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Covid Prediction using Machine Learning

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*Abstract*___**Prediction of COVID is most challenging problem due to structure of LungNodule, where most of the cells are overlapped each other. An outbreak of a novelcorona virus disease (i.e., COVID-19) has been recorded in Wuhan, China since late December 2019, which subsequently became pandemic around the world. The onset of serious illness may result in death as a consequence of substantial alveolardamage and progressive respiratory failure. Although laboratory testing, e.g., usingreverse transcription polymerase chain reaction (RT-PCR), is the golden standard for clinical diagnosis, the tests may produce false negatives. Moreover, under thepandemic situation, shortage of RT-PCR testing resources may also delay the following clinical decision and treatment. Under such circumstances, chest CT imaging has become a valuable tool for both diagnosis and prognosis of COVID-19 patients. In this project, we propose a weakly supervised deep learning strategyfor detecting and classifying COVID-19 infection from CT images. The proposedmethod can minimize the requirements of manual labeling of CT images but stillbe able to obtain accurate infection detection and distinguish COVID-19 from non-covid cases.**

Keywords:- COVID19, Reverse Transcription Polymerase Chain Reaction (RT-PCR), Computer Demography, Artificial Intelligence(AI).

I. INTRODUCTION

Coronavirus disease (COVID-19) is a respiratory disease caused by a newly discovered coronavirus. The common symptoms of this disease are fever, dry cough, and tiredness. Other symptoms are aches and pains, nasal congestion, headache, sore throat, loss of taste and smell called Anosmia. It also causes a condition called Parosmia where the scents that one used to find pleasant may now become unbearable. One cause of parosmia symptoms is olfactory damage due to the virus. COVID-19 can damage the lungs, causing pneumonia. The virus can exacerbate through the respiratory tract and enter into a person's lungs. This causes damage to the air sacs or alveoli, that can fill with fluid. This progression then constraints a person's ability to take in oxygen. Continuous oxygen deprivation can damage many of the body's organs, causing kidney failure, heart attacks, and other life-threatening conditions. People who have pre-existing conditions such as cancer, diabetes, high blood pressure, kidney or liver disease, including but not limited to asthma are at most risk of COVID-19 pneumonia. People over the age of 65 years are more prone to the intense effects of this disease. The disease has turned into a widespread pandemic where the cases and deaths seem to surge rapidly day by day. This research intends to uncover the prognosis of various parameters involved with this virus such as the increase of new cases, recoveries and deaths daily worldwide with the help of a machine learning technique called Prophet model which was developed and introduced by Facebook.

II. SYSTEM TECHNIQUES& RELATED WORKS

EXISTING SYSTEM:

Digital image processing deals with manipulation of digital images through a digital computer. It is a subfield of signals and systems but focus particularly on images. DIP focuses on developing a computer system that is able to perform processing on an image. The input of that system is a digital image and the system process that image using efficient algorithms, and gives an image as an output. The most common example is Adobe Photoshop. It is one of the widely used application for processing digital images.

WORKING:

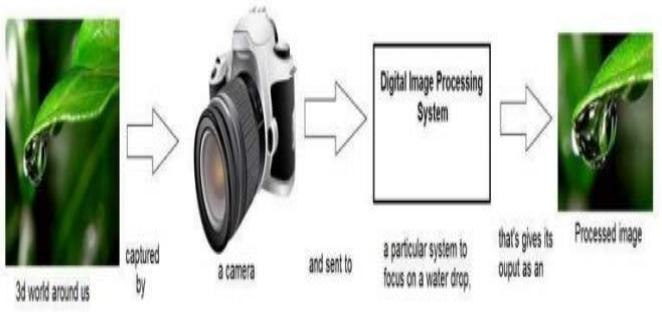

FIG.NO:1

In the above figure, an image has been captured by a camera and has been sent to a digital system to remove all the other details, and just focus on the water drop by zooming it in such a way that the quality of the image remains the same.

SIGNAL PROCESSING:

Signal processing is a discipline in electrical engineering and in mathematics that deals with analysis and processing of analog and digital signals , and deals with storing , filtering , and other operations on signals. These signals include transmission signals , sound or voice signals , image signals , and other signals etc.Out of all these signals , the field that deals with the type of signals for which the input is an image and the output is also an image is done in image processing. As it name suggests, it deals with the processing on images.It can be further divided into analog image processing and digital image processing.

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ANALOG IMAGE PROCESSING:

Analog image processing is done on analog signals. It includes processing on two dimensional analog signals. In this type of processing, the images are manipulated by electrical means by varying the electrical signal. The common example include is the television image.Digital image processing has dominated over analog image processing with the passage of time due its wider range of applications.

DIGITAL IMAGE PROCESSING

The digital image processing deals with developing a digital system that performs operations on an digital image.

IMAGE:

An image is nothing more than a two dimensional signal. It is defined by the mathematical function f(x,y) where x and y are the two co-ordinates horizontally and vertically.The value of f(x,y) at any point is gives the pixel value at that point of an image. The above figure is an example of digital image that you are now viewing on your computer screen. But actually , this image is nothing but a two dimensional array of numbers ranging between 0 and 255.

TECHNIQUES:

In proposed System non-invasive imaging technique, computed tomography (CT) can detect those characteristics, e.g., bilateral patchy shadows or ground glass opacity, manifested in the COVID-19 infected lung. Hence CT may serve as an important tool for COVID-19 patients to be screened and diagnosed early. Despite its advantages, CT may share some common imagery characteristics between COVID-19 and other types of pneumonia, making the automated distinction difficult. Recently, deep learning based artificial intelligence (AI) technology has demonstrated tremendous success in the field of medical data analysis due to its capacity of extracting rich features from multimodal clinical datasets. Previously, deep learning was developed fordiagnosing and distinguishing bacterial and viral pneumonia from thoracic imaging data. In addition, attempts have been made to detect various chest CT imaging features. In the current COVID-19 pandemic, deep learning based methods have been developed efficiently for the chest CT data analysis and classification. Besides, deep learning algorithms have been proposed for COVID-19 monitoring, screening and prediction of the hospital stay. A full list of current AI applications for COVID-19 related research can be found elsewhere. In this project, we will focus on the chest CT image based localization for the infected areas and disease classification and diagnosis for the COVID-19 patients. The result will be send through mail and GSM.

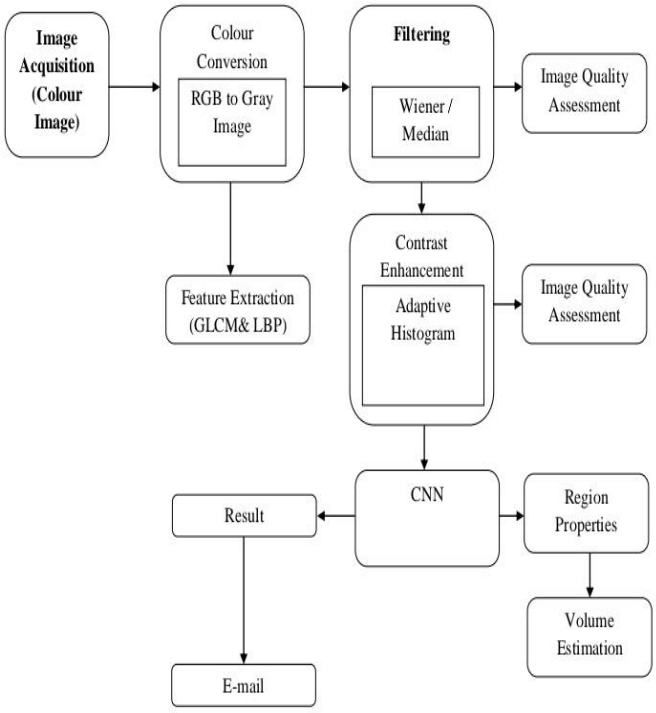

FIG.NO:2

111.HARDWARE IMPLEMENTATION

POWER SUPPLY UNIT:

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

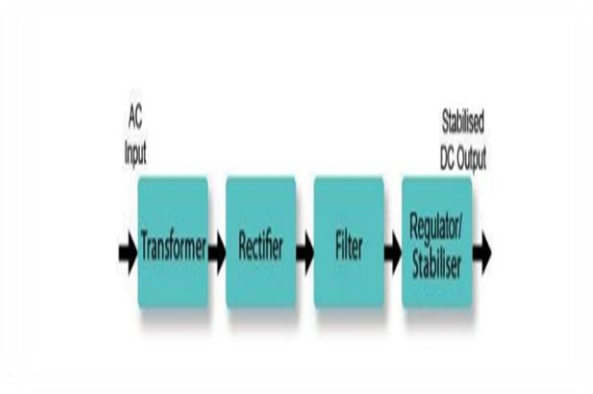

FIG.NO:3

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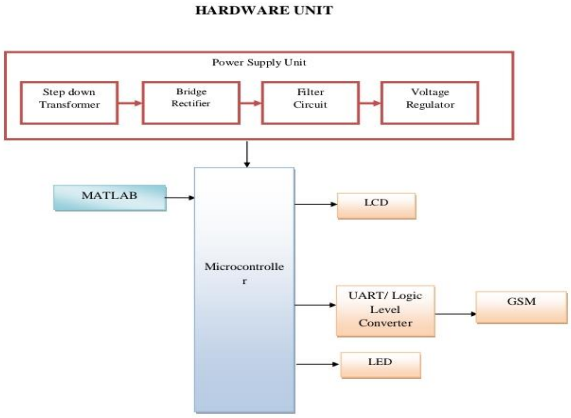

FIG.NO:4

STEP DOWN TRANSFORMER

Basic power supply the input power transformer has its primary winding connected to the mains (line) supply. A secondary winding, electro-magnetically coupled but electrically isolated from the primary is used to obtain an AC voltage of suitable amplitude, and after further processing by the PSU, to drive the electronics circuit it is to supply.The transformer stage must be able to supply the current needed. If too small a transformer is used, it is likely that the power supply's ability to maintain full output voltage at full output current will be impaired. With too small a transformer, the losses will increase dramatically as full load is placed on the transformer. As the transformer is likely to be the most costly item in the power supply unit, careful consideration must be given to balancing cost with likely current requirement. There may also bea need for safety devices such as thermal fuses to disconnect the transformer if overheating occurs, and electrical isolation between primary and secondary windings, for electrical safety.

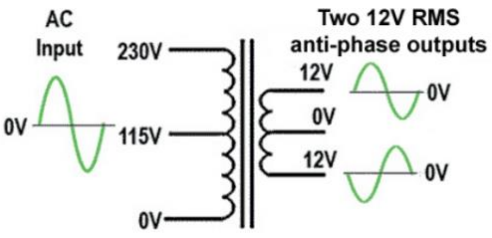

FIG.NO:5

THE RECTIFIER STAGE: Rectifier circuit is used, to convert the AC input is converted to DC. The full wave bridge rectifier uses four diodes arranged in a bridge circuit to give full

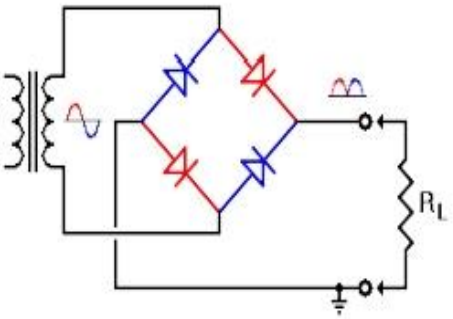

FIG.NO:6

wave rectification without the need for a centre-tapped transformer. An additional is that, as two diodes are conducting at any one time, the diodes need only half the reverse breakdown voltage capability of diodes used for half and conventional full wave rectification. It can be seen that on each half cycle, opposite pairs of diodes conduct, but the current through the load remains in the same polarity for both half cycles.

FILTER:

A typical power supply filter circuit can be best understood by dividing the circuit into two parts, the reservoir capacitor and the low pass filter. Each of these parts contributes to removing the remaining AC pulses, but in different ways.Electrolytic capacitor used as a reservoir capacitor, so called because it acts as a temporary storage for the power supply output current. The rectifier diode supplies current to charge a reservoir capacitor on each cycle of the input wave. The reservoir capacitor is large electrolytic, usually of several hundred or even a thousand or more microfarads, especially in mains frequency PSUs. This very large value of capacitance is required because the reservoir capacitor, when charged, must provide enough DC to maintain a steady PSU output in the absence of an input current; i.e. during the gaps between the positive half cycles when the rectifier is not conducting.The action of the reservoir capacitor on a half wave rectified sine wave. During each cycle, the rectifier anode AC voltage increases towards Vpk. At some point close to Vpk the anode voltage exceeds the cathode voltage, the rectifier conducts and a pulse of current flows, charging the reservoir capacitor to the value of Vpk.Once the input wave passes Vpk the rectifier anode falls below the capacitor voltage, the rectifier becomes reverse biased and conduction stops. The load circuit is now supplied by the reservoir capacitor alone.Of course, even though the reservoir capacitor has large value, it discharges as it supplies the load, and its voltage falls, but not by very much. At some point during the next cycle of the mains input, the rectifier input voltage rises above the voltage on the partly discharged capacitor and the reservoir is re-charged to the peak value Vpk again.

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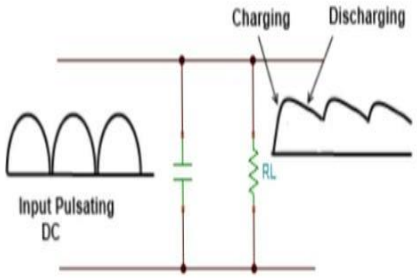

FIG.NO:7

VOLTAGE REGULATOR

Voltage regulator ICs are available with fixed or variable output voltages. They are also rated by the maximum current they can pass. Negative voltage regulators are available, mainly for use in dual supplies. Most regulators include some automatic protection from excessive current and overheating. The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications. One of these is local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow these regulators to be used in logic systems, instrumentation, Hi-Fi, and other solid state electronic equipment. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and current.

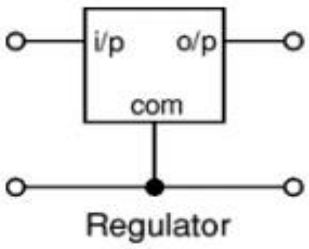

FIG.NO:8

1. Positive regulator
   1. input pin
   2. ground pin
   3. output pin
2. It regulates the positive voltage
3. Negative regulator
4. Ground pin
5. Input pin
6. Output pin

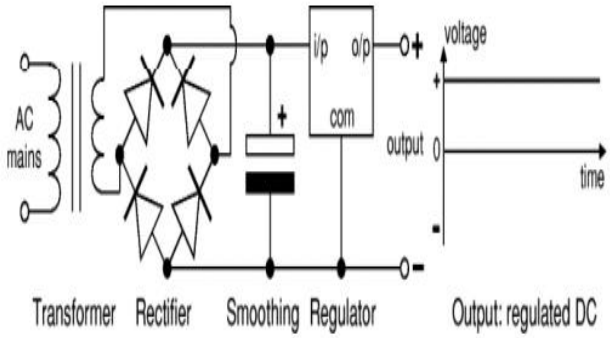

FIG.NO:9

It regulates the negative voltage. The regulated DC output is very smooth with no ripple.It is suitable for all electronic circuits.

1V.SOFTWARE IMPLEMENTATION

ARDUINO UNO

An Arduino is actually a microcontroller based kit which can be either used directly by purchasing from the vendor or can be made at home using the components, owing to its open source hardware feature. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005.The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward.

ARDUINO ARCHITECTURE:

Arduino's processor basically uses the Harvard architecture where the program code and program data have separate memory. It consists of two memories- Program memory and the data memory.The code is stored in the flash program memory, whereas the data is stored in the data memory. The Atmega328 has 32 KB of flash memory for storing code (of which 0.5 KB is used for the bootloader), 2 KB of SRAM and 1 KB of EEPROM and operates with a clock speed of 16MHz.The most important advantage with Arduino is the programs can be directly loaded to the device without requiring any hardware programmer to burn the program. This is donebecause of the presence of the 0.5KB of Bootloader which allows the program to burned into the circuit. All we have to do is to download the Arduino software and writing the code.

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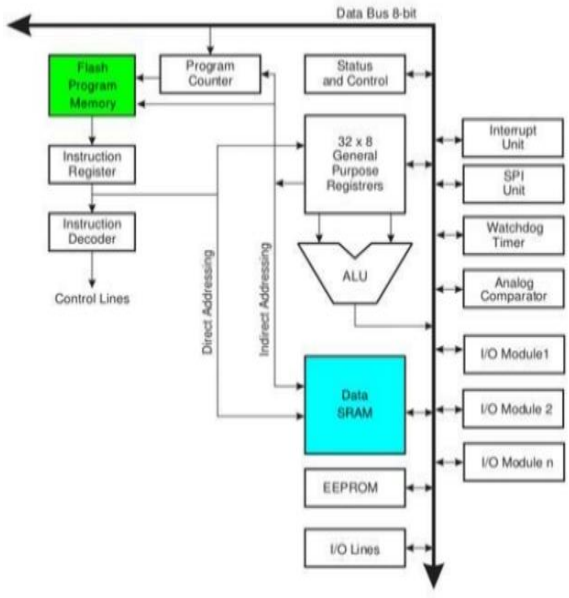

FIG.NO:10

POWER JACK

Arduino can be power either from the pc through a USB or through external source like adaptor or a battery. It can operate on a external supply of 7 to 12V. Power can be applied externally through the pin Vin or by giving voltage reference through the IORef pin.The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging.The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

DIGITAL INPUTS

It consists of 14 digital inputs/output pins, each of which provide or take up 40mA current. Some of them have special functions like pins 0 and 1, which act as Rx and Tx respectively , for serial communication, pins 2 and 3-which are external interrupts, pins 3,5,6,9,11 which provides PWM output and pin 13 where LED is connected.

ANALOG INPUTS:

It has 6 analog input/output pins, each providing a resolution of 10 bits.

AREF

It provides reference to the analog inputs.

RESET

It resets the microcontroller when low.

STEPS TO PROGRAM AN ARDUINO

Programs written in Arduino are known as sketches. A basic sketch consists of 3 parts

1. Declaration of Variables
2. Initialization: It is written in the setup () function.
3. Control code: It is written in the loop () function.

- The sketch is saved with .ino extension. Any operations like verifying, opening a sketch, saving a sketch can be done using the buttons on the toolbar or using the tool menu.
- T sketch should be stored in the sketchbook directory.
- Chose the proper board from the tools menu and the serial port numbers.
- Click on the upload button or chose upload from the tools menu. Thus the code is uploaded by the bootloader onto the microcontroller.

ADRUINO FUNCTIONS

- digitalRead(pin): Reads the digital value at the given pin.
- digitalWrite(pin, value): Writes the digital value to the given pin.
- pinMode(pin, mode): Sets the pin to input or output mode.
- analogRead(pin): Reads and returns the value.
- analogWrite(pin, value): Writes the value to that pin.
- serial.begin(baud rate): Sets the beginning of serial communication by setting the bit

rate.

V. CONCLUSION AND FUTURE WORK

In conclusion, without the need for annotating the COVID-19 lesions in CT volumes for training, our weakly-supervised deep learning algorithm obtained strong COVID-19 detection performance. Therefore, our algorithm has great potential to be applied in clinical application for accurate and rapid COVID-19 diagnosis, which is of great help for the frontline medical staff and is also vital to control this epidemic worldwide.

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