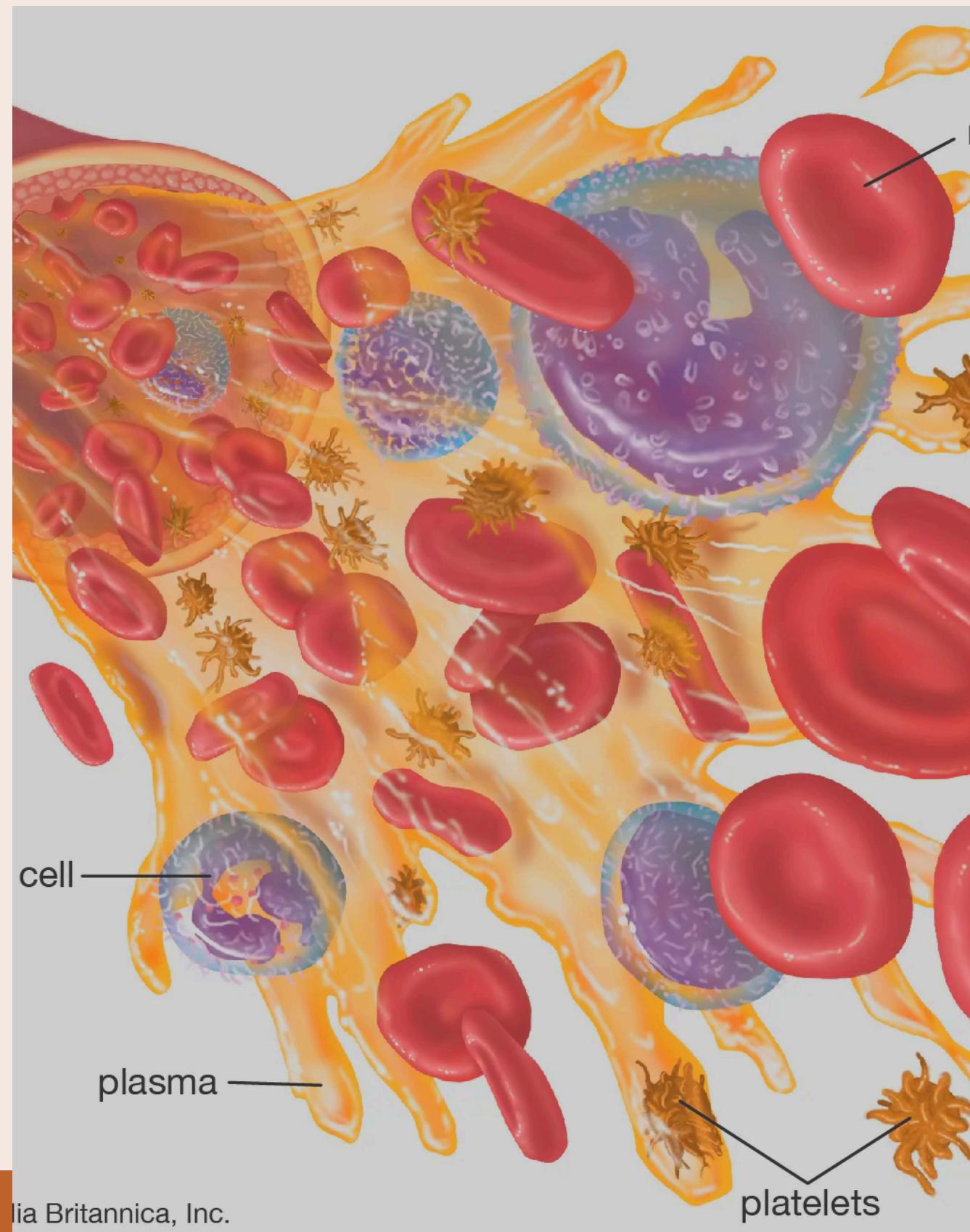




# HARDWARE RELATED OUTPUT



# Conclusion



In this project, blood cell counter and a heartbeat sensor are contained in proposed system. As continuing exposure to infrared light might cause electro kinetic potential change of blood in circulation and by using the blood cell circulation, we can able to count blood cells by using infrared waves. A non-invasive technique permits pain free on-line patient observance with reduced risk of infection and enable real time information observance permitting prompt clinical reaction to the measured information. The amount of backscattered light is detected by infrared sensor when it sends light into the tissue.

The variation in the quantity of the backscattered light depends on variation in blood volume, this is because Blood absorbs enhances light compared to the surrounding tissue. It's acknowledge that applicable variation of blood volume in tissue are often discovered by measurement the transmission or reflection of light through it. The heartbeat of the patient is monitored to measure heart rate of the human body. This methodology is Fast and cost-effective blood cell counting has major attention in the medical world. The proposed systems are reliable and acceptable outcome and put an endurable quantity of strain on the Clinical lab technicians.

# Future Enchantment

## Recommendation 1

In future this system will be utilized in monitoring enormous number of patients at the same time.

This could be utilized in hospitals to check regular blood count of patients and based on the result necessary action will be taken. Although it causes potential risks of infection because of the cut in the skin. The estimation of blood parameters is widely practiced by invasive methods

## Recommendation 2

But as a no cut, cheap and a convenient diagnostic tool, non-invasive method has several advantages, and could be a better option. It can even be utilized in measuring the blood pressure, blood oxygen levels, cardiac output, and the autonomic operations of the body, and may be utilized in rural and hilly areas in primary health care centers and remote clinics. By combining Wireless Technology

# Reference

- Yaqub, M.A., Woo, S.W., & Hong, K.S. (2020). Compact, Portable, High-Density Functional Near-Infrared Spectroscopy System for Brain Imaging. *IEEE Access*, 8, 128224-128238.
- Mateu-Mateus, M., Guede-Fernandez, F., García-González, M.A., Ramos-Castro, J., & Fernandez-Chimeno, M. (2019). Non-contact infrared-depth camera-based method for respiratory rhythm measurement while driving. *IEEE Access*, 7, 152522-152532.
- Lange, F., Dunne, L., Hale, L., & Tachtsidis, I. (2018). MAESTROS: a multiwavelength time-domain NIRS system to monitor changes in oxygenation and oxidation state of Cytochrome-C-Oxidase. *IEEE Journal of Selected Topics in Quantum Electronics*, 25(1), 1-12.

