DESIGN AND IMPLEMENTATION OF APPLICATION BASED ON DIGITAL SIGNAL PROCESSING THROUGH INTER INSTITUTE FACULTY-STUDENT PEER COLLABORATION

Internship Project report submitted in
partial fulfillment of requirement for the award of degree of

Bachelor of Engineering in
Electronics & Telecommunication Engineering

by

Ms. Riddhi Gundawar **Ms. Sayli Bhongade**

Ms.Taruna Pakhare **Ms.Tanmayee Pandya**

Industry / Organization Guide

Dr. Vikram Gadre
at
IIT Bombay

Institute Guide (from College)
Dr. S.S.Salankar

Department of Electronics & Telecommunication Engineering
G.H. Raisoni College of Engineering, Nagpur

(An Autonomous Institute Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
NAAC "A+" Grade & NIRF Ranked 130th for 2021

DECEMBER 2021

Declaration

We, hereby declare that the project report titled “BRAIN TUMOR DETECTION USING IMAGE SEGMENTATION” And “VIDEO COMPRESSION FOR MULTIMEDIA REPRESENTATION” submitted herein has been carried out by us in the Indian Institute of Technology, Bombay towards partial fulfillment of requirement for the award of Degree of Bachelor of Engineering in Electronics & Telecommunication Engineering. The work is original and has not been submitted earlier as a whole or in part for the award of any degree / diploma at this or any other Institution/ University.

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Place: Nagpur

Riddhi Gundawar

Sayli Bhongade

Taruna Pakhere

Tanmayee Pandya

Date:

Certificate

The Industry project Internship report entitled as "BRAIN TUMOR DETECTION USING IMAGE SEGMENTATION" submitted by **Riddhi Gundawar, Sayli Bhongade, Taruna Pakhare, Tanmayee Pandya** for the award of Degree of Bachelor of Engineering in Electronics & Telecommunication Engineering has been carried out under our supervision. The work is comprehensive, complete and fit for evaluation.

Industry / Organization Guide
Dr. Vikram Gadre
Professor
Department of Electrical Engineering, Indian Institute of Technology, Bombay.

Institute Guide
Dr.S.S.Salankar
Professor
Department of Electronics and Telecommunication Engineering, GHRCE, Nagpur

Dr. K. A. Akant
Head
Department of Electronics and Telecommunication Engineering
GHRCE, Nagpur

Dean Industry Relation GHRCE, Nagpur

Dr. Sachin Untawale
Director

GHRCE, Nagpur

भारतीय प्रौद्योगिकी संस्थान, मुंबई
पवई, मुंबई-400 076, भारत

Indian Institute of Technology, Bombay
Powai, Mumbai-400 076, India

Phone : (+91-22) 572 2545
Fax : (+91-22) 572 3480
Website: www.iitb.ac.in

IIT Bombay

Date: 31/12/2021 **Ref: GHRCoE + PVGCoET/ Students/ Internship/ Jul to Dec 2021**

CERTIFICATE

This is to certify that Ms. Riddhi Gundawar

a student of G. H. Raisoni College of Engineering, Nagpur

from Electronics/ Electronics and Telecommunication Engineering

has completed a six month- Industry Project Internship, successfully, from **01 July 2021 to 31 December 2021,** under my guidance.

S/he has worked for the development of two practical applications of Digital Signal Processing, aimed at applying the knowledge of Digital Signal Processing obtained in an academic course, in practical problems.
S/he worked in a team of students from the Institutes: G. H. Raisoni College of Engineering, Nagpur; PVG's College of Engineering and Technology and G. K. Pate (Wani) Institute of Management, Pune

This activity has also given this student, an opportunity to learn skills of teamwork and leadership, by association with students and faculty members of other Institutes of repute. We trust that the applications, that s/he has explored and developed, would be of value to professionals in the industry working in this space and also useful in an academic setting, to further understanding of digital signal processing principles through application platforms. Thus, s/he has contributed both to industry and to academia, in the process of this internship.

I wish this student, all the best for career growth and personal growth, in future.

Digital Signature
Vikram M Gadre (i94038)
01-Dec-21 03:22:07 PM

Dr. V. M. Gadre, Professor, Department of Electrical Engineering,
Indian Institute of Technology Bombay

(Pre-Authorized for award, along with counter-signature of Internship Faculty Coordinator(s) from G. H. Raisoni College of Engineering, Nagpur, after completion of internship)

Counter-signed:

Dr. S.K.Tadse,Assistant Professor, E&TC, GHRCE,Nagpur

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भारतीय प्रौद्योगिकी संस्थान, मुंबई
पवई, मुंबई-400 076, भारत

Indian Institute of Technology, Bombay
Powai, Mumbai-400 076, India

Phone : (+91-22) 572 2545
Fax : (+91-22) 572 3480
Website: www.iitb.ac.in

IIT Bombay

Date: 31/12/2021 **Ref: GHRCoE + PVGCoET/ Students/ Internship/ Jul to Dec 2021**

CERTIFICATE

This is to certify that Ms. Sayli Bhongade

a student of G. H. Raisoni College of Engineering, Nagpur

from Electronics/ Electronics and Telecommunication Engineering

has completed a six month- Industry Project Internship, successfully, from **01 July 2021 to 31 December 2021,** under my guidance.

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Fax : (+91-22) 572 3480
Website: www.iitb.ac.in

IIT Bombay

Date: 31/12/2021 **Ref: GHRCoE + PVGCoET/ Students/ Internship/ Jul to Dec 2021**

CERTIFICATE

This is to certify that Ms. Taruna Pakhare

a student of G. H. Raisoni College of Engineering, Nagpur

from Electronics/ Electronics and Telecommunication Engineering

has completed a six month- Industry Project Internship, successfully, from **01 July 2021 to 31 December 2021,** under my guidance.

S/he has worked for the development of two practical applications of Digital Signal Processing, aimed at applying the knowledge of Digital Signal Processing obtained in an academic course, in practical problems.
S/he worked in a team of students from the Institutes: G. H. Raisoni College of Engineering, Nagpur; PVG's College of Engineering and Technology and G. K. Pate (Wani) Institute of Management, Pune

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Digital Signature
Vikram M Gadre (i94038)
01-Dec-21 03:22:07 PM

Dr. V. M. Gadre, Professor, Department of Electrical Engineering,
Indian Institute of Technology Bombay
(Pre-Authorized for award, along with counter-signature of Internship Faculty Coordinator(s) from G. H. Raisoni College of Engineering, Nagpur, after completion of internship)

Counter-signed:

Dr. S.K.Tadse,Assistant Professor, E&TC, GHRCE,Nagpur

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PROJECT NO. 01

BRAIN TUMOR DETECTION USING IMAGE SEGMENTATION

ABSTRACT

Brain tumor is a totally collection of abnormal cells in the human brain. It is that the most troublesome and exhausting task within the space of medicative image getting ready. Tumors are primarily differentiating into two types malignant and benign when they develop. It can be life serious hence it is crucial to recognize and identify the presence of tumors in brain image.

It is an incense task where there is a large amount of data present to be required. Brain tumors have high diversity in appearance and there is a common between tumor and normal tissues and thus the extraction of tumor regions from images becomes tough. Image segmentation is the fundamental approaches come under digital image processing. Brain tumor consist of different, position, shape, location, varieties, and size in brain.

They even have overlapping intestines and have normal tissue with it. So, it is very important to detect tumor on time for further surgical process. Exactness of the system and step by step detection can make it effective and help for surgical process. The main mechanism used to detect the tumor in brain is MRI.

MRI is used in radiology for analyzing internal structures and makes easy to extract the required region and it is most accurate and safest method for detection. MRI is useful in many soft tissues of human body such as oncological (cancer), neurology (brain) and musculoskeletal. MRI image have lots of information regarding image which is really important for detection tumor by using image segmentation or and digital image processing mechanism.

As magnet create a strong magnetic field that aligns all the protons of hydrogen atoms which are exposed to a beam of radio waves. This paper introduces a well-organized detection of brain tumor from cerebral MRI images. The methodology consists of three steps: pre-processing, extraction, filtering, segmentation and detection. To limit the risk of distinct regions fusion, improve the feature of images and in the segmentation phase an enhancement process is applied.

LIST OF FIGURES

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CHAPTER I

INTRODUCTION

1.1 Introduction

The occurrence of restraint and abnormal growth of cells within the skull is called as brain tumor. They are of two types non-cancerous or benign and cancerous or malignant. However, it will be not appropriate to call benign as non-cancerous because it could be fatal too. The tumor can either damage the whole brain cells directly or even indirectly compress different areas of the brain as the tumor enlarge or swelling inside the brain led to severe pain. The human body is consisting of different types of cells where the brain plays a very crucial role. The identification of brain tumors is not only identifying the affected part of the brain but also to the tumor shape, size, boundary, and position. The correct understanding of brain tumor stages is a crucial work for the prevention and cure of illness. It is termed by their location in the brain as well as the tissue they are consist of. Whether the tumor has property of benign or malignant, the cause for this tumor is hereditary or developed before birth such as craniopharyngioma. Some of the common symptoms of being it are a headache, vomiting, personality or behavioral changes, abnormalities of eyes or double vision weakness, lethargy, hand tremor etc. The benign tumor can easily detected as compare to the malignant tumor. Also the early stage tumor may be malignant of benign but after the first stage it will change to a harmful malignant tumor which is deadly. Following fig (1.1.1) represents brain tumor developed in brain.

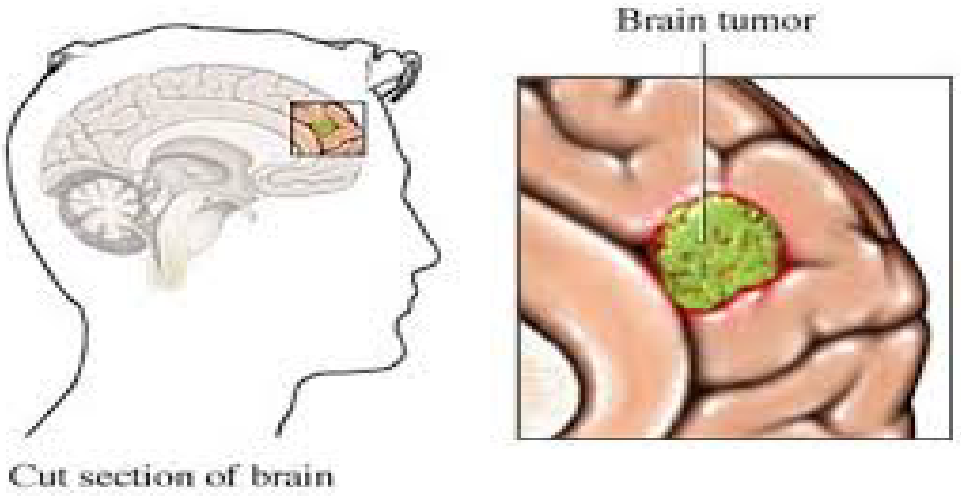


Fig.1.1.1 Brain tumor

The largest percentage of all brain tumors that arise in the brain and central nervous system (CNS) are benign growths that take place in a structure consisting of three layers of protective tissue that surround the cerebral cortex. Most malignant primary brain tumors, however, occur in the cerebral cortex with the largest percentage developing in the frontal lobe. Chances of occurrence of brain tumor according to different location of brain can be analysis by given fig (1.1.2).

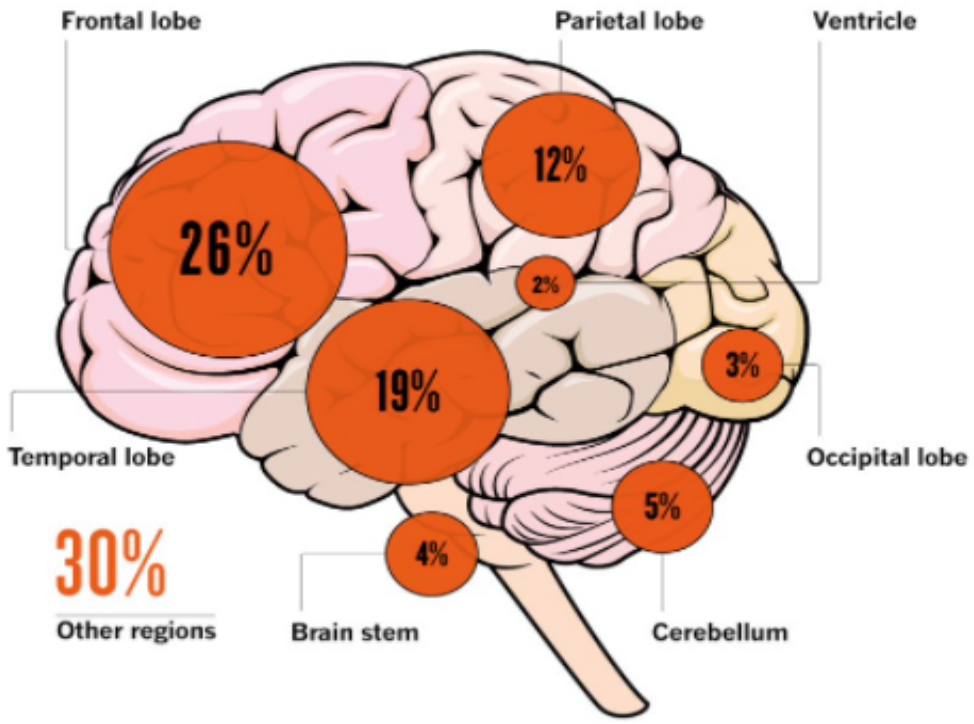


Fig.1.1.2 Chances of brain tumor chances of occurrence according to different locations of brain

The Frontal lobe (26%) part of brain which consist of two fifth area of brain has an ability to modulate various brain functions which are voluntary moments, expression of emotion and at last speech fluency. Then Temporal lobe part of brain (19%) has both hemisphere containing itself. Most of its functions are connected to auditory processing. The Pariental lobe (12%) adapt many role of right and left hemisphere of brain, such as left affect persons speech whereas right one affect perception of physical location of body part and understanding its geographical location. The Cerebellum (5%) Tumor detected in this part affect person ability to co-ordinate voluntary moments ex. blinking, balance. At last Brain Stem (4%) in cerebral cortex up to spinal cord if tumor is there in this part it affects person's ability to walk, vision, facial tension and speak.

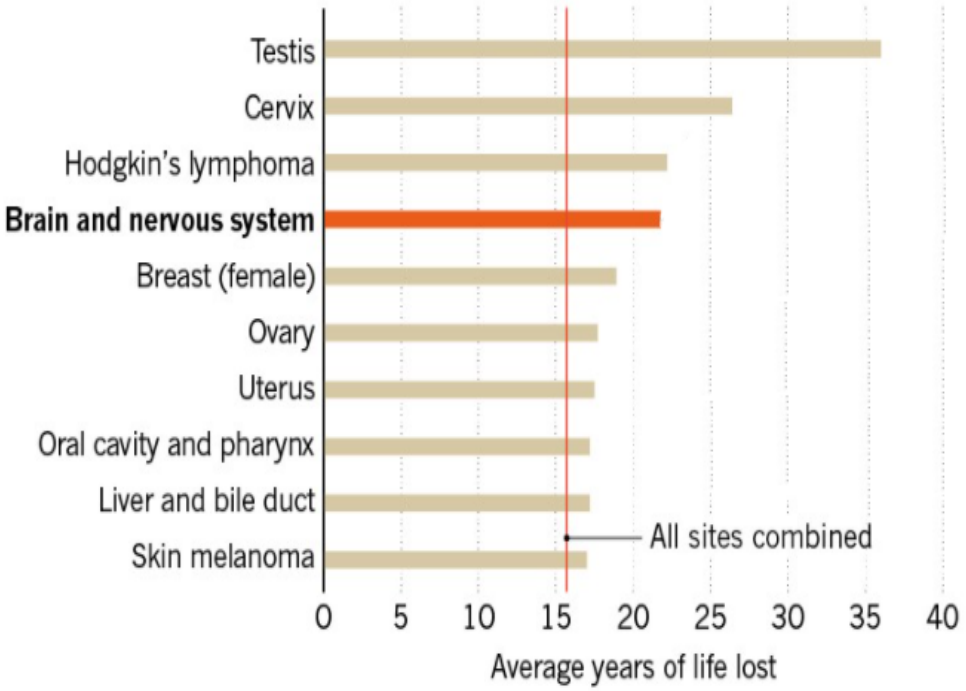


Fig.1.1.3 Death with respect to different parts of body

Above fig (1.1.3) represent life lose with respect to different parts of body. Brain cells are responsible for the fourth highest number of years of life lost, this happens because this disease is difficult to diagnose and it is most cancer in children which causes death.

The very first aim of image segmentation in medical image processing is mostly tumor or bruise detection, well organized machine vision and obtaining satisfactory results for further diagnosis. From general opinion segmentation is the subdivide of an image into a set of homogeneous and remarkable regions having a single label and clear or similar properties. They are depending on various methods: contour, region and texture.

The advanced detection of brain tumors can play a necessary role in advancing the treatment possibilities, and a larger gain of survival possibility could be accomplished. But manual segmentation of tumors or lesions is a time consuming, challenging and burdensome task as a large number of MRI images are generated in medical routine. MRI, also known as Magnetic Resonance Imaging is mainly used for brain tumor detection. MRI image technique is widely used visualize the anatomy and structure of the brain. Brain tumor segmentation from MRI is one of the most crucial work in medical image processing as it generally involves an appreciable amount of data. However, the tumors can be unclear with soft tissue boundaries. So it is a very large work to obtain the correct segmentation of tumors from the human brain.

In this project, we suggested an easy and skillful method which helps in the segmentation and detection of the brain tumor without any human assistance based on both traditional classifiers and algorithms.

Moreover, we have created a user-friendly GUI which is easy to detect tumor by identifying it step by step and with that it also shows the type of tumor.

The organization of this thesis work for the project 01 is as follows. In Chapter 2 the literature review is given, it focusses on reviewing other related models or projects. Chapter3 provides the methodology of the project. Chapter 4 provides design and implementation of the project; we have already discussed about software used and the coding part. Chapter 5 represents the result we observe as a GUI. Chapter 6 is about references.

CHAPTER II

LITERATURE REVIEW

2.1. Literature Review

Suresha D,Jagadisha N,Shrisha H S,Kaushik K S "Computer Aided System for Brain Tumor Detection and Segmentation" IEEE Xplore Detection of Brain Tumor Using Image Processing (ICCMC 2020). Associate Professor, Computer Science and Engineering Canara Engineering College, Mangaluru, Karnataka, India. In this paper detection of brain tumor using image processing is proposed. The proposed system is useful in detection of brain tumors automatically. Here we applied hybrid techniques K-means which is a clustering algorithm and Support Vector Machine(SVM) which is a machine learning method. The K-means is applied on the extracted features from the image by clustering the spots and later machine learning technique Support Vector Machine(SVM) to effectively applied. This system identifies the abnormalities in the brain which is detected in the MR image. The system requires less training set and helps in faster detection of the tumors and provides accurate results. The proposed system is built using Python programming.

Navpreet Kaur and Manvinder Sharma proposed the mind tumor location utilizing self-versatile K-Means grouping. (ICECDS 2017) The cerebrum X-ray pictures demonstrate an uncertain system of synapses alongside hard structures and suspected strong increasing growth (if present). Accordingly, a division procedure is required to remove the developed. In unique K-implies calculation, the quantity of bunches is set apart by the client for example client information is required. In any case, this impediment is overloaded by covering the self-versatile K-implies bunching calculation to recognize cerebrum tumor precisely. A sobel edge location strategy is pursued to extricate the edges of the fragmented cerebrum tumor from its environment. In self versatile k-implies bunching, the quantity of groups is registered by figuring the tops in histogram. The dim variant is utilized to remove textural and shading based highlights for the nature of development examination. Self-calculation estimation of 'k' for example number of bunches is registered by Proceedings of the histogram of the picture test where Histogram of picture is separated. The dark shading histogram gives the highest extreme pinnacle shading powers present in the picture.Concentrate the histogram tops with counter to get the estimation of 'k' as the number of bunches. The displayed work identifies the mind tumor development in each cut of the X-ray picture. Self-versatile k-implies grouping gives the client a choice to choose a number of bunches. As it's hard to judge physically precisely what number of bunches can be there in the picture and furthermore it differs from person to person. In this way, in view of the nature of the picture as far as its histogram, the quantity of groups might be registered. Further, the sobel edge indicator limits the development in a limit from where size estimation should be possible.

Swapnil R. Telrandhe,Amit Pimpalkar and Ankita Kendhe proposed Detection of Brain Tumor from MRI images by using Segmentation & SVM here they propose adaptive brain tumor detection: **World Conference on Futuristic Trends in Research (2016)** Image processing is used in the medical tools for detection of tumor, only MRI images are not able to identify the tumorous region. In this paper they are using K-Means segmentation with preprocessing of images. Also they are using object labeling for more

detailed information of tumor region. To make this system adaptive they are using SVM (Support Vector Machine), SVM is used in an unsupervised manner which will use to create and maintain the pattern for future use. Also for patterns they have to find out the feature to train SVM. For that here they have find out the texture feature and color features. It is expected that the experimental results of the proposed system will give better result in comparison to other existing systems.

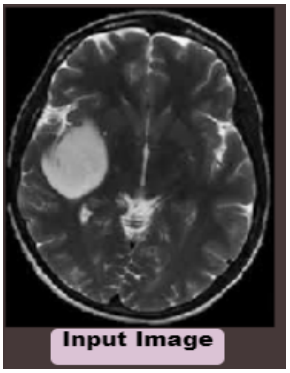
Animesh Hazra , Ankit Dey , Sujit Kumar Gupta , Md. Abid Ansari proposed Brain Tumor Detection Based on Segmentation using MATLAB. (ICECDS – 2017) An unusual mass of tissue in which some cells multiply and grows uncontrollably is called brain tumor. It needs to be detected at a very first stage using MRI or CT scanned images when it is as small as possible because the tumor can possibly result to cancer. They mostly focus on identifying and localizing the tumor region existing in the brain by proposed methodology using patient's MRI images. MRI image of the brain is processed for the detection of the tumor using MATLAB. The proposed methodology employed here comprises three stages. K-means clustering algorithm has been implemented as an back up method of segmentation. K-means clustering displays other crucial tissues and edges with the tumor region. By the proposed algorithm, identification of the brain tumor regions is done easily. In future to detect the tumor regions more accurately, the algorithm can be better by using new segmentation techniques. Well organized methods can be obtained by applying the latest clustering algorithms as well as classification algorithms. The category of brain tumor identification i.e. malignant or benign can be done in near future.

NgangomPriyobata Singh, Dr. Sunanda Dixit, Prof. B.I. Khodanpur proposed A Survey on Different Methods for BrainTumor Segmentation.Magnetic resonance (MR) images are a very helpful tool to identify the tumor growth in the brain. (IJANA 2020) Segmentation of brain tumor from MRI images in a time saving way becomes a crucial role in medical image processing. One of the challenging tasks is to segment the tumor in an automated manner. They are highlighting various methods and technology used to detect the tumor. The signs and symptoms of brain tumor mainly depend on location, position and size of the tumor. The symptom onset in the timeline of the development of the tumor depends on various tasks on the nature of the tumor. In many of the cases it is also linked to the change in the nature of the neoplasm, from slow growing, late symptom onset benign to faster growing. They describe the estimated that the number of new brain cancer cases in USA, 2015 is 22,850 (12,900 males and 9,950 female) and death due to brain cancer in USA, 2015 is 15,320 (8,940 males and 6,380 female). It is found that California has the maximum number of death cases (1690 death cases) as compared to other states in USA.

CHAPTER III

METHODOLOGY

1. **Data Selection**



The MRI dataset of Lung tumor detection is taken from TCI Archive which is hub of different Cancer X-Ray images. The Cancer Imaging Archive (TCIA) is a service that de-identifies and host a large public archive of cancer medical images. Fig 3.1.1 is taken from that TCI Archive.

Fig. 3.1.1 Dataset

Imaging data is organized into "collections" defined by common disease (e.g. lung cancer), aspect or type of imaging (MRI, CT, digital histopathology, etc.), or focus of the study.

DICOM is the default file format used by the TCIA for radiographic imaging. It focuses on providing image-related corroborative data such as patient outcomes, treatment details, genomics, and expert analysis.

The Cancer Imaging Program (CIP) is one of four programs in the National Cancer Institute's NCI Division of Cancer Treatment and Diagnostics (DCTD). CIP supports the basic and applied research of cancer imaging and contributes to the advancement of in vivo medical imaging through the advancement of clinical trial imaging to better understand cancer patients and cancer biological pathways for the benefit of cancer patients in danger.

The Cancer Imaging Archive (TCIA) was originally created and hosted by the University of Washington at Saint Louis. In December 2010, the National Cancer Institute, through Fredrick National Laboratory, contracted with the University of Washington to establish a highly available cluster-based storage environment for the collection and maintenance of Maintain current and future image collections.

TCIA data are organized as "collections"; typically these are patient cohorts related by a common disease (e.g. lung cancer), image modality or type (MRI, CT, digital histopathology, etc) or research focus. Supporting data related to the images such as patient outcomes, treatment details, genomics and image analyses are also provided when available. Try using the filter box above the table to quickly find collections of interest using keywords. Column headers can also be clicked to change the sorting method.

Show 125 entries Previous Next Filter table: lung cancer

Collection	Cancer Type	Location	Species	Subjects	Image Types	Supporting Data	Access	Status	Updated
National Lung Screening Trial (NLST)	Lung Cancer	Chest	Human	26254	CT, Pathology	Clinical	Public	Complete	2021-09-24
COVID-19-NY-SBU	COVID-19 (non-cancer)	Lung	Human	1,384	CR,CT,DX,MR,NM,OT,PT,SR	Clinical, Image Analyses	Public	Complete	2021-08-11
NSCLC-Radiogenomics	Non-small Cell Lung Cancer	Chest	Human	211	PT, CT, SEG	Clinical, Image Analyses, Genomics	Public	Complete	2021-06-01

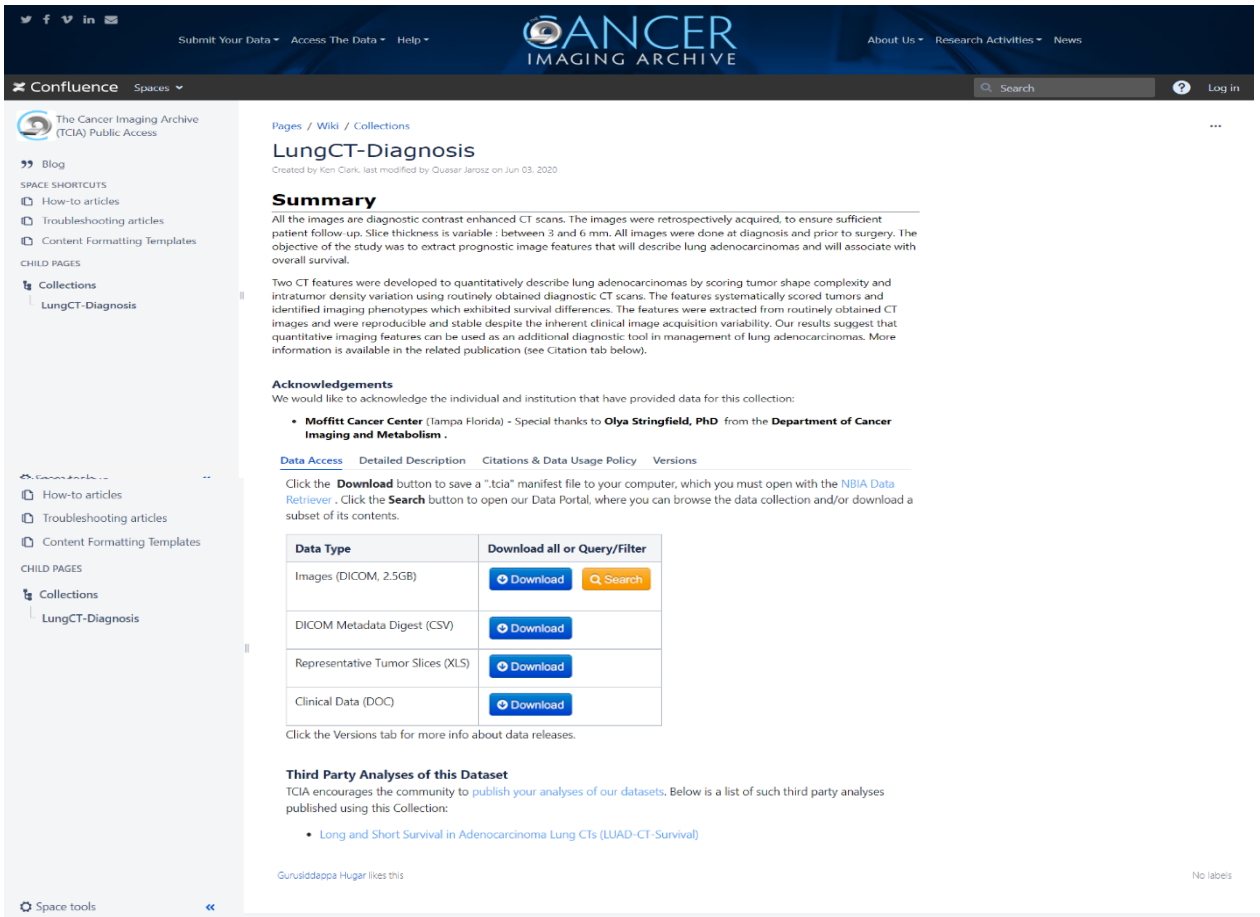


Fig. 3.1.2 TCI Archive

2. Flow Chart

Following is the of step wise processing flowchart of Brain tumor detection.

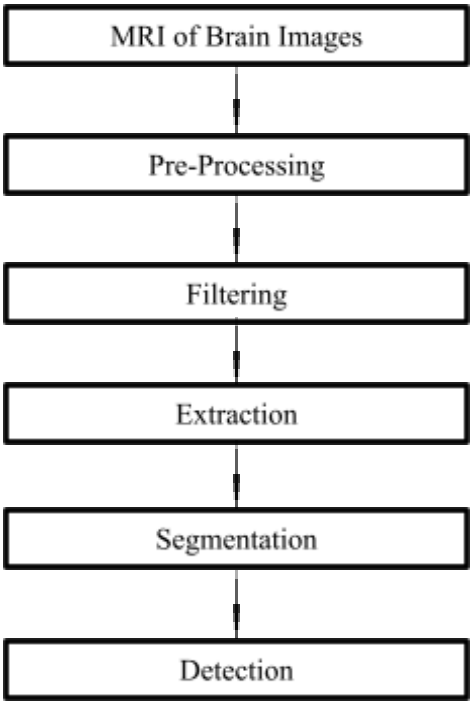


Fig. 3.1.3 Flow chart of this project

3. Preprocessing

Random noises caused by different equipment during x-ray imaging degrade the images, leading to incomplete or even erroneous medical diagnoses.

Image preprocessing (Fig 3.1.4) is the main process of digital x-ray film equipment. Due to the characteristics of medical radiographic images, a time recursive filter can be used, the filter factor decreases with increasing order of magnitude. multiplied by the difference of two adjacent frames.

However, considering the complexity of hardware implementation in real-time dynamic processing, an improved self-adaptive filtering algorithm is proposed, its filtering coefficient is generated by a decay function linear.

We use a Field Programmable Gate Array (FPGA) and other peripherals to design and implement an Advanced Self-adaptive filter-based Medical X-Ray Image Preprocessing System.

The fundamental design and methods are discussed briefly which also contain video decoders, encoders, processing, and display. The results of the test show that the proposed algorithm and system effectively improve the signal-to-noise ratio of

Image as per, after 4 to 8 image recursion. The preprocessing system can be used practically in a digital radiograph.

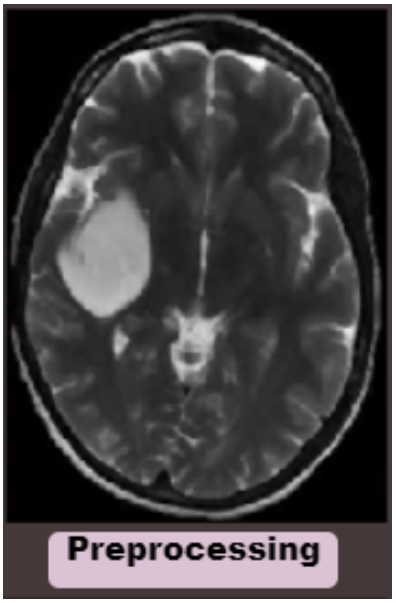


Fig. 3.1.4 Preprocessing

4. Filtering

Adaptive filtering (Fig 3.1.5) that changes the sequence of radiographic images obtained during endovascular procedures improve radiologists' visual monitoring of catheters.

Existing techniques blur important parts of the image sequence, such as catheter tips, anatomical structures, and organs; and they may introduce leaked artifacts. To address this concern, an adaptive filtering procedure is presented to apply temporal filtering in regions with no motion and spatial filtering in regions with motion.

Adaptive filtering is a multi-step process.

- First, a normalized motion mask describing the difference between two consecutive images is generated.
- Second, every image is spatially filtered using a particular motion mask to specify different types of filtering in each area and location.
- Third, an IIR filter is then used to combine the spatially filtered image with the previous output image; therefore, the motion mask acts as a weighted input mask to determine how much spatial and temporal filtering should be applied.

This method can improve both static and mobile fields.

Fig. 3.1.5 Filtering

5. Extraction

Feature extraction is part of dimensionality reduction, where the original set of raw data is divided and reduced into more manageable groups. These features are easy to handle, yet can still describe the actual data set with precision and uniqueness.

In computer vision and image processing, a feature is information about the content of the image; usually if a certain area of the image has certain properties.

Feature extraction (Fig 3.1.6) aims to reduce the number of features in the dataset by creating new features from existing features (then deleting the original features). These newly reduced feature sets will then be able to summarize most of the information contained in the original feature set.

In machine learning, pattern recognition and image processing, feature extraction starts from an initial set of measurement data and builds up derived values (features) for informational and non-informative purposes.

Popular digital programming environments such as MATLAB, SciLab, NumPy, Sklearn, and the R language provide some of the simplest feature extraction techniques (e.g., principal component analysis) through installation commands available.

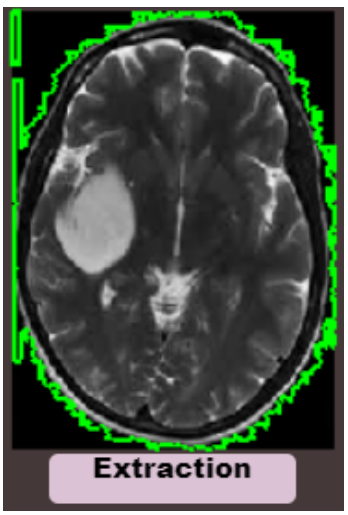


Fig. 3.1.6 Extraction

6. Segmentation

Image processing or more specifically digital image processing is a process by which a digital image is processed using a set of algorithms. It covers a simple level task like noise removal for common tasks like identifying objects, people, text, etc. to more complex tasks like image classification, emotion detection, anomaly detection, segmentation, etc.

Ecosystem, digital image processing using neural networks has become popular in recent times. It has many application areas such as security, banking, military, agriculture, law enforcement, manufacturing, medical, etc.

Using these labels, we can specify boundaries, draw lines, and separate the most essential objects in an image from the rest of the less important ones.

The facial recognition system performs image segmentation, identifies an employee and allows him to automatically mark his presence.

Segmentation (Fig 3.1.7) in image processing is used in the medical industry for more efficient and faster diagnosis, detection of diseases, tumors, and cell and

tissue samples from various medical images generated from X-rays.

X-ray, MRI, endoscopy, temperature, ultrasound, etc processed to identify models, features, geo-envelopes, land information, etc. different, which can then be used for agriculture, mining, geolocation, etc.

Image segmentation has a large application area in the field of robotics such as RPA, self-driving cars, etc. Security images can be processed to detect harmful objects, threats, people and incidents. Image segmentation implementations in python,

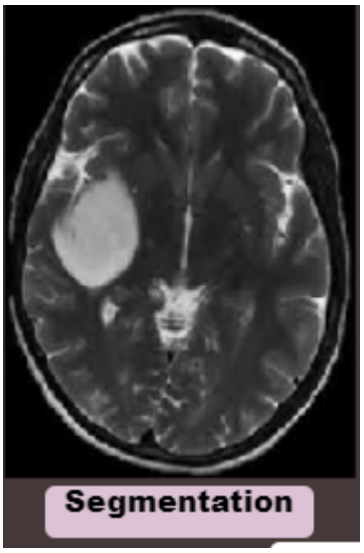


Fig. 3.1.7 Segmentation

7. Nodule Detection

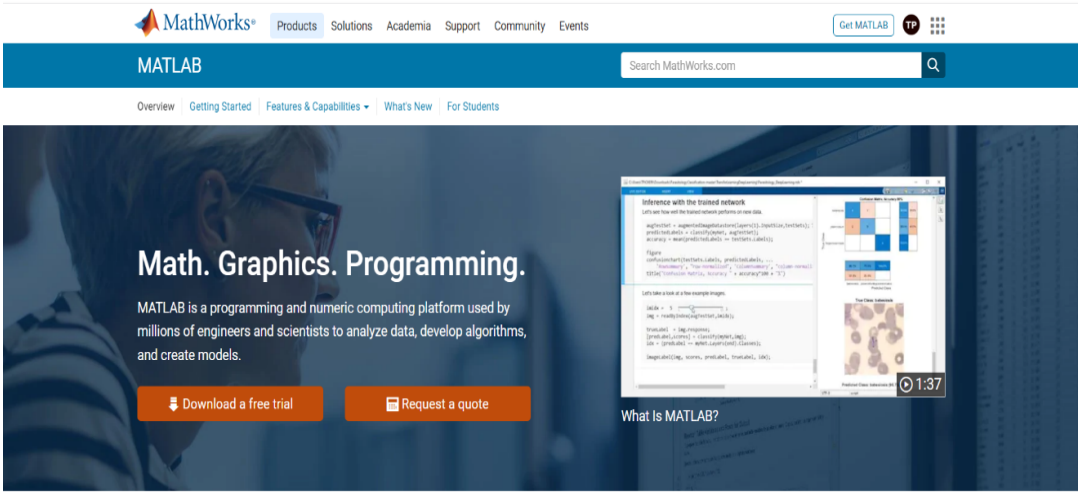
Detection of malignant nodules (Fig 3.1.8) in chest radiographs is currently performed by pulmonary radiologists, potentially with the aid of CAD systems. Recent advancements in convolutional neural network (CNN) models have improved image classification. In this paper we explore using a ResNet CNN model with transfer learning to classify complete chest radiographs as non-nodule, benign nodule, or malignant nodule, and to localize the nodule, if present. The model is able to classify radiographs as nodule or non-nodule with 92% sensitivity and 86% specificity, but is less able to distinguish between benign and malignant nodules. The model is also able to determine the general nodule regions but is unable to determine exact nodule locations.

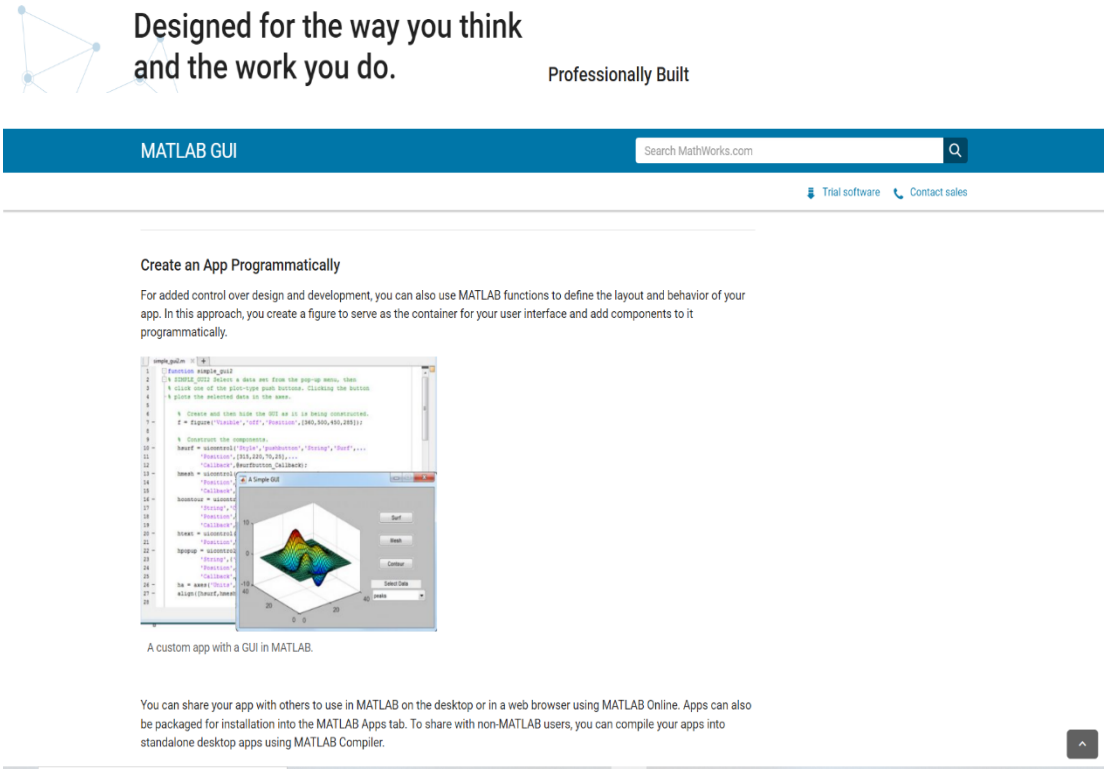
Fig. 3.1.8 Nodule Detection

CHAPTER IV

DESIGN AND IMPLEMENTATION

1. Platform used



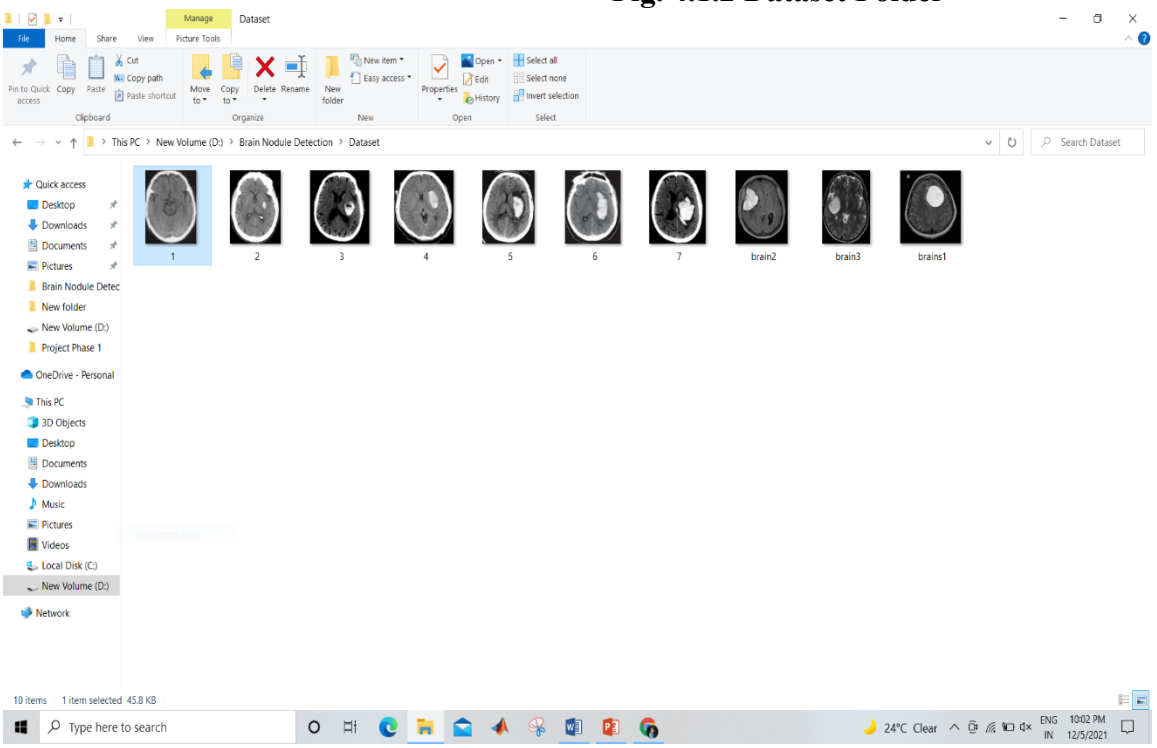


MATLAB combines a desktop environment tailored for iterative analysis and design processes with a programming language that directly expresses the mathematics of matrices and arrays. It includes a live editor for creating scripts that combine code, output, and rich text in an executable notebook.

Fig. 4.1.1 Matlab & GUI

Dataset

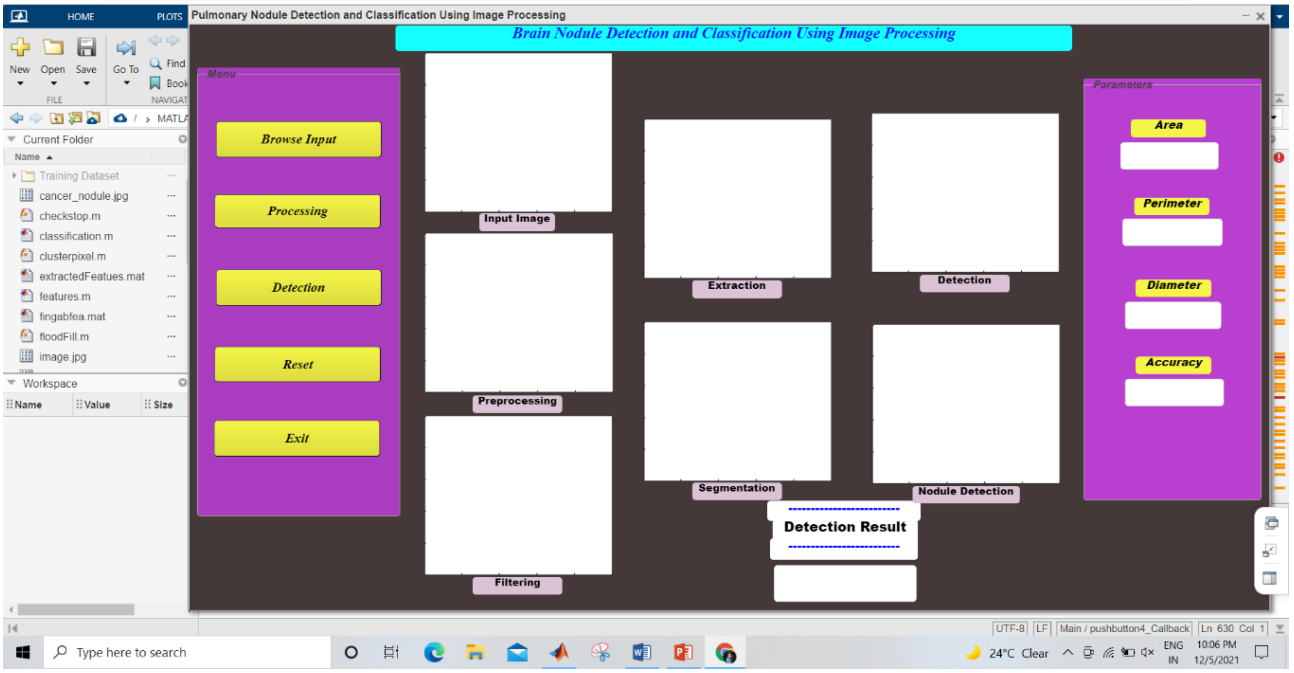
Fig. 4.1.2 Dataset Folder



CHAPTER V

RESULTS

Fig. 5.1.1 Brain Tumor Detector



As a result, we have created a GUI Interface. Above Fig 5.1.1 shows the result.

Fig. 5.1.2 Inserting Image

Above Fig 5.1.2 is showing the insertion of the MRI image in GUI.

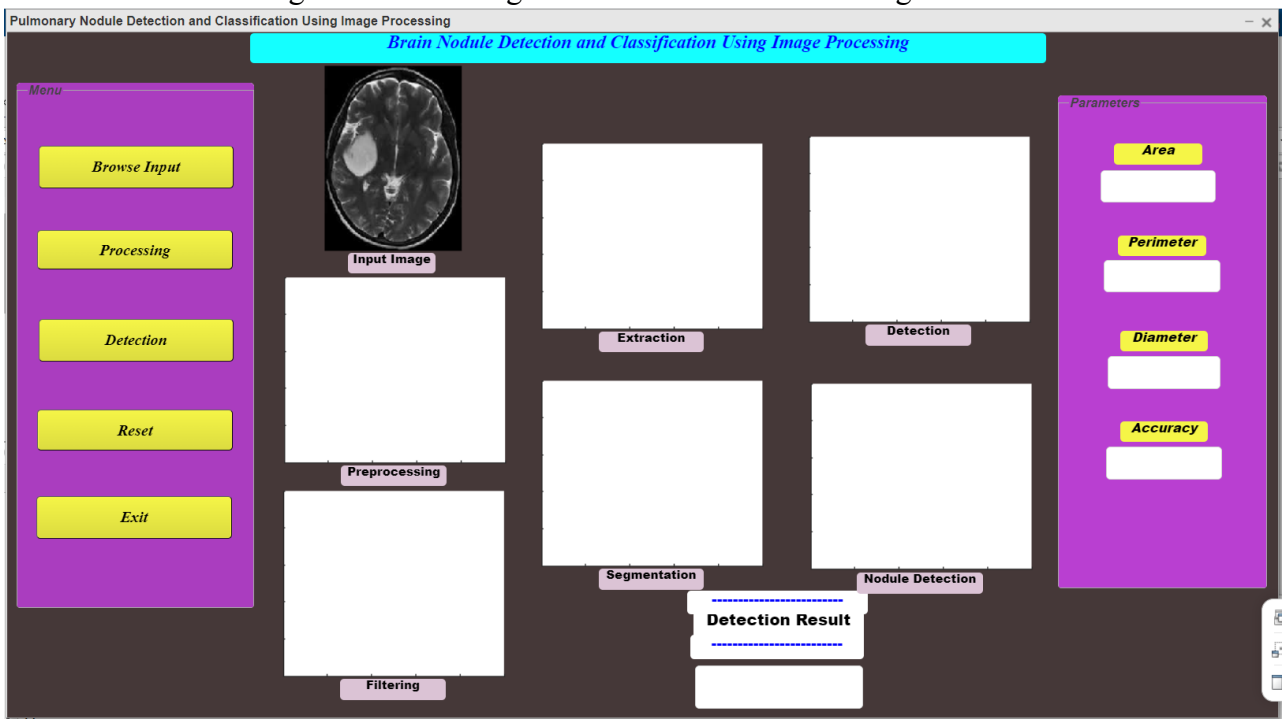
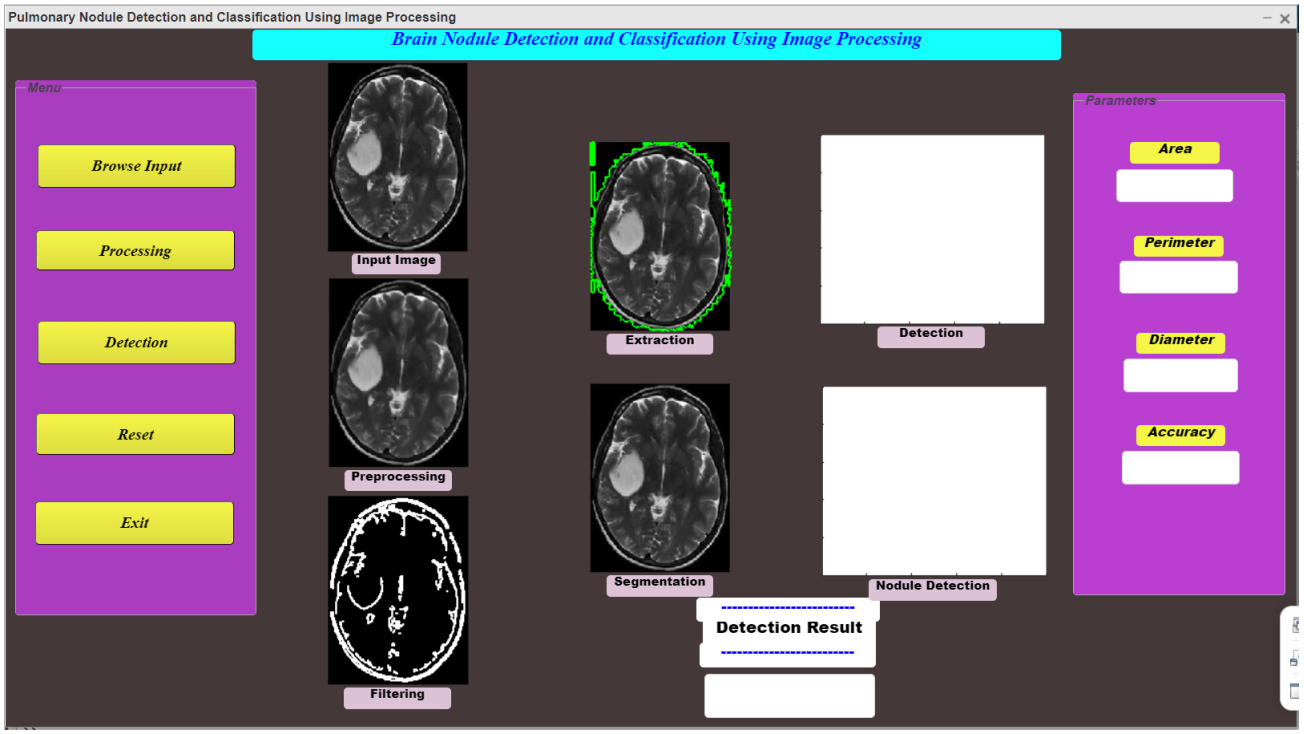


Fig. 5.1.3 Processing



Above Fig 5.1.3 which is a processing step 1.e., Extraction and Segmentation of MRI image

Fig. 5.1.4 Detection

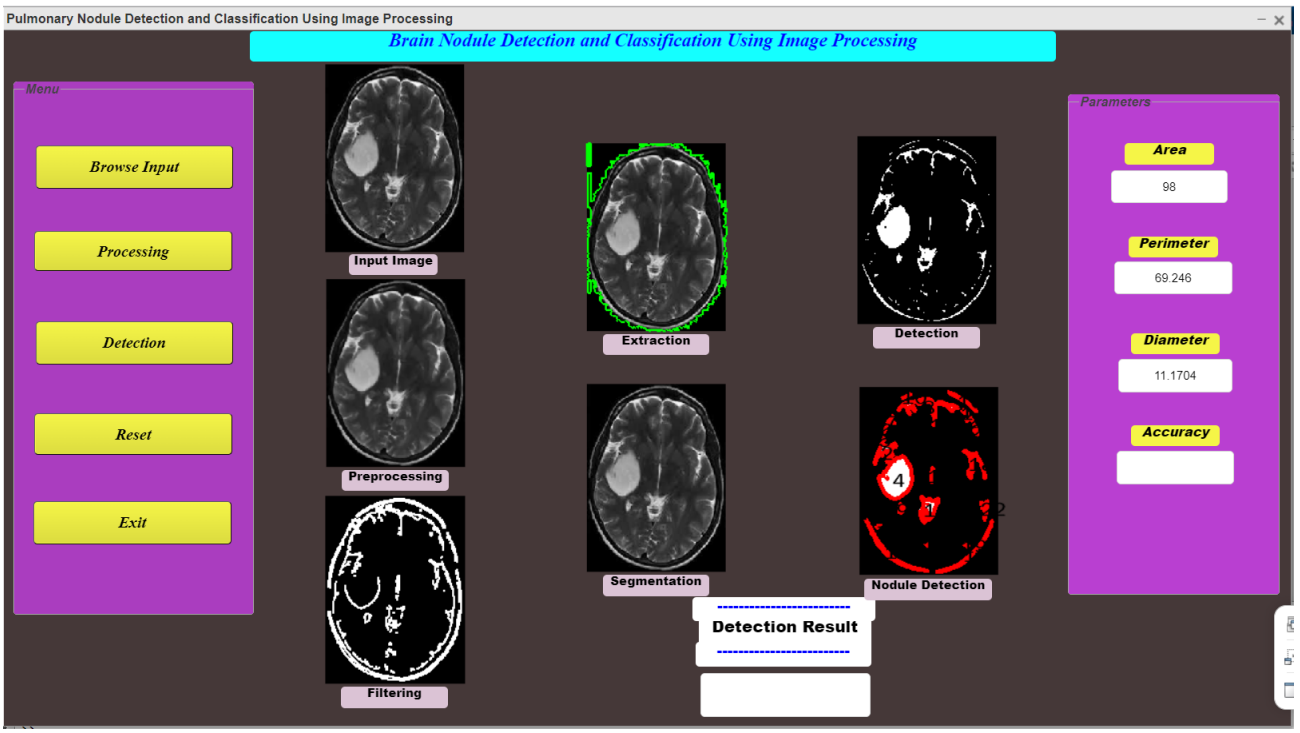


Fig 5.1.4 is the final output of this project. It is showing nodule detection and calculation of area, parameter, diameter, accuracy of this project.

CHAPTER VI
REFERENCES

REFERENCES

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PROJECT NO. 02

VIDEO COMPRESSION FOR MULTIMEDIA REPRESENTATION

ABSTRACT

This study aims to review the latest techniques in digital multimedia compression with regard to intraframe video compression techniques.

For this we have used FFmpeg which is a collection of open-source multimedia file management tools. FFmpeg consist of collection of shared multimedia libraries like libavcodec, libavutil, and libavformat. Also, it works behind scenes with many multimedia tools. Thus, it allows us to convert video and audio files, create streaming, and resize video files. This update opens the way for further research in the field of intraframe encoding in video compression and removes barriers to its implementation in order to compare video intraframe compression with popular video compression methods.

Video compression is a process of removing obsolete information from a video just to store important information in order to reduce storage size, transfer bandwidth and transfer time.

Important information is extracted with various conversion techniques so that it can be reconstructed without losing video quality and knowledge.

Video compression is a standard program with a specific algorithm or formula to determine the best way to reduce data size or memory.

Important information is extracted with various conversion techniques so that it can be rebuilt without losing the quality and information of the original file.

In this analysis work a comparative analysis of video compression is performed by the GUI. GUI (Graphical User Interface) A visual interface for an image-based operating system that uses icons, menus and a mouse (clicking an icon or drop-down menus) to control program interaction and communication can be done by working with these images instead. Python programs were written and completed based on results obtained as a Graphical User-based Interface.

LIST OF FIGURES

INDEX

CHAPTER 1

INTRODUCTION

1.0. Introduction

The development of high-quality and affordable video acquisition devices has produced a continuous increase in both file size and resolution, as well as a major effect on the design of efficient compression systems.

The growing demand for multimedia content such as digital photography and video has led to a growing interest in the study of compression strategies. Although storage capacity and transfer bandwidth have grown exponentially in recent years, many applications still need compression.

The basic rule of thumb is to reduce the number of bits needed to represent the video. In video processing, video frames are often represented as a matrix.

Digital video compression algorithms take advantage of duplicate images so that they can be represented using a small number of bits while maintaining acceptable visual quality.

Factors related to the need for Compression include:

- Large requirements for multimedia data storage
- Low-power devices i.e mobile phones which have a small storage capacity
- The impact of computer complexity on practical application
- Network bandwidth is currently available for transfer

In addition, the compression time should be low. Image and audio are one of the most common ways used in communication between the users along with the video. Video compression are widely used in various educational sector, gaming sector and finantial sector. Many techniques are used to compress these multimedia files and they exhibit various degrees of compression rate and quality (Fig 1.1.2).

The data compression is consist of two types lossy and lossless compression techniques. Lossless compression techniques have the advantage that the size of the original and the compressed data is the same.

One of the main aim of data compression is to reduce the size of transferred data by abolishing the redundant information or data to keep the transmission bandwidth and without remarkable effects on the quality of the data. However, the compression rate is normally less than lossy techniques.

Such techniques are widely used on the internet. In video compression every frame can be treat as an image. So, in video compression both image and audio compression work (Fig1.1). This study discusses the improvement on the intraframe coding and shows the performance of applying it on video files.

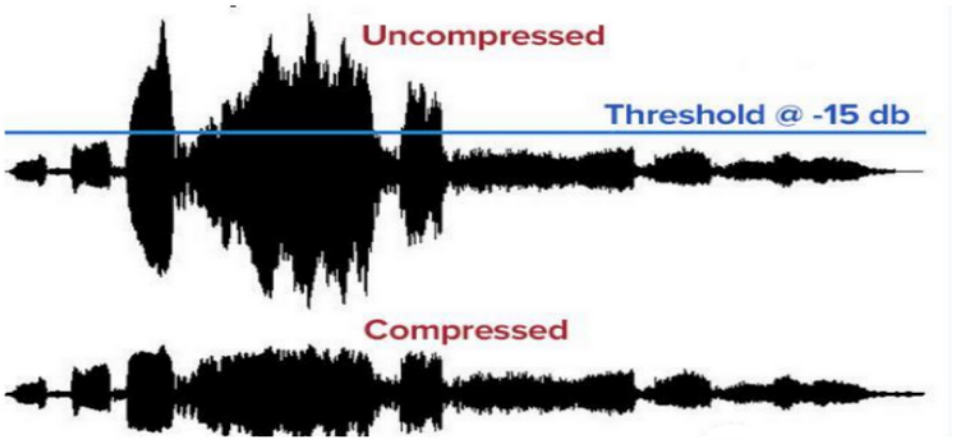


Fig.1.1.1Compressed and uncompressed frame in video /image and sound Compression

Fig. 1.1.2 Quality before and after compression

The organization in thesis for this project 02 is as follows. In Chapter 2 the literature review is given, it focusses on reviewing other related models or projects. Chapter3 provides the methodology of the project. Chapter 4 provides design and implementation of the project; we have also discussed about software used in project and the coding part. Chapter 5 represents the result we observe as a GUI. Chapter 6 is about references.

CHAPTER II

LITERATURE REVIEW

1.1. Literature Review

Damian Karwowski, Tomasz Grajek, Krzysztof Klimaszewski, Olgierd Stankiewicz, Jakub Stankowski, and Krzysztof Wegner (IWSSIP) 2012. General View on the Path of Video Coding Development Here Compression of moving images/video bit per sec has opened unprecedented chances of transmission and storage of digital videoThen they end the attempt of authors' forecasting about the future evolution of video compression technologies.

With the progress of development of compression methods, apart from its efficiency, also the functionality started to matter. Not only did efficiency started to play a role, but also other functionalities that the codecs were expected to have.

In order to maintain high coding efficiency while giving those latest requested features, the coders needed to develop by implementing a set of necessary functionalities Another crucial feature that the codec was expected to have is the error resilience.

During transmission or storage, the bit stream (i.e. compressed video data) may become corrupted. Even the change of a every single bit value may render the bitstream unusable, since the entropy decoders can't handle any errors. To prevent that, various features were introduced in the codec that help to recover from this type of errors, at a cost of slightly lower compression ratio.

The selection of image sequences will change compression performance of those video compression algorithms which employ inter-frame coding algorithms.For patient positioning, MP4 is the most suitable method for CBCT image compression among three video encoders because it has the highest compression ratio and comparable positioning accuracy.

R. Mahalakshmi, S.K. Mahendran, International journal of Engineering science and research technology (IJERT). Compression works by removing repetitive or redundant information, effectively summarizing the contents of a file in a way that preserves as much of the original meaning as possible. Multimedia files are large and consume lots of hard disk space. The files size makes it time-consuming to move them from place to place over school networks or to distribute over the Internet. A simple characterization of data compression is that it involves transforming a string of characters in some representation such as ASCII into a new string of bits, which contains the same information but whose length is as small as possible. In reviews of different basic lossless data compression methods are given. They concluded that in the Statistical compression techniques, Arithmetic coding technique performs better than Huffman coding, Shannon Fano coding, and Run Length Encoding technique.

An experimental comparison of a number of different lossless data compression algorithms is presented. They concluded by considering the compression times, decompression times and saving percentages of all the algorithms. In lossless data compression methodologies are provided and their performances are compared. The most popular compression format for videos on the internet is Flash Video. Encoding of audio and video data for FLV files are same as those for SWF files.

Pavana M, Mrs.Nagarathna R, International journal of Scientific Development and Research(IJSDR)March 2019. The technique video compression which is related to image processing which is widely used in many applications. The major problem is memory requirement size in order to store the recorded videos of different applications. The compression technique can be used to decrease the memory size of the media. The proposed algorithm which saves the memory and also it increases the signal to noise ratio, and it also calculates the overall performance of the system.

Video has become one of the most useful media in order to represent some of the important information. The problem occurs with media is because of its large size and it also contains a lot of redundant information. The main aim of this paper is to solve the bandwidth requirement problem and it uses Discrete Cosine Transform (DCT) algorithm for compressing video's size.

Lossy compression is preferred for video compression. It has to achieve high compression ratio and also to maintain the quality of the reconstructed video in the following compression scheme. DCT and DWT transforms are used in hybrid compression technique. Arithmetic coding is used for more compression. The performance of the system can be done using criterion compression ratio, PSNR and mean square error.

Data file can be reduced by compressing the size of the data file is said to be data compression. Lossy and lossless are the two compression techniques used for data compression. Lossy compression is preferred for video compression. It has to be high compression ratio and o maintain the quality of the reconstructed video is really important. The information should not be lost in the lossless compression and the Lossy compression in which lower the number of bits by identifying the unrequired information and it delete that unnecessary information. The compression technique can be used to decrease the memory size of the media and it increases the transmission capacity. The compressed data must be decompressed later in order to use or read that data, this extra process may increases costs or it will become complex.

Video compression which reduces and removes the redundant data and it minimizes the storage space in the system. In this project video compression is done based on the motion compensation technique in order to reduce the size of the video. The proposed method reduces the number of motion in frames to either one or two and also it improves the compression efficiency.

For the secured video transmission compressed video should be encrypted and transmitted over the media. By applying both the techniques at a time is one of the challenges where the storage and the quality are crucial. Here, They have design a new technique for video compression and encryption. Here the compression is done using both hybrid DWT and DCT and vector quantization. Reference frame encoding and current frame encoding are the two main steps of this compression algorithm which is based on the reference frame.

CHAPTER III

METHODOLOGY

Methodology

In order to allow efficient video transmission, the digital signal representing the moving pictures must be compressed. Generally, there are two approaches: To use some mathematical tricks to squeeze the data to the edge of the entropy of the data, or just to throw out less important data contained in the video. The limits of the first approach are expressed by the entropy of the coded data. In the second approach, the question is which data are unimportant, and can be thrown out. The desired way is to discard the information that is either not seen (perceived) by the viewers, or not important for the overall impression.

3.1 Algorithms of data encoding

The main algorithms of data encoding will be recalled, which are well recognized in the field of image/video compression. From the point of view of contemporary image/video compression these algorithms should be considered as a single functional block in a codec, rather than a full compression technology.

Entropy Coding

The beginning of the development of data compression methods dates back to the late 40s of the last century, when Claude E. Shannon has presented the results of his work, which clearly showed what are the basic limitations of data compression.Video signal is not an exception here. Shannons work became the foundation for many methods of statistical coding that were developed later, which are known in the literature as entropy coding methods. At least, the following methods should be mentioned here: Huffman coding (year 1952), and its widely used special cases Golomb codes (year 1966), Exponential Golomb codes (1978), LZW, arithmetic coding (year 1963), and ANS method (year 2005). From the beginning of development of the video compression, there were attempts to treat moving pictures as any other digital signal.

Prediction

Taking into account the above, additional coding tools were strongly needed, that would be an essential complement to the methods of entropy coding. First ideas of such tools boiled down to prediction of image samples based on the already transmitted ones.Instead of original image pixel the main goal was to transmit only the difference between the prediction signal and the actual one. An example of such tools were developed in 1950 in the form of Differential Pulse Code Modulation (DPCM) technique. More advanced approach that was developed later is INTRA directional prediction, that is commonly used in all contemporary video codecs (like AVC and HEVC). Even with the use of advanced INTRA prediction the efficient encoding of a video was still a serious problem.

A breakthrough was in 1981, when it was developed the technique of predictive coding of a video data with the motion estimation and compensation. It is commonly known as INTER coding. With this

method it was possible to accurately predict the motion in a video sequence over the time, which became the basis for a very efficient compression of a video.

Transform Coding

Discussed in the previous sub-section predictive coding leads to decorrelation of the data on whom this algorithm is realized. The same reasult can be achieved by the use of Discrete Cosine Transformation (DCT). This is a type of a transform coding, and was developed in year 1974. In this transformation the input signal is represented with a cosinusoidal components, which in the case of image/video data can be a source of a significant reduction of a bitrate. Taking into consideration properties of human visual system it is worth to use this transformation in a combination with a lossy coding. Thus, transform coding of a video data followed by quantization of transform coefficients make an approach which is in common use today.

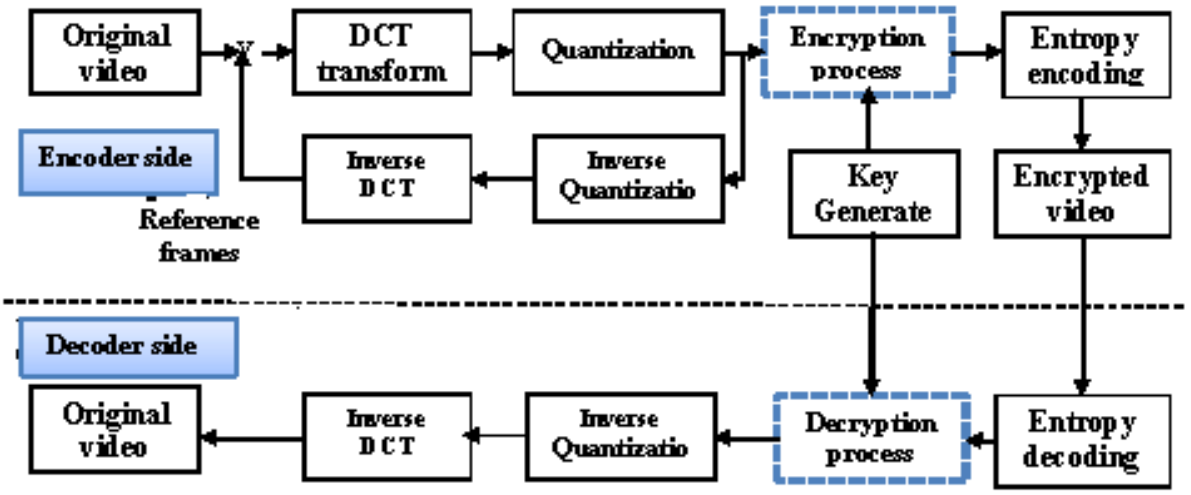


Fig. 3.1.1 Block diagram of video compression encryption-decryption algorithm

3.2 Video Compression Technologies

Contemporary video codec must be treated as a collection of a number of such algorithms resulting in a technology of video compression

Hybrid video compression

A joint application of the predictive coding (INTRA and INTER) together with the DCT-based lossy transform coding and the entropy coding of the data is commonly called as as hybrid video compression in the literature. This technology of video encoding is in common use.

Wavelet video compression

Another such method was the wavelet coding that uses Discrete Wavelet Transformation (DWT). This method was developed intensively from the 80s until 2004. The performance of solutions of the wavelet compression that were developed for still images was so astonishingly high, when compared to other available techniques, that many people believed that the wavelet compression will replace the hybrid codecs in a short time. Thereby, there was increasing the pressure to repeat the success of JPEG2000 also for the purpose of a video compression, which has motivated many laboratories to work on this compression technique. Undoubtedly, a breakthrough here was the beginning of the 90s, when it was proposed the concept of a three-dimensional video coding with motion compensation. The success of this method caused the hybrid coding techniques and the wavelet techniques became for yourself a direct competition.

The Moving Picture Experts Group and Video Coding Experts Group looked for the best technology for scalable video coding. There were a number of proposals based both on the hybrid technique and wavelet coding. But at that time hybrid approach outclassed the other proposals. Hybrid compression proved to be the best for compressing a video

CHAPTER IV

DESIGN AND IMPLEMENTATIONS

1. Platform used

IDLE (Python 3.9) is Python's Integrated Development and Learning Environment.

IDLE has the following features:

- coded in 100% pure Python, using the tkinter GUI toolkit
- cross-platform: works mostly the same on Windows, Unix, and macOS
- Python shell window (interactive interpreter) with colorizing of code input, output, and error messages

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

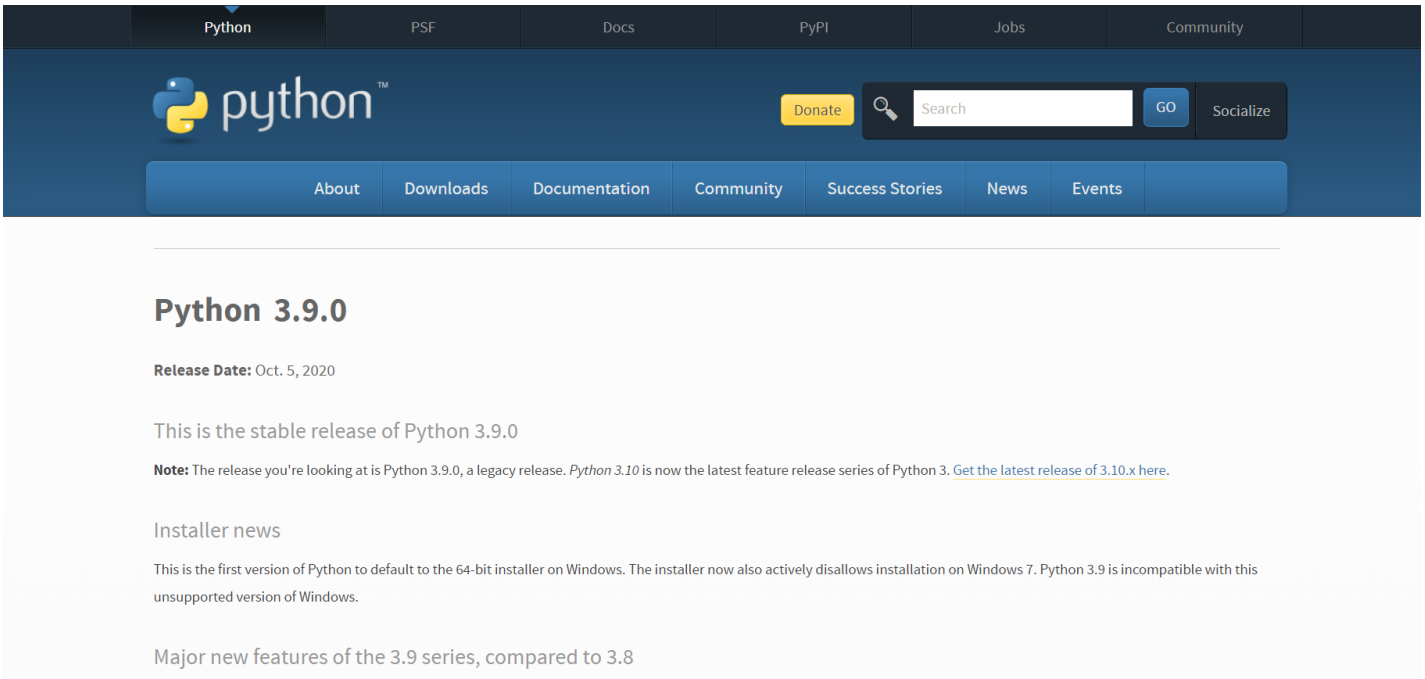


Fig 4.1.1. Python 3.9.0 download interface

CHAPTER V
RESULTS

Output

Fig. 5.1.1 GUI Interface

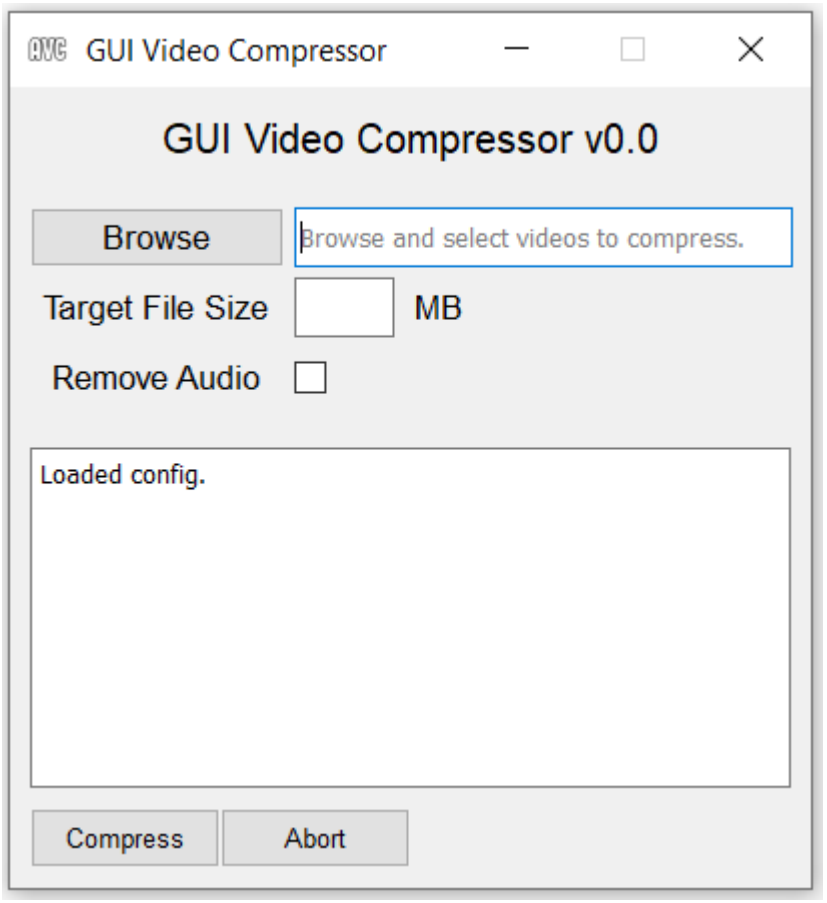
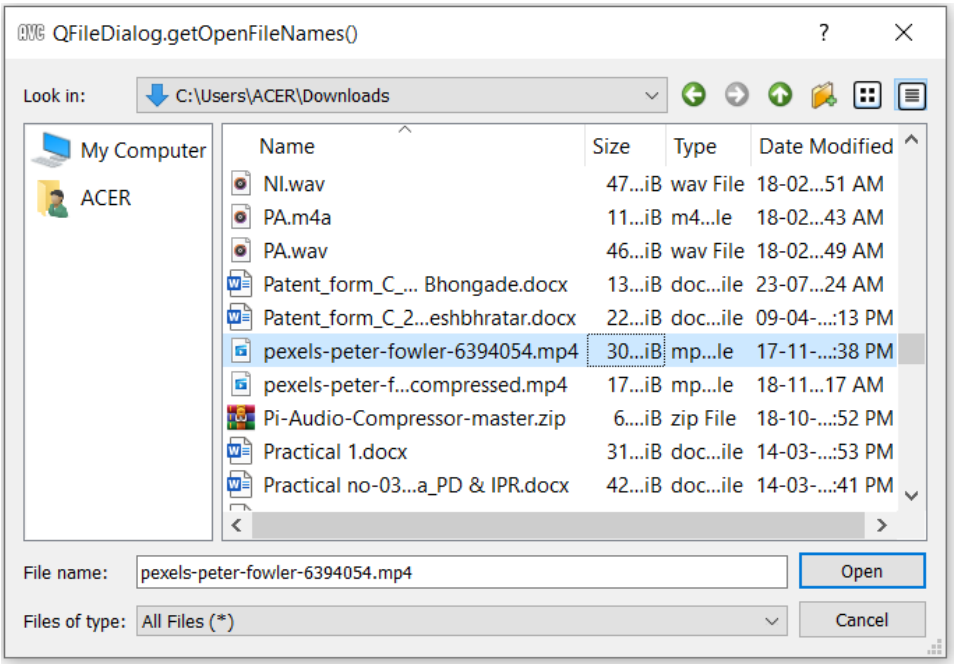
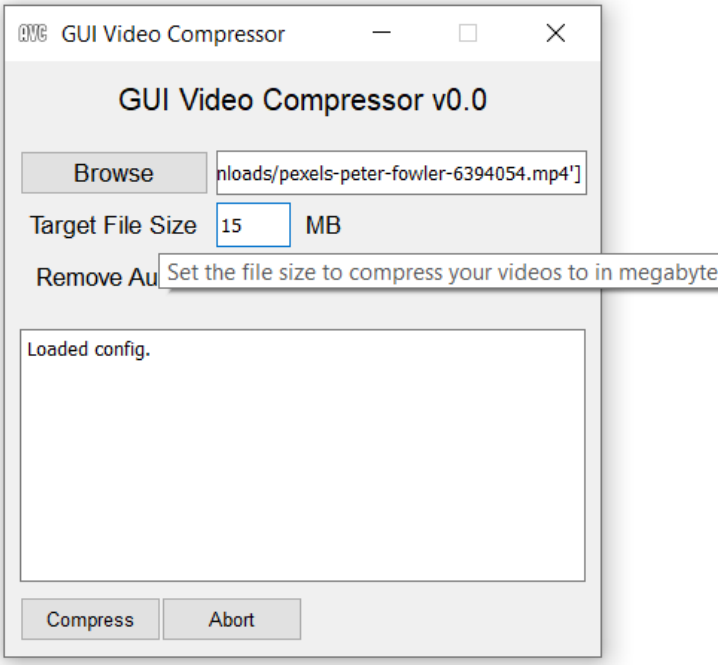


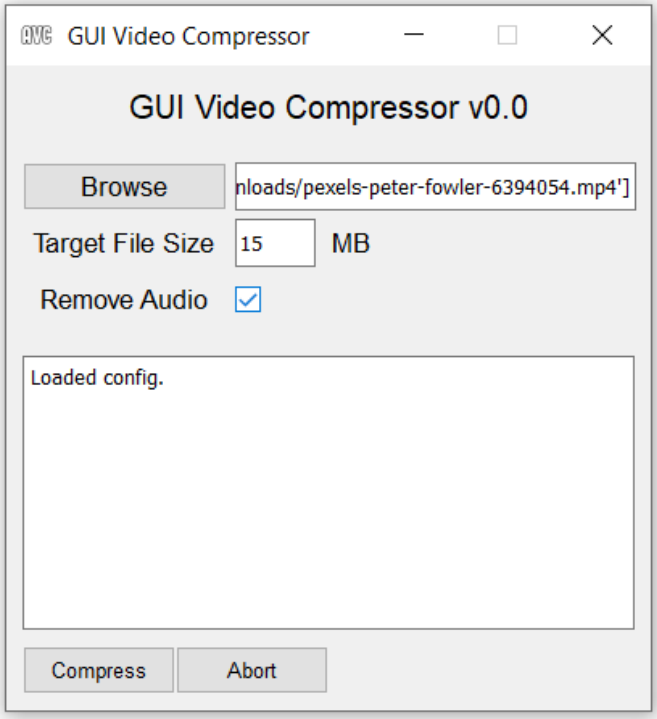
Fig. 5.1.2 Video Inserting



In above fig5.1.1 and fig 5.1.2 user first Browse the video from there device for compression.

Fig. 5.1.3 File size of video





In Above figure type the target file size upto which user want to compress the browse video.

Fig 5.1.4 Remove audio from inserted video

In above fig if user want to remove audio from browse video then Check the Tab Remove Audio for that.

Fig.5.1.5 (a) Loading Dataset

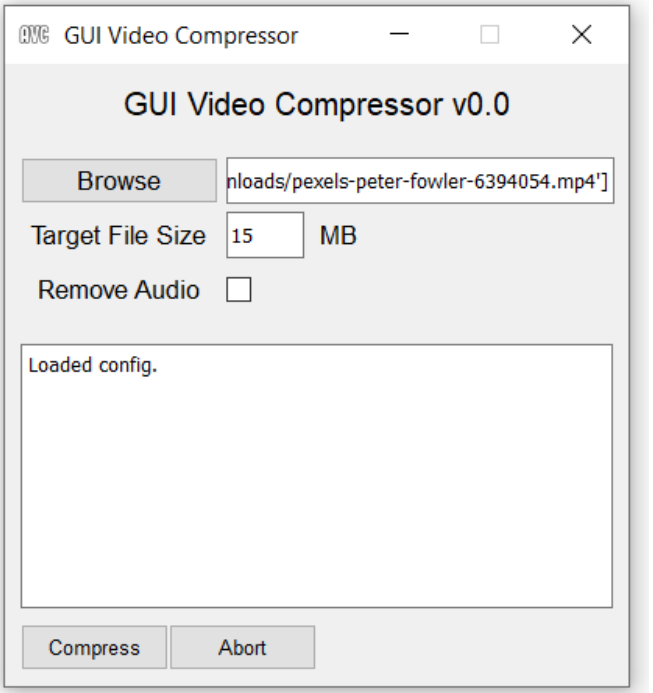
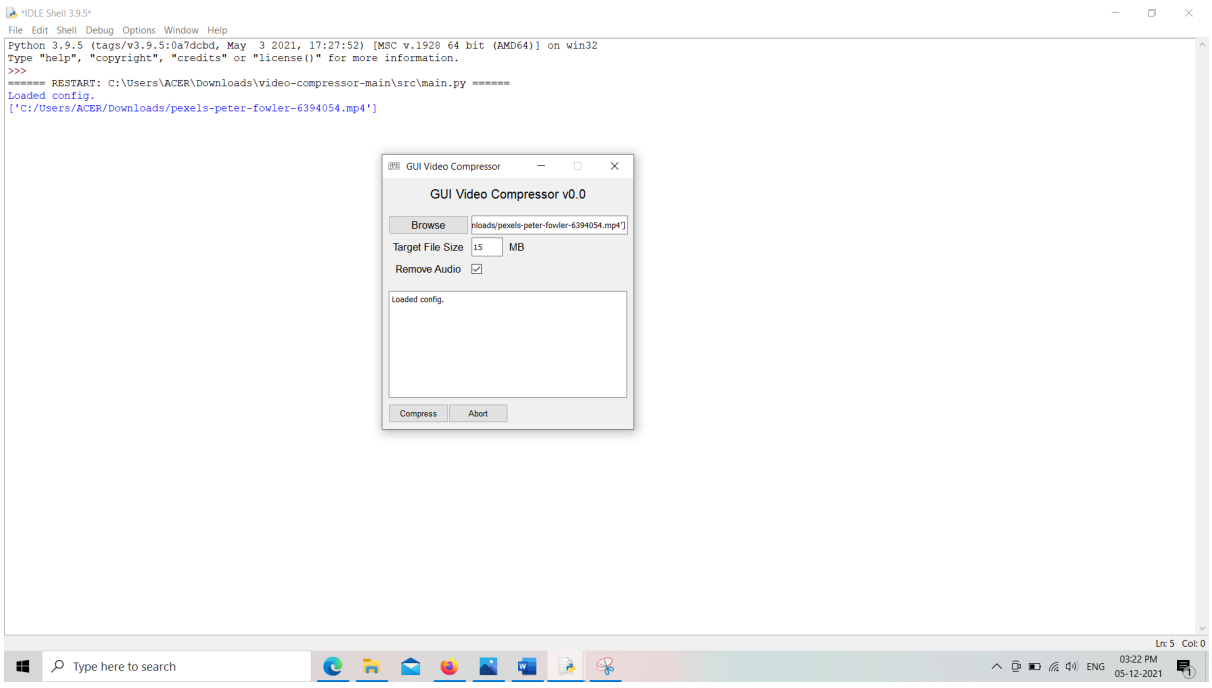
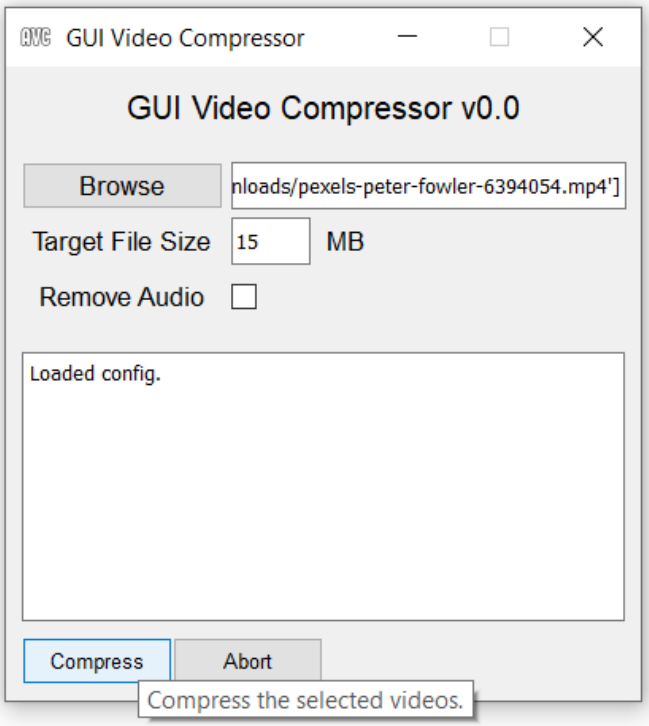


Fig.5.1.5 (b) Loading Dataset



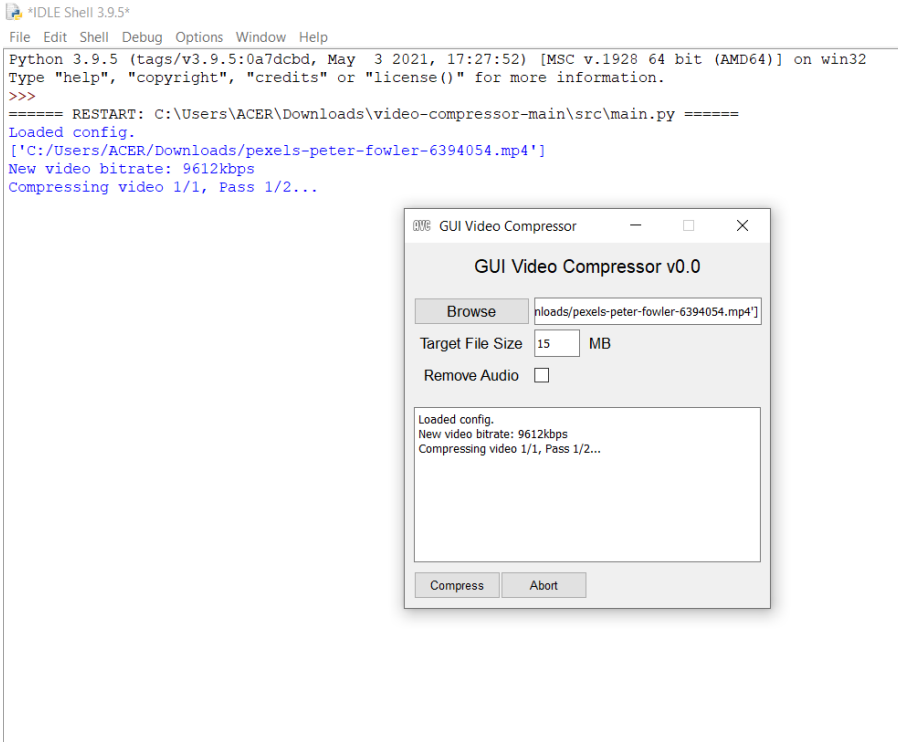
Above fig load dataset after selecting video and remove audio option of a) GUI b) GUI with Python interface.

Fig.5.1.6. Pressing compress button



Above figure after loading dataset click on compress button for compression process.

Fig 5.1.7. Compression in process



Above figure show whole compression process of uploaded video with its bitrate (shown on python interface).

Fig 5.1.8 a)Compression start with warning for abort (on GUI)

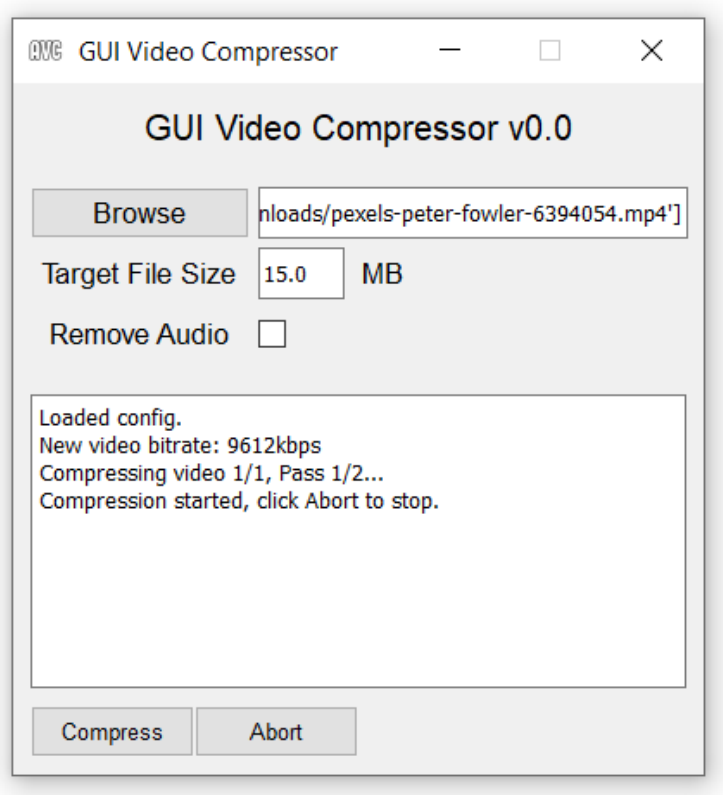
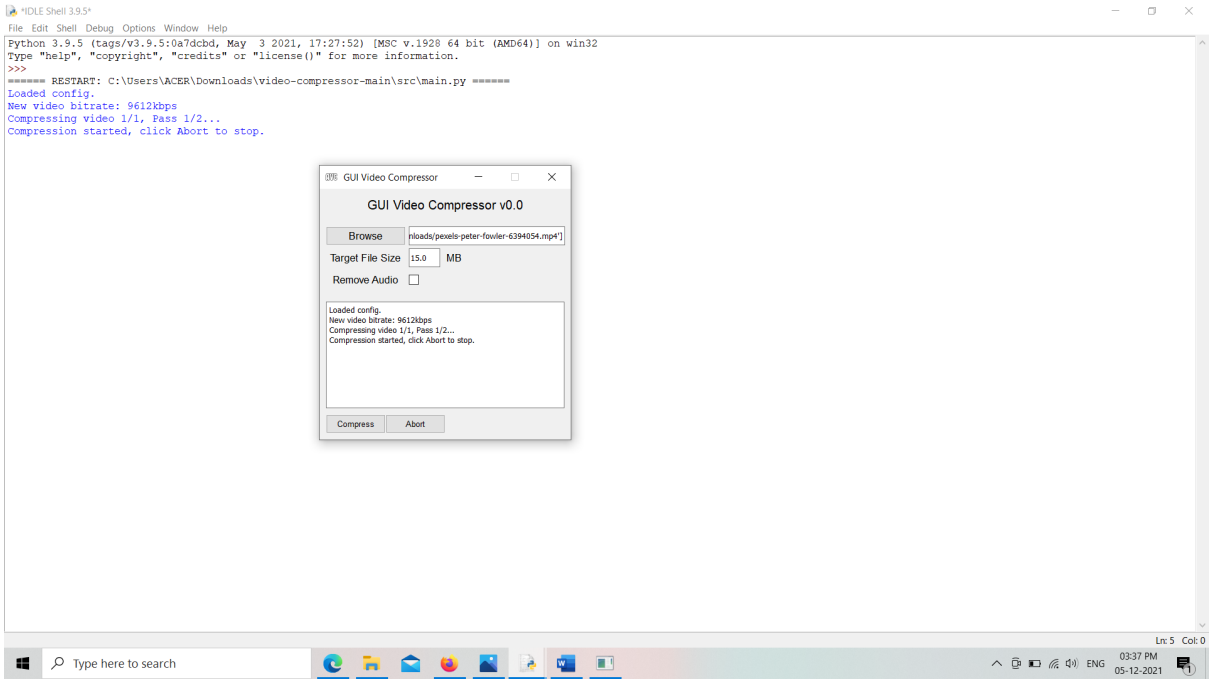


Fig 5.1.8 b) Compression start with warning for abort (on Python interface)



Above figures give warning for abort if user want to stop compression process anytime by clicking on abort a)GUI b)GUI and Python interface.

Fig 5.1.9 (a)Video compressed

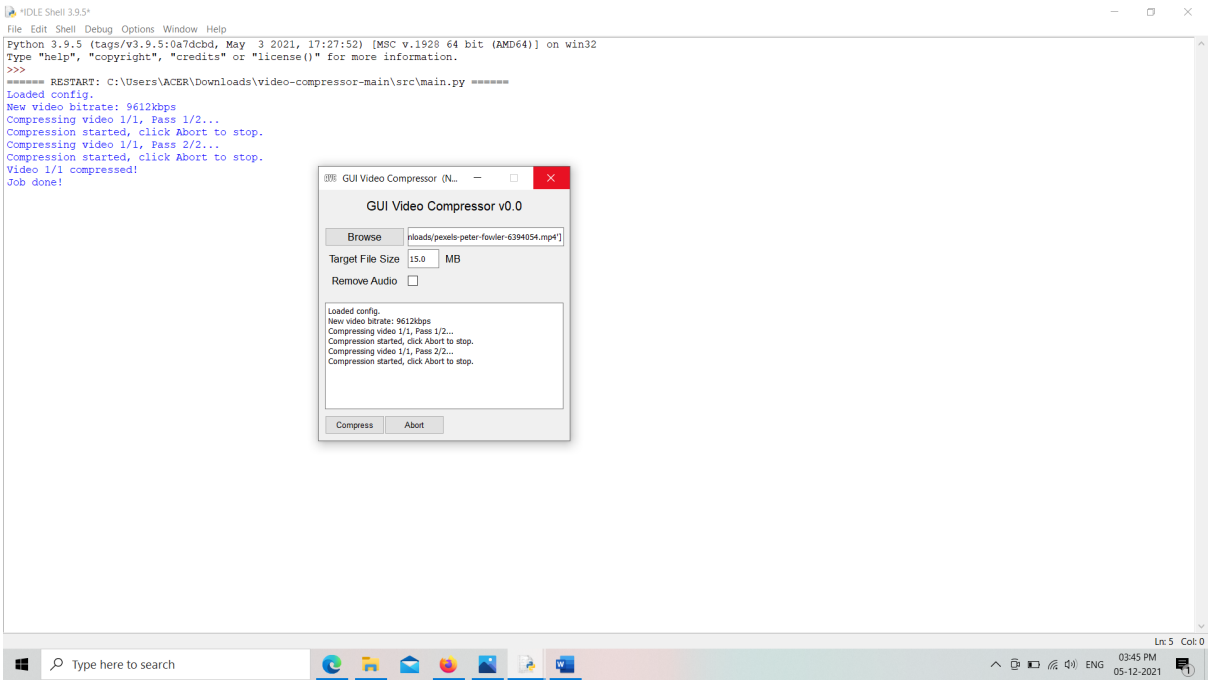


Fig 5.1.9 (b) Video compressed

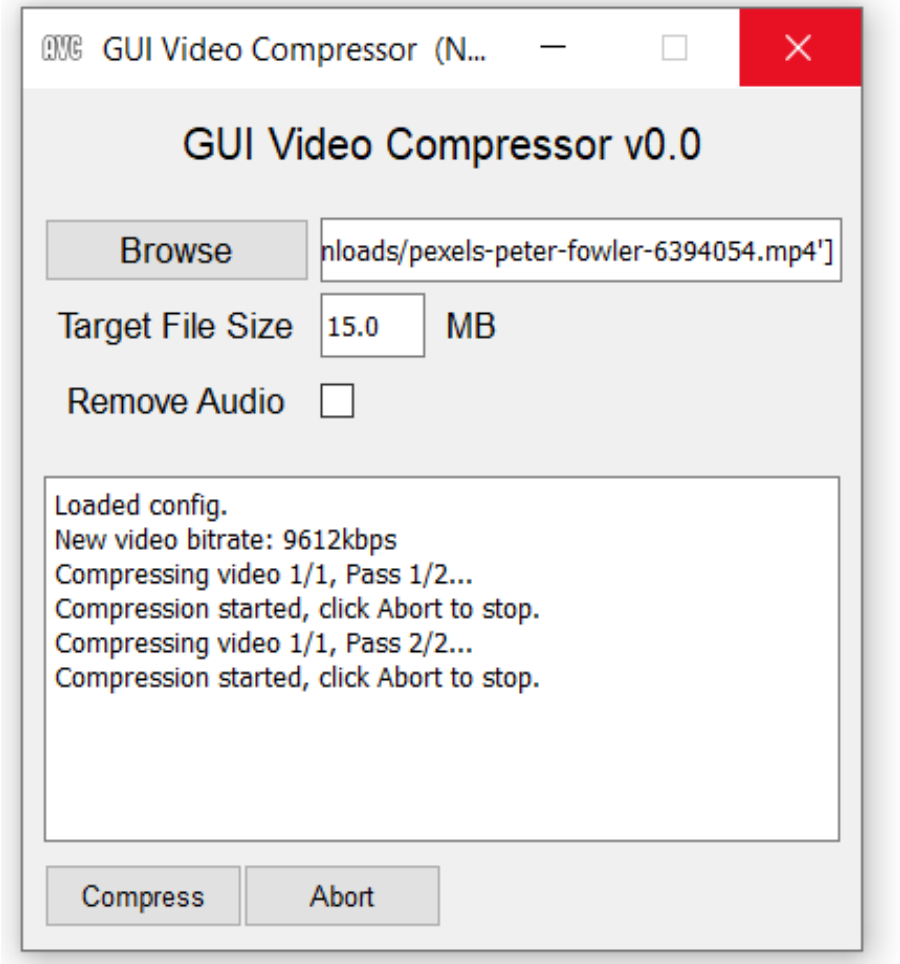
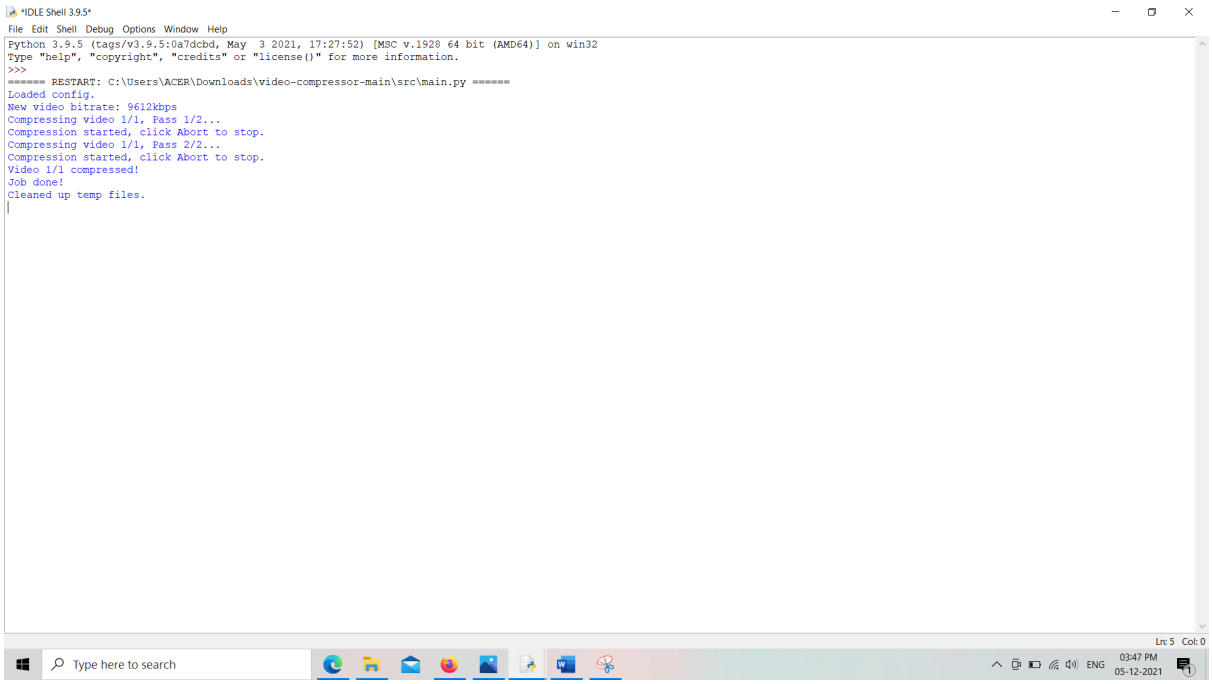


Fig 5.1.9 (c) Video compressed



Above figure show Video fully compressed and got message Job Done! Video Compressed.

CHAPTER VI

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