

# **CONTENT BASED VIDEO PROCESSING USING SCENE SEGMENTATION**

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# ABSTRACT

- Visual Multimedia Source.
- Many Applications.
- Video Hierarchy.
- Scenes.
- Shots.
- Frames.
- Scene Segmentation.

# PROBLEM STATEMENT

- The amount of video data is continuously growing.
- A video has a huge amount of raw and dynamic data which is difficult to process.
- Videos have much richer content than individual images which makes it more difficult than image processing.
- Scenes have higher semantics than a shot.

# EXISTING SYSTEM

- Scenes are Segmented by identifying shots with similar content.
- Information used to Segment: texts, images or the audio track.
- Divided into four categories according to the processing method . These are
  - Merging Based
  - Splitting Based
  - Statistical model-Based
  - Shot boundary Classification.

# PROPOSED SYSTEM

- Shot boundary Classification: scene and the non –scene boundaries are classified.
- MATLAB (matrix laboratory)
  - Multi-paradigm numerical computing environment.
  - Provides application program interface for videos.
- The three approaches which are going to be implemented in matlab are
  - Key frame-Based approach
  - Audio Vision Integration-Based approach
  - Background- Based Approach

# LITERATURE SURVEY

## A Survey on Visual Content-Based Video Indexing and Retrieval

**Authors:** Weiming Hu, Senior Member, IEEE, Nianhua Xie, Li Li, Xianglin Zeng, and Stephen Maybank.

**Description:** This paper offers a tutorial and an overview of the landscape of general strategies in visual content-based video indexing and retrieval, focusing on methods for video structure analysis, including shot boundary detection, key frame extraction and scene segmentation.

# LITERATURE SURVEY (CONTD.)

## Semantic Scene Segmentation for Advanced Story Retrieval

**Authors:** Songhao Zhu and Zhiwei Liang

**Description:** In this study, the issue of categorizing video scenes into semantic classifications is addressed with respect to the information of audio-visual cues. More specifically, the grammar of film production is first exploited to specify scene contents with respect to human perception. Next, each scene is categorized into one of the following three classes: conversation, action and suspense.

# LITERATURE SURVEY (CONTD.)

## Video Segmentation Based on Image Change Detection for Surveillance Systems

**Author:** Tung-Chien Chen

**Description:** Using images to identify regions that have undergone some significant change is of widespread interest due to numerous amounts of applications in diverse disciplines. These areas of interest include: remote sensing, video surveillance, medical diagnosis and treatment, civil infrastructure, and underwater sensing. Even though there is a huge difference between the applications, the way to approach the problem is very similar. Every change detection method requires employing some processing steps and main algorithms.



# SYSTEM ARCHITECTURE

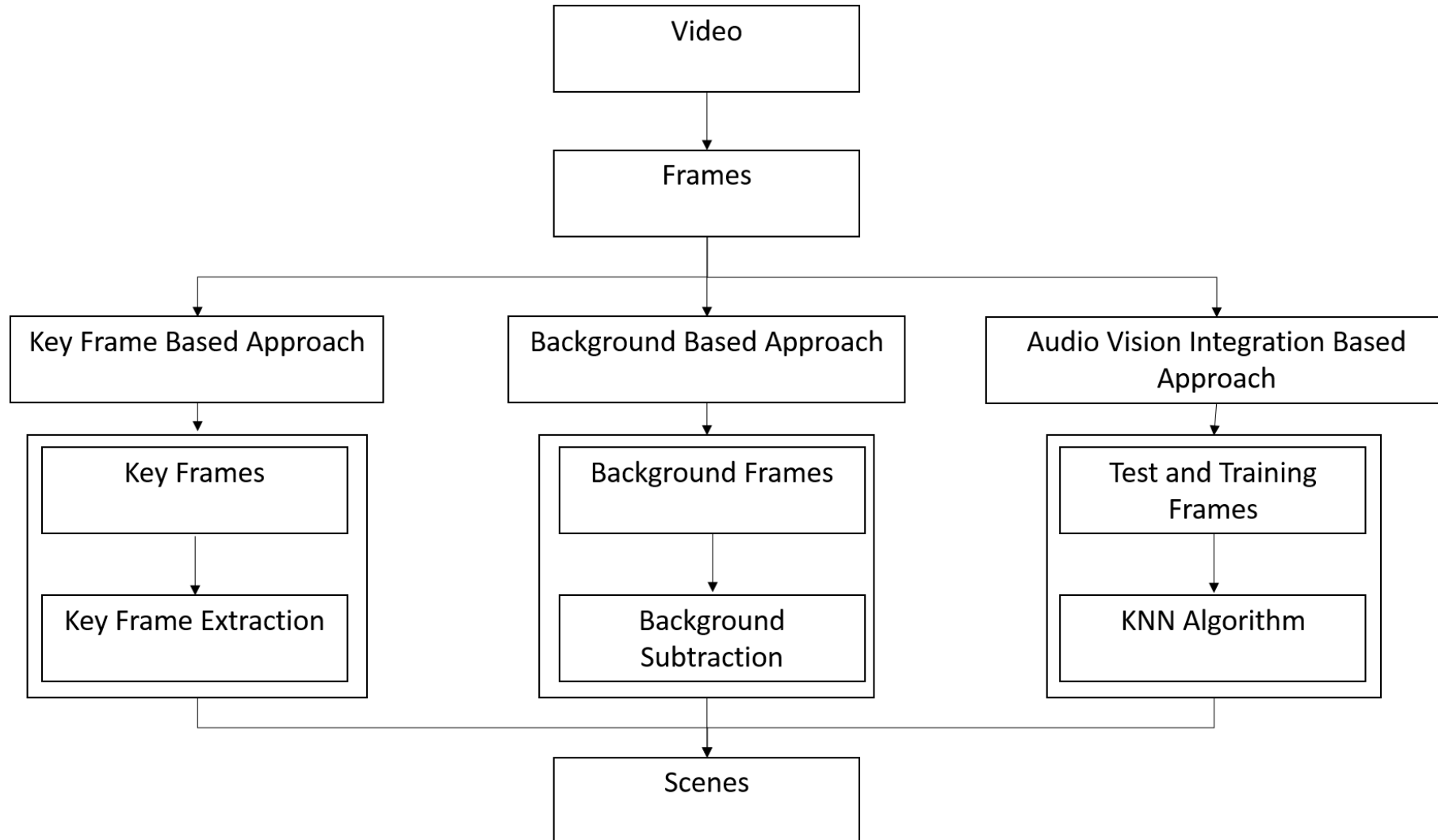


Fig. 1 System architecture

# MODULES

- There are three groups of approaches to perform scene segmentation.
- These groups are performed according to the representation of shots.
  - Key frame based approach
  - Audio vision based approach
  - Background based approach

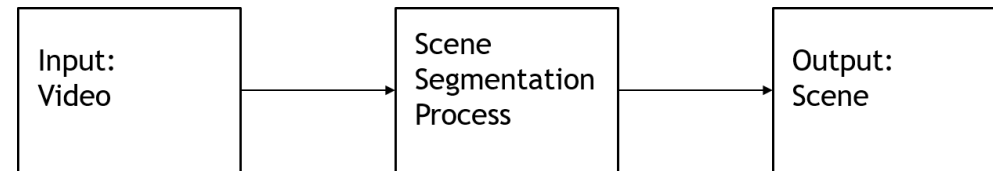


Fig. 2 Scene Segmentation Process

# MODULE DESCRIPTION

## KEY FRAME BASED APPROACH

- Frames of the same shot contain a great amount of redundancy.
- Certain frames that best reflect the contents of the shot are selected as key frames.
- Features Used: colours, edges, optical flow, etc.
- The similarity between different shots are measured to detect the scene changes.
- Limitation: dimensions of the shot contents are not efficiently represented by key frames.

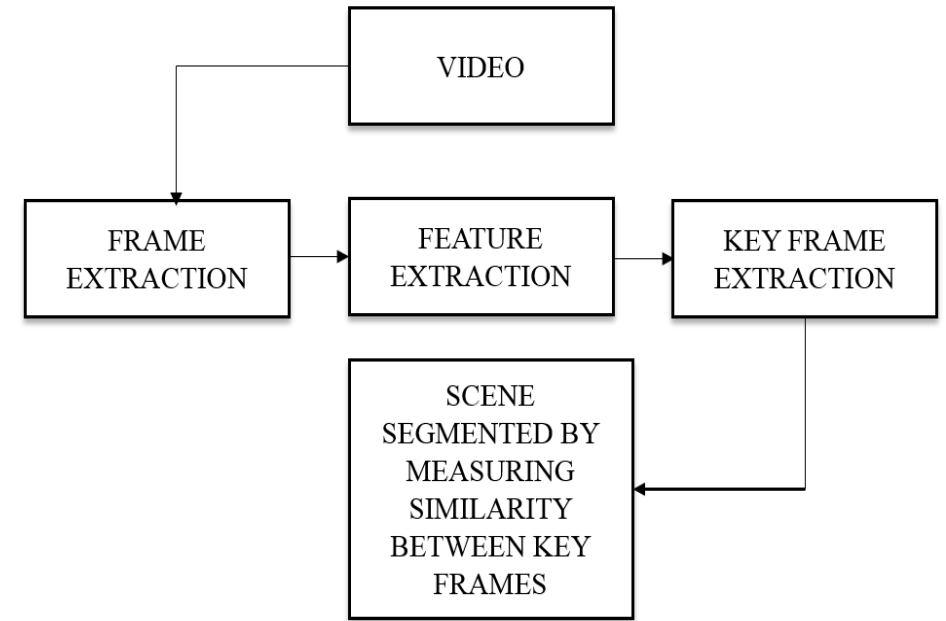


Fig. 3 Key Frame Based Approach

# ALGORITHM FOR KEY FRAME BASED APPROACH

- Two frames are considered at each time and their difference in histograms are calculated.
- The mean and variance are calculated as per the formula
- Mean =  $\frac{(\sum_{i=1}^n x_i)}{n}$
- Standard Deviation (SD) =  $\sqrt{\frac{(\sum_{i=1}^n (x_i - \bar{x})^2)}{n-1}}$  (Or)  $\sqrt{\frac{(\sum_{i=1}^n (x_i - \bar{x})^2)}{n}}$
- The threshold value is calculated.
- Then, any consecutive pair of frames whose absolute difference is greater than the threshold value is selected as a key frame and as a scene change.
- The output of the procedure are a set of key frames which defines the scene change.

# MODULE DESCRIPTION

## AUDIO VISION INTEGRATION APPROACH

- Based on the simultaneous visual and audio content changes.
- A time-constrained nearest neighbour algorithm is used.
- Input: Test and Training data.
- Frames with highest correspondence are grouped into a scene.
- Limitation: It is difficult to determine the relation between audio segments and visual shots.

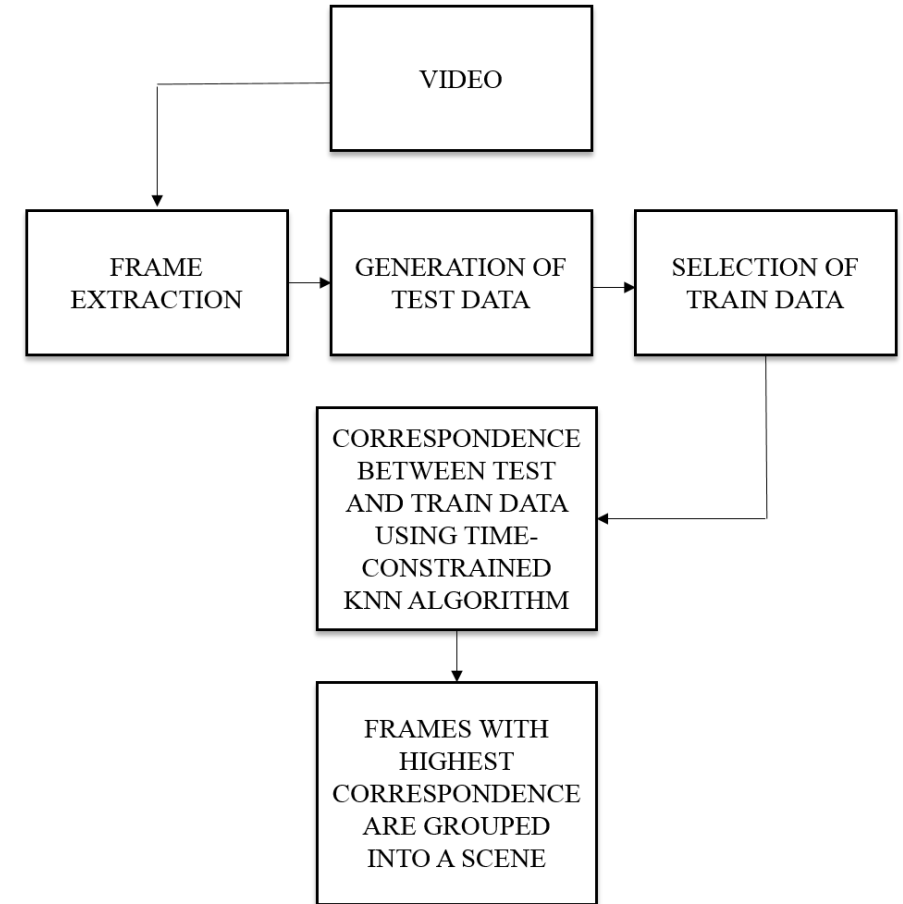


Fig. 4 Audio Vision Integration Approach

# ALGORITHM FOR AUDIO VISION INTEGRATION BASED APPROACH

- The frames from the video are extracted and stored as test images.
- Each training image has a class/group that indicates it.
- Each test image is compared with all the training set and the best match is found.
- Using a time-constrained nearest neighbor algorithm, a specific class is assigned to each frame.
- Scenes are segmented based on the assumption that whenever the class of the frame changes, there is a change in the scene.

# MODULE DESCRIPTION

## BACKGROUND BASED APPROACH

- A frame belongs to a scene based on the similarity that they have in a background.
- The classification of frames into scenes is done with the change in background.
- The background can be subtracted from all scenes
- Changes in the frames is determined on a measure of how different the frame is from the background.

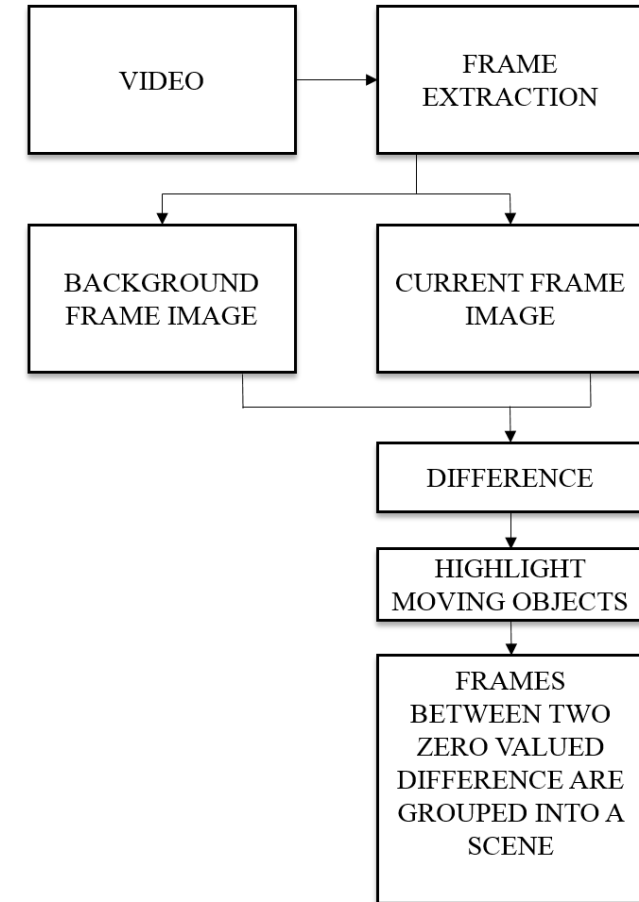


Fig. 5 Background Based Approach

# ALGORITHM FOR BACKGROUND BASED APPROACH

- Compare each frame with the background.
- Mark any changes present using any indication.
- Check the indication and the scenes containing the background are identified
- Scenes are segmented using the assumption that, from one point where background appears to the next consists of one scene.
- The output of this algorithm consists of the subtracted background.
- Finally, the scenes are segmented using these indication.



# SCREEN SHOTS : KEY FRAME BASED APPROACH

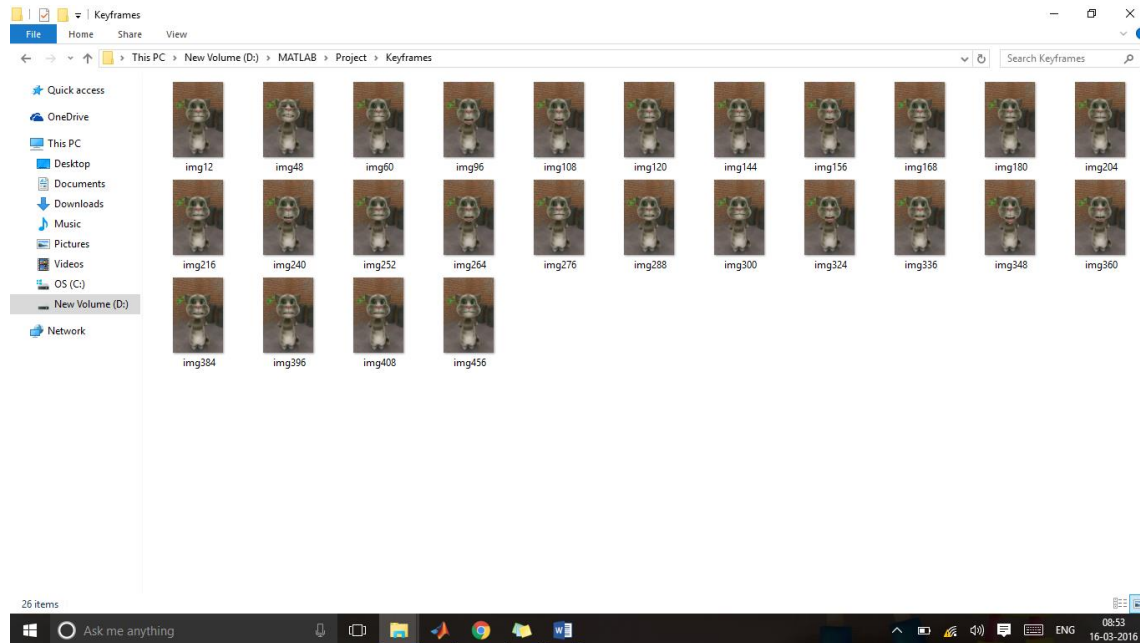


Fig. 6 Generated key frames in file

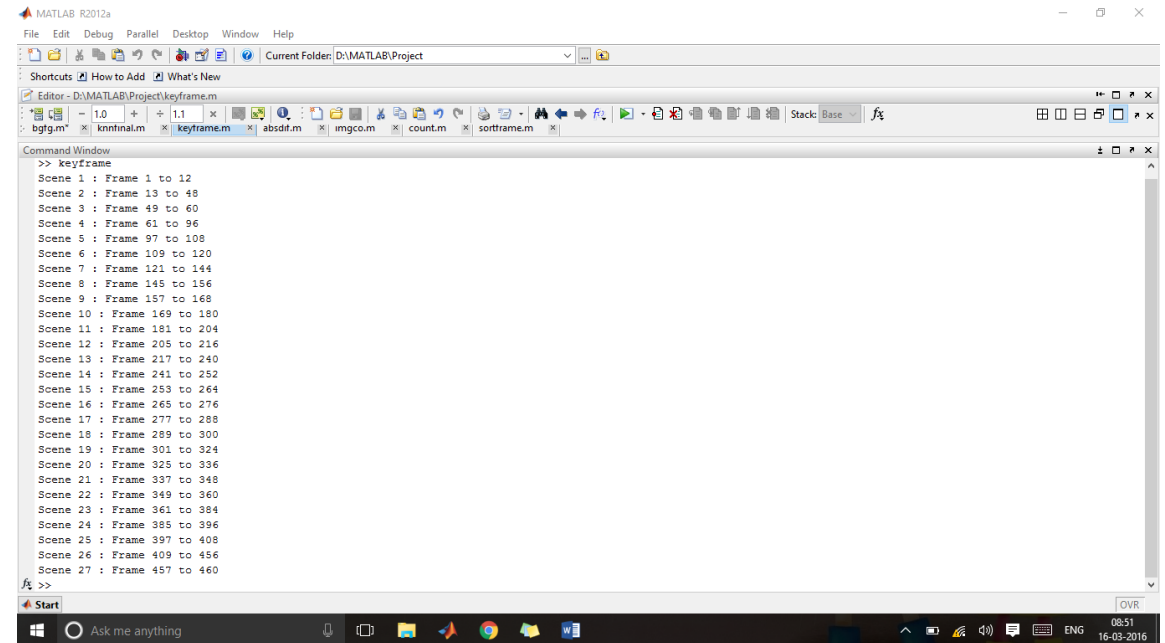


Fig. 7 Frame generation in matlab

# SCREEN SHOTS : AUDIO VISION INTEGRATION APPROACH

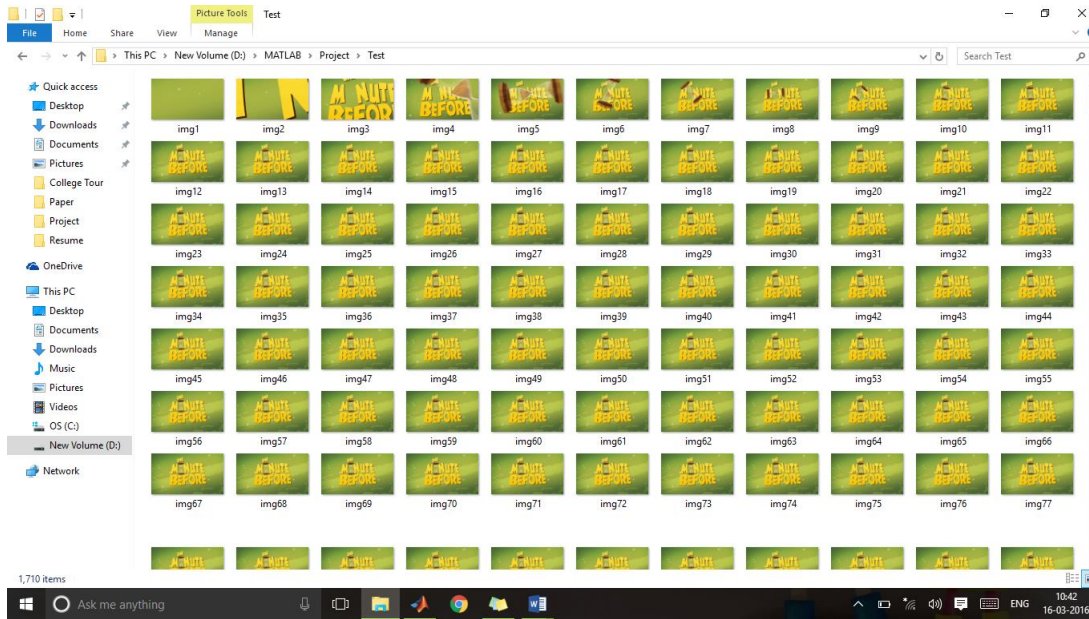


Fig. 8 Frames generated for AV Integration in File

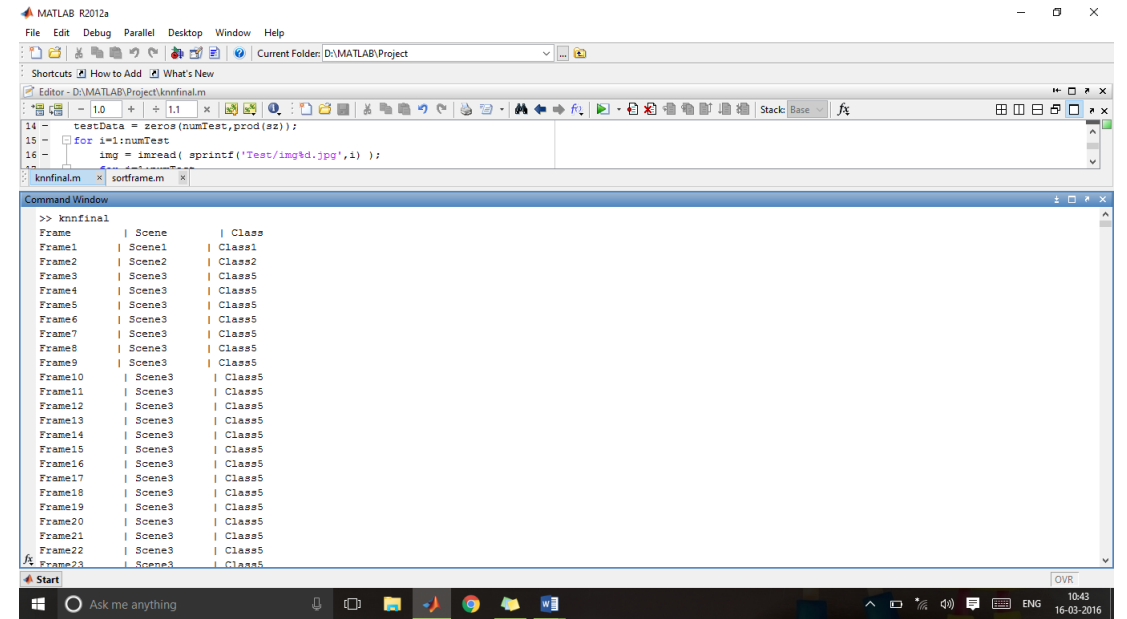


Fig. 9 Output for AV in Matlab-1

# SCREEN SHOTS : BACKGROUND BASED APPROACH

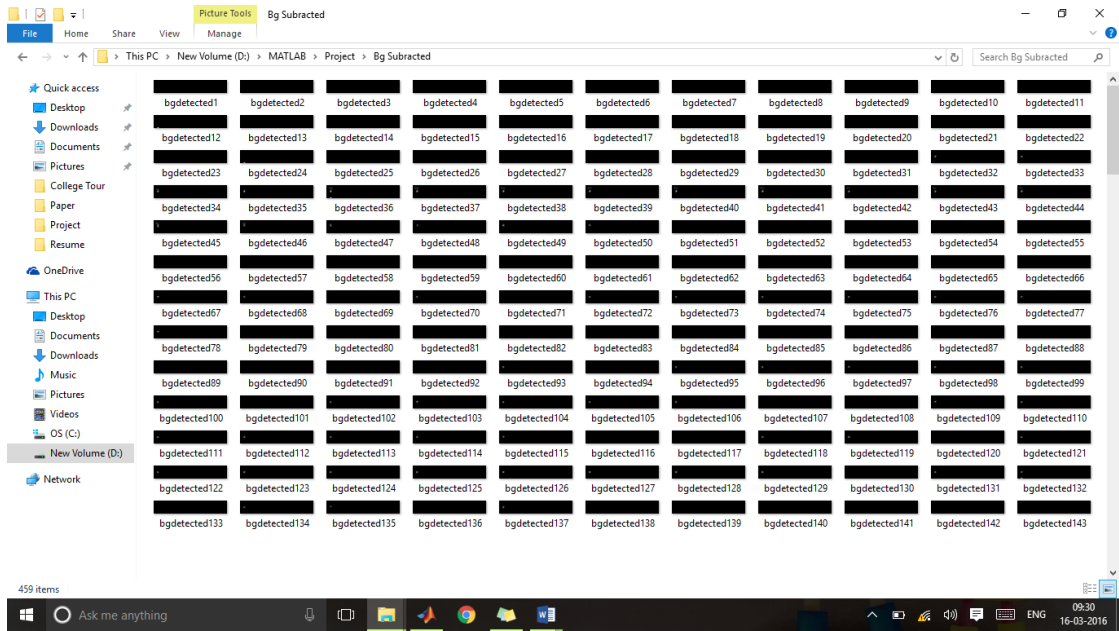


Fig. 10 Generated Background Frames in File

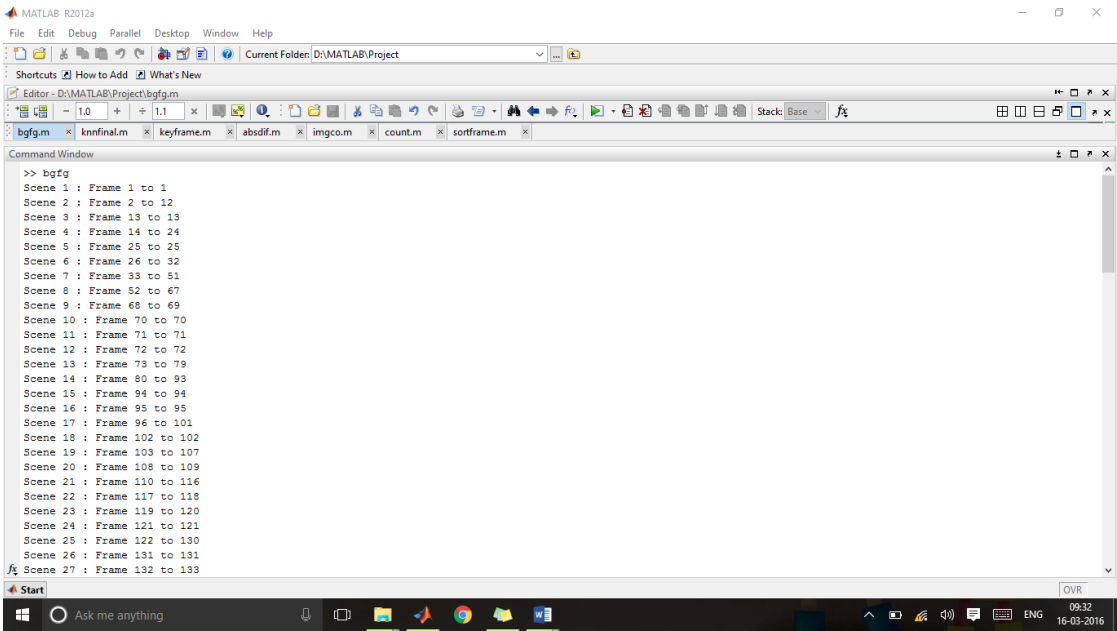


Fig. 11 Output in Matlab - 1

# CONCLUSION

In our project, We have presented

- The implementation of structural analysis of video.
- Shot boundary detection.
- Scene segmentation was executed using three approaches:
  - Key frame based approach,
  - Audio-vision integration based approach
  - Background based approach.
- Used as the base for implementation of video indexing and retrieval.

# FUTURE WORK

Although there are many developments in the processing of video, content based video indexing still has many approaches to be explored. Processing of any video starts with structural analysis. The following developments can be carried out.

- Video Data mining.
- Video Classification.
- Video Annotation.
- Indexing using Query and retrieval.

THANK YOU