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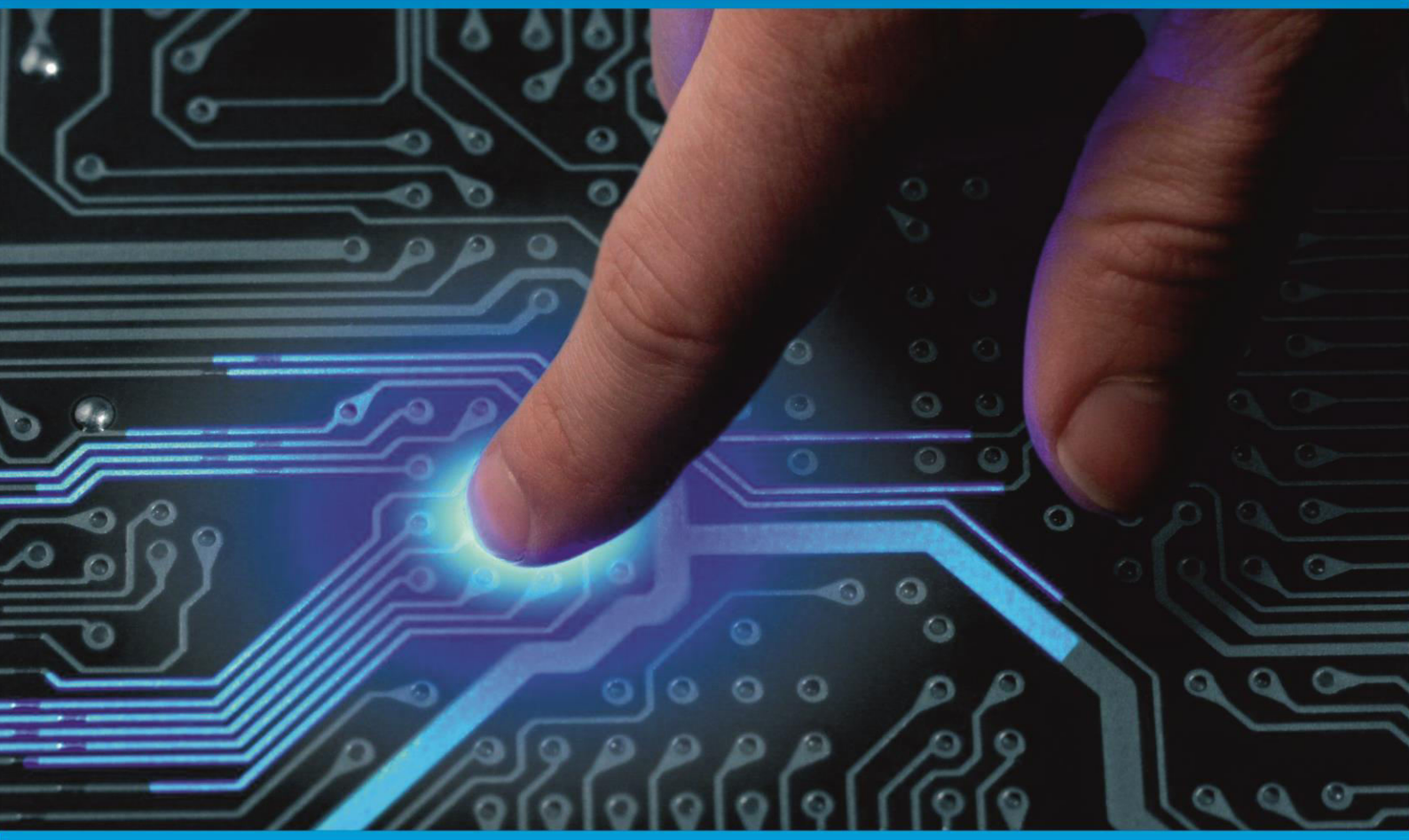

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Detection and Classification of White Blood Cell Cancer Using CNN, KNN and IOT

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ABSTRACT: Cancer detection has always been a challenge in the diagnosis and treatment plan for hematological diseases. Leukemia could be a cancer of white blood cells (WBCs) which damages blood and bone marrow of shape. It can be fatal illness if not diagnose at earlier stage. In this Project, planned an automatic technique for the detection of Acute Lymphocytic Leukemia (ALL), Acute Myeloid Leukemia (AML), Chronic Lymphocytic Leukemia (CLL), Chronic Myeloid Leukemia (CML) by microscopic blood image analysis. This approach initial section out the various kinds of cells from the image i.e., White blood cells, red blood cells and platelets. Afterward Lymphocytes are separated from the white blood cells. Then CNN classifier to classify the cells into Non Cancerous or Cancerous. After that the counting of the WBC cells are also detected for accurate diagnosis. This automated malignant neoplastic disease detection system found to be more practical, fast and correct as compared to manual identification methods. We have used Arduino UNO microcontroller which acts as brain of our system; hence the entire system program is stored in it. The system consists of buzzer and Arduino microcontroller for automated detection of white blood cells cancer diseases updated in IOT. White blood cancer cells will be detected by image processing with predefined set of images. If any threshold value increases automatically alarm will be produced using buzzer. These processes will be displayed on LCD display and all these values will be monitored in IOT.

KEYWORDS: Leukemia, CNN, Image Processing, White Blood Cells, Microscopic images, WBC cancer, IOT Arduino UNO, Buzzer, LCD display.

I. INTRODUCTION

Blood contains mainly three cell types: RBC, WBC, platelets. In this WBC have important function for the immune system, as they are the main defence of the body against infections and diseases.WBC can be categorized into two types, defined by the appearance of the cytoplasm. The first type are Granulocytes and include Basophils, Eosinophils and Neutrophils. The second type, called Agranulocytes, include Lymphocytes and Monocytes. Millions of people are affected by Leukemia, which is considered as a maligant tumor. It starts in the lymphatic system, where blood cells are produced. It begins in the bone marrow and is then distributed in the blood cells of the entire body. Normally, WBCs grow based on body needs, but in case of leukemia, they are created abnormally and become inefficient. People who have leukemia make a lot of white blood cells that can't fight infections. Leukemia is divided into four types based on the kind of white blood cell it affects and whether it grows quickly (acute) or slowly (chronic).

II. RELATED WORK

This study provides a robust mechanism for the classification of Acute Lymphoblastic Leukemia (ALL) and Multiple Myeloma (MM) using the SN-AM dataset. Acute lymphoblastic leukemia (ALL) is a type of cancer where the bone marrow forms too many lymphocytes. On the other hand, Multiple myeloma (MM), a different kind of cancer, causes cancer cells to accumulate in the bone marrow rather than releasing them into the bloodstream. Therefore, they crowd out and prevent the production of healthy blood cells. Conventionally, the process was carried out manually by a skilled professional in a considerable amount of time. The proposed model eradicates the probability of errors in the manual process by employing deep learning techniques, namely convolutional neural networks.

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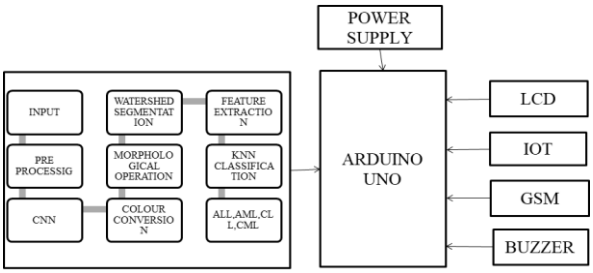
III. PROPOSED WORK

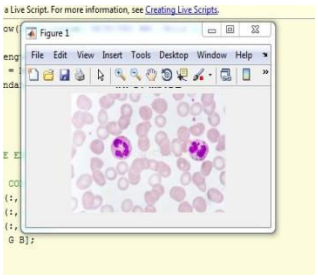
In this paper we propose efforts have been made for the detection of Acute lymphoblastic leukemia, Acute myeloid leukemia, Chronic lymphocytic leukemia, Chronic myeloid leukemia from microscopic blood images by using image processing techniques. Preprocessing was applied over the images to remove any noise, and then segmentation is performed to detect lymphocytes from the image. Watershed is used to separate the grouped lymphocytes for counting of cells, after that CNN is used to classify normal and blast cells.



IV. WBC CANCER DETECTION STEPS

1. INPUT IMAGE:

Read and Display an input Image. Read an image into the workspace, using the imread command. In image processing, it is defined as the action of retrieving an image from some source, usually a hardware-based source for processing. It is the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed.



2. PREPROCESSING:

Pre-processing is a common for operation with images at level of abstraction for both input and output intensity images. The aim of the pre-processing is to improve the image data that suppresses unwanted distortions and enhances some image features for further processing. Image pre-processing method ct in real image have essentially the same use the considerable redundancy images. Neighbouring pixels corresponds to one objeor similar brightness value. Thus distorted pixel can be restored as an average value of neighbouring Pixels.

3. SEGMENTATION:

Image segmentation may even be a ordinarily used technique in digital image process and analysis to partition a picture into multiple components or regions, usually supported the characteristics of the pixels among the image. In laptop vision, Image Segmentation is that the method of subdividing a digital image into multiple segments (sets of pixels, conjointly stated as super pixels. Segmentation may even be a method of grouping along pixels that have similar attributes. Image Segmentation is that the tactic of partitioning a picture into non-intersecting regions such every region is consistent and so the union of no 2 adjacent regions is consistent Pixels throughout area unit| district locality vicinity part section} are similar consistent with some homogeneity criteria like colour, intensity or texture therefore on find and establish objects and limits (lines, curves, etc) in a very image . Segmentation accuracy determines the ultimate success or failure of processed analysis procedure.

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A. COLOUR SPACE CONVERSIONS: Colour space conversion is the translation of the representation of a colour from one basis to another. This typically occurs in the context of converting an image that is represented in one colour space to another colour space, the goal being to make the translated image look as similar as possible to the original. Here we use rgb to ycbcr colour space conversion for white blood cell segmentation.

B.MORPHOLOGICAL OPERATIONS: Morphological image process may be a assortment of non-linear operations associated with the form or morphology of options in a picture. Morphology may be a broad set of image process operations that method pictures supported shapes. Morphological operations apply a structuring component to associate input image, making associate output image of identical size.

Some segmentation techniques are,

A) ROI (Region of Interest)
B) Water Shed Segmentation

V. FEATURE EXTRACTION

A) COLOUR FEATURES: Global options embrace colour and texture histograms and colour layout of the entire image. Native options embrace colour, texture, and form options for sub pictures, divided regions, and interest points. These options extracted from pictures square measure then used for image matching and retrieving

B) GEOMETRICAL FEATURES: Geometric options area unit options of objects created by a group of geometric parts like points, lines, curves or surfaces. These options are often corner options, edge options, Blobs, Ridges, salient point's image texture then on, which may be detected by feature detection strategies. Here we tend to use space, diameter, density options for calculations.

C) TEXTURE FEATURES: An image texture may be a set of metrics calculated in image process designed to quantify the perceived texture of a picture .Image Texture provides United States of America info concerning the arrangement of colour or intensities in a picture or hand-picked region of a picture. Here we tend to use GLCM (Grey Level Co-occurrences Matrix) for texture feature analysis. Some feature extraction ways are A) GLCM (Grey level co-occurrence matrix) B) LBP (Local Binary Pattern) C) PCA (Principal part Analysis).

ALL, AML, CLL, CML:

1. Acute white blood cell Leukemia(ALL):It happens in kids aged 1-12 years and adults aged forty years. Here white blood cell of WBCs gets affected. ALL conjointly referred to as acute lymphocytic leukemia. ALL conjointly common in men compare to girls.

2. Acute Myeloid Leukemia(AML):It happens in kids aged one year and maturity and maturity patient. Enlargement of spleen and bone pain these are the prime symptoms of acute chronic leukemia. During this myeloid line of stem cells are affected.

3. Chronic white blood cell Leukemia(CLL):It happens in grownup patients who are suffering from maturity diseases. Lymphocytes are affected. It doesn't show any symptoms at early stage.

4. Chronic Myeloid Leukemia(CML):It happens in time of life tolerant age thirty five to forty five years. Genetic changes occur at early stage of myeloid cells.

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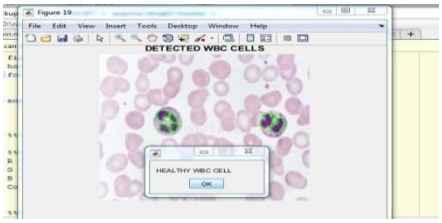
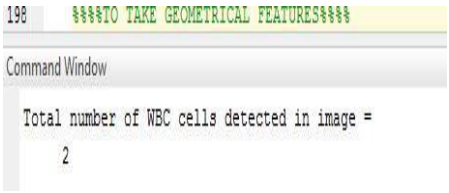
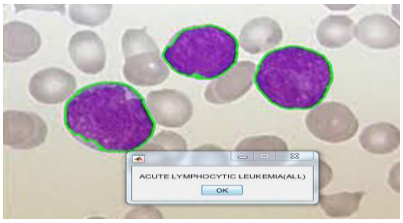
OUTPUT IMAGE:

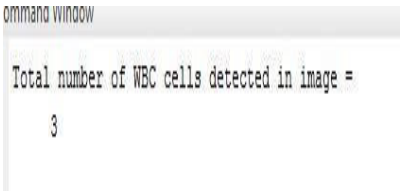
HEALTHY CELL





CANCER CELL





VI. HARDWARE DESCRIPTION

ARDUINO UNO:

The UNO is that the best board to induce started with natural philosophy and cryptography. If this can be your 1st expertise tinkering with the platform, the UNO is that the most sturdy board you'll be able to begin fiddling with. The UNO is that the most used and documented board of the entire Arduino family.

Arduino Uno could be a microcontroller board supported the ATmega328P. It's fourteen digital input/output pin s (of that vi are often used as PWM outputs), vi analog inputs, a sixteen Mc quartz, a USB association, an influence jack, associate ICSP header and a push button. It contains everything required to support the microcontroller; merely connect it to a pc with a USB cable or power it with a AC-to-DC adapter or battery to induce started. you'll be able to tinker together with your UNO without fear an excessive amount of regarding doing one thing wrong, worst case situation you'll be able to replace the chip for a number of greenbacks and begin once more.

LCD DISPLAY:

LCD screen is associate electronic show module and understand a decent vary of applications. A 16x2 liquid crystal show alphanumeric display is implausibly basic module and is implausibly commonly used in varied devices and circuits. These modules square measure most well-liked over seven phases and various multi section LEDs. the reasons being: LCDs square measure economical; merely programmable; haven't got any limitation of displaying special & even custom character (unlike in seven segments), animations then on.

A sixteenx2 liquid crystal show alphanumeric display implies that it'll display sixteen characters per line and there square measure a combine of such lines. throughout this alphanumeric display each character is displayed in 5x7 pixel matrix. This alphanumeric display has a pair of registers, namely, Command and data. The command register stores the command directions given to the alphanumeric display. A command is associate ins truction given to alphanumeric display to do a predefined task like initializing it, clearing its screen, setting the indicator position, dominant show etc. the knowledge register stores the knowledge to be displayed on the alphanumeric display. The knowledge is that the yank commonplace Code for data Interchange price of the character to be displayed on the alphanumeric display. Click to seek out tons of concerning internal structure of a LC.

SIM 900 GSM/GPRS MODULE:

GSM/GPRS Modem-RS232 is built with twin Band GSM/GPRS engine- SIM900, works on frequencies 900/ 1800 rate. The equipment is returning with RS232 interface, that allows you connect pc likewise as microcontroller with RS232 Chip(MAX232). the knowledge live is configurable from 9600-115200 through AT command. The GSM/GPRS equipment has internal TCP/IP stack to alter you to connect with internet via GPRS. it's applicable for SMS, Voice

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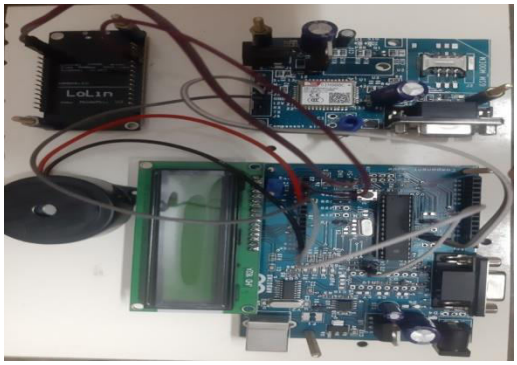
likewise as data transfer application in M2M interface. The aboard Regulated Power give permits you to conn ect wide range unregulated power give . pattern this equipment, you will be able to build audio calls SMS, Read SMS, attend the incoming calls and internet through easy AT commands.

BUZZER:

A buzzer or electronic device is AN audio device, which can be mechanical, mechanical device, or electricity (piezo for short). Typical uses of buzzers and beepers embody alarm devices, timers, and confirmation of user input like a depression or keystroke.



HARDWARE KIT

VII. CONCLUSION AND FUTURE WORK

In this paper, efforts are created for the detection and investigating of acute lymphocytic leukemia from microscopic blood pictures by victimization image process techniques. Preprocessing was applied over the pictures to get rid of any noise, and so segmentation is performed to observe lymphocytes from the image. Watershed is employed to separate the sorted lymphocytes when extracting form and colur features; CNN is employed to classify traditional and blast cells. Final output can show in LED show with buzzer sound. Through GSM module result can send to correspond mobile victimization AT commands.

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