

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.

KEYWORDS

Infrared Sensor(IR), Heart Sensor, Non-Invasive Technique, Blood Cells Count.

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.

Literature Survey

SERIAL NO	PROBLEM	SOLUTION	REMARKS
1.	To develop a model for brain disorder identification	Phantom test, arterial test is utilized for SNR calculation. The graphical plot of time and concentration change.	It affords actual-time view of collected chromophores.
2.	To compute respiratory rhythm utilizing infrared image camera.	The graphical image shows reference system and the raw respiratory signal, respiratory cycles and instantaneous frequency.	The reduced error in outcome and good sensitivity is recognized.
3.	The oxidation state and haemoglobin concentrations are weighted and computed.	Standard wavelength of VOA position for OD values is fetched in detection stage.	The system parameters are required to improve.
4.	To execute a ternary NIRS-BCI with enhanced ITR, utilized prefrontal cortex hemodynamic variation stimulated by breath-holding is stimulated by prefrontal	Reduction and variation in amplitude of respiration signals was noticed over time.	The ITR was widely enhanced.
5.	To find Heart rate detection	Each channel frequency to power after FFT of channel signal is graphically viewed	A non-invasive HR identification technique is formulated
6.	To identify the Whole-Body fluctuations on Muscle operation	The frequency and normalized frequency spectrum in the muscle activation is graphically obtained.	Whole body vibration facilitates rehabilitation process and enhance blood flow.
7.	To reveal brain tumors proving non-invasive and non-ionizing image modality.	The graphical design shows the spectral output along the CCD bins for the three pairs of HS images and S/N Ratios.	This technique is useful for several brain related issues
8.	In the wireless infrared imaging sensor to detect brain tumor is obtained	The effective use of brain features helps to foretell brain tumors and the evaluation of the database image is acquired.	The 3D image segmentation method is not utilized.

9.	To attain the mental workload from the Prefrontal Cortex (PFC) utilized fNIRS.	The graphical depict of fNIRS system functional response, and concentration change in the signal shows mental activity.	Single svm classifier utilized to evaluate accuracy.
10.	Hemodynamic responses is detected by applying using dry electrode.	In mental arithmetic experiment total hemoglobin is recognized.	HBM systems are utilized in real BCI purpose.
11.	During progress the heart heart is attained.	The graphical portrayal of the six PPG, ECG signals.	For exact HR estimation two modes is determined.
12.	To inspect the temporal-spatial features.	The graphical depiction of maximum current density for total brain area is determined.	It is multiple and effective operation.
13.	To decide the glucose level in human body.	Graphical portrayal between output voltage and the concentration solution is measured.	Non invasive estimation of glucose level.
14.	To analyse the symptom of stroke.	The graphical plot of normal muscle orders of stroke patient.	The self-supported exercise develops the stroke therapy.
15.	To find human vigilance level for both stationery and walking state.	The graphical plot of hemodynamic signal from walking state fNIRS signal and artifacts extracted form is obtained.	Distort the fNIRS signal is attained.
16.	To analysis of various diseases in DCT	To gain the trans axial slices of the reconstruction images of the phantom.	Advance figure border of blood tissue is found.
17.	To detect the signal figure in brain activity, brain-disease.	The graphical plot shows the accuracy of motion imagery and mental arithmetic task.	Tensor fusion method is focused.
18.	To measure brain activation variation of the auditory cortex	The frequency feedback characteristics of dynamic analysis and the velocity were determined.	Bone conduction transducers activates auditory cortex.
19.	To exhibit the design for photodynamic therapy in the analysis of cancer.	The histograms comparing the singlet oxygen signal acquired from Rose Bengal, Methylene Blue.	Utilized in research in vitro animal model.
20.	Brain dynamics evaluated during complex works.	Hemodynamic reaction during rest and task values are sensed.	Hemodynamic actions are complex and demand.

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 their 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.

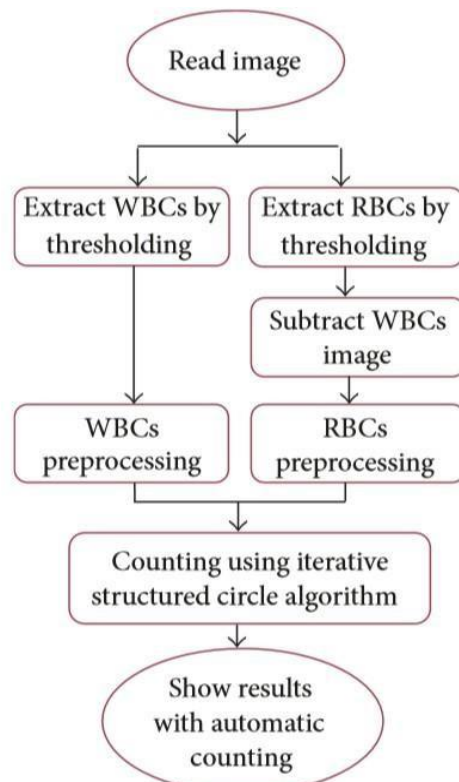


Fig. 1.Block Diagram of Existing System

The image processing is helpful to find the real image of blood of patient and it undergoes the several process. Preprocessing, segmentation, feature extraction and classification are acquired from the blood microscopic image and it is known as the recognition system. The first step is preprocessing stage where the blood sample are converted from RGB color space to YCbCr space. The segmentation process is used for converting the blood sample colors. Our selection to YCbCr color space was because of the reddish and purplish colors of our blood samples. The extracted Cb and Cr coefficients are utilized for cell segmentation procedure after transforming images to YCbCr. In segmentation process the image is segmented. Segmentation of whole cell from relative background is goal of this stage. Algorithm is utilized to find counted result from images. Cost is high, need more reference images, statistical error and in every stage the patient is needed are drawbacks of the existing system.

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

for predicting the disease.

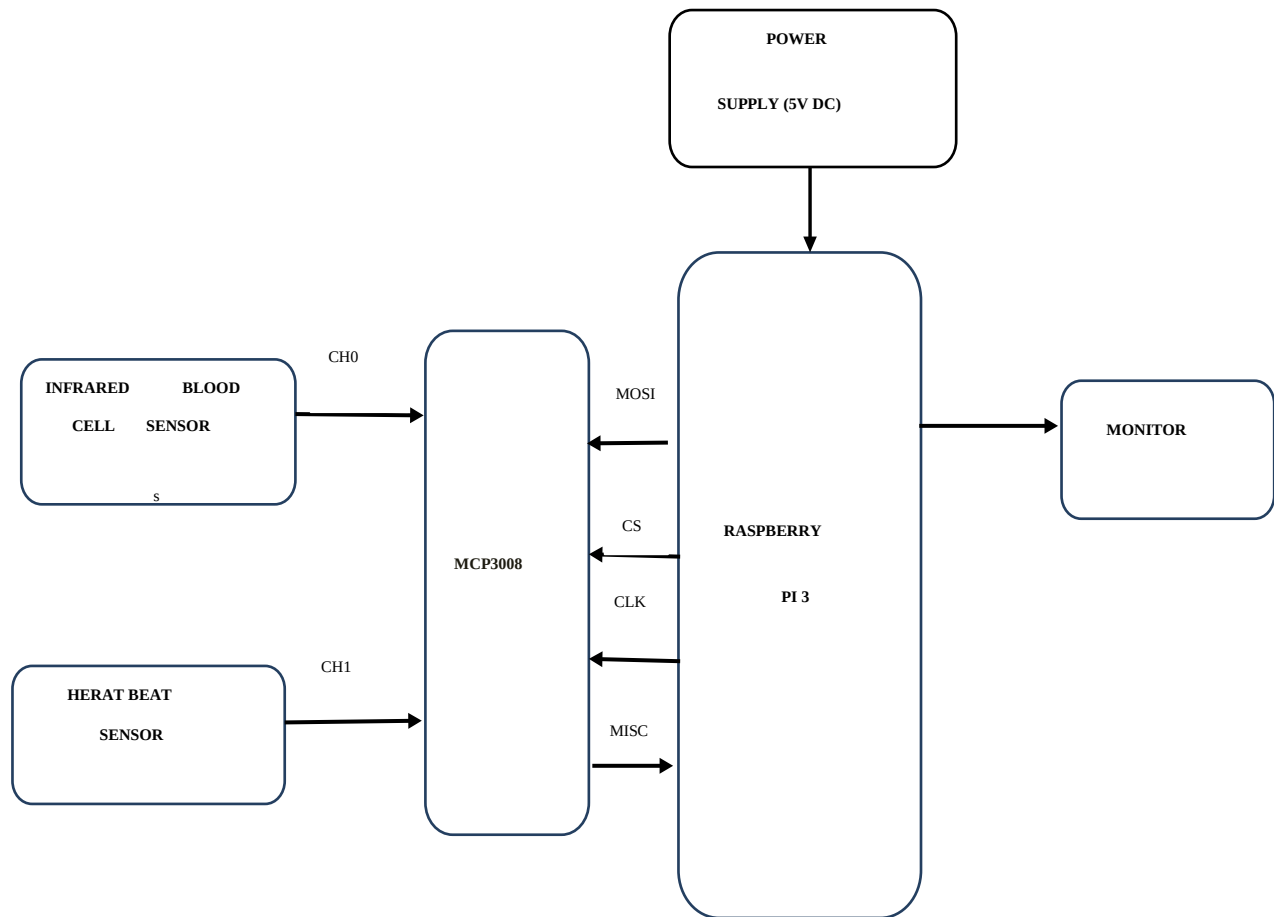


Fig. 2. Block Diagram of The Proposed System

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

signal is assessed the electrochemical, optical, calorimetric, mass-sensitive, and sound wave. The interactive respond signal is sensed and transferred to the physical signal form. the fashionable world wanted to develop the noninvasive monitoring technology to alleviate pain and anxiety related to the present finger stick methods. Without puncturing the skin for blood sample, we will check the blood levels by means of non-invasive method.

Heartbeat Sensor

Heartbeat sensor works for evaluate the speed of 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.

Outputs

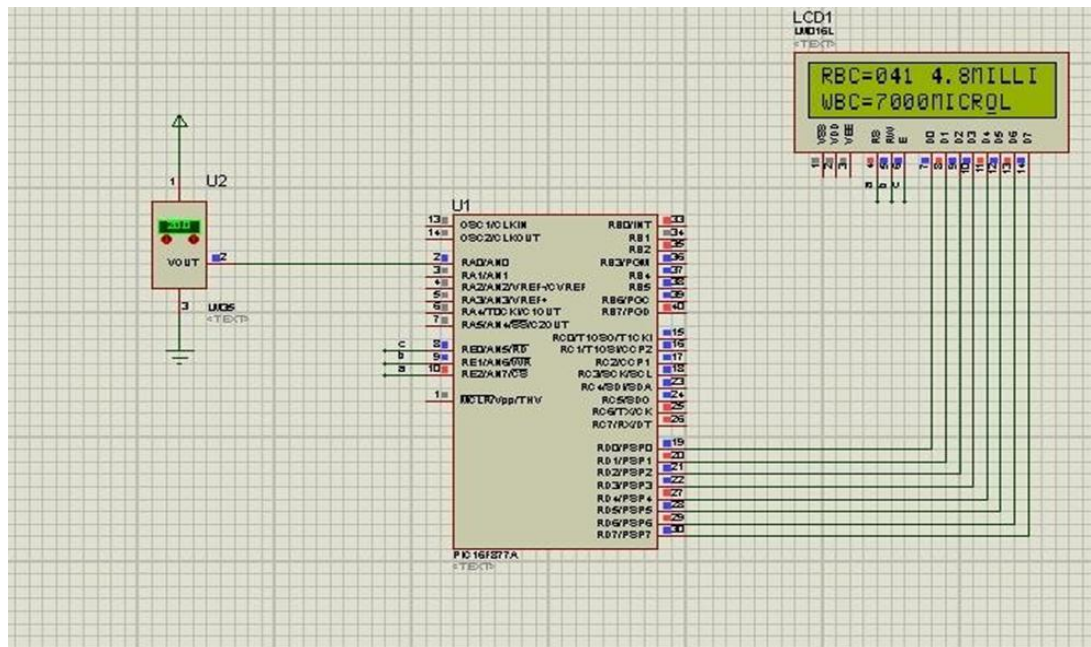


Fig. 3.Simulation Result

Hardware Related Output



Fig. 4. OFF State of Hardware



Fig. 5. ON State of Hardware



Fig. 6. Processing of Hardware

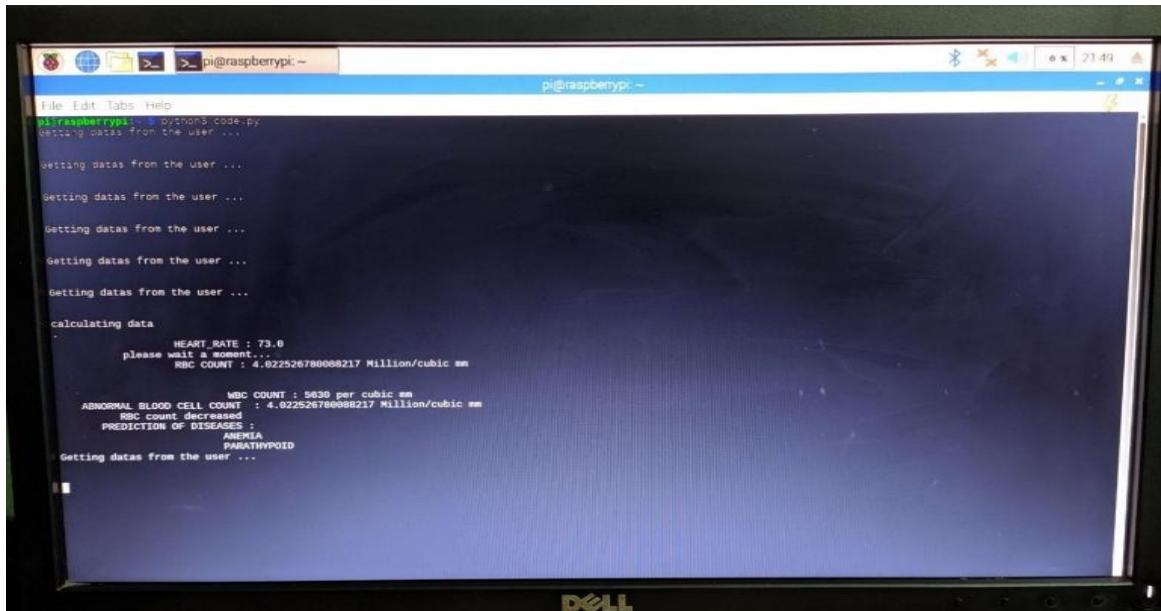


Fig. 7. Blood cell count and Heart beat rate

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 Enhancement

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. 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

and storing data in IOT the project can even be further made advance. Which may help in storing many number of data's online and one can see the result at anywhere with any devices. This method also can be used for Predicting diseases in animals.

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