

Robotic System to Identify Finite Number of Significant Image Frames on Large Video Data
using Unsupervised Machine Learning TechniqueSreedhar Kumar Seetharaman ^{1,2*}, and Basant Kumar³^{*1} Department of Information Science and Engineering, Sir M Visvesvaraya Institute of Technology, Bengaluru, Karnataka, India^{*2} Post Doctoral Fellow, Lincoln University College Malaysia, Malaysia³ Department of Mathematics and Computer Science, Modern College of Business and Science, Bowshar, Sultanate of Oman

INTRODUCTION & AIM

In this research paper, a video related automated system namely Robotically Image Key Frame Identification System (RIKFIS) is proposed. It aims to instinctively identify the finite number of representative image frames over the any type of input video through the process of splitting the video contents into optimum number of distinct clusters with different size using Optimal-N-Means (ONM) clustering technique.

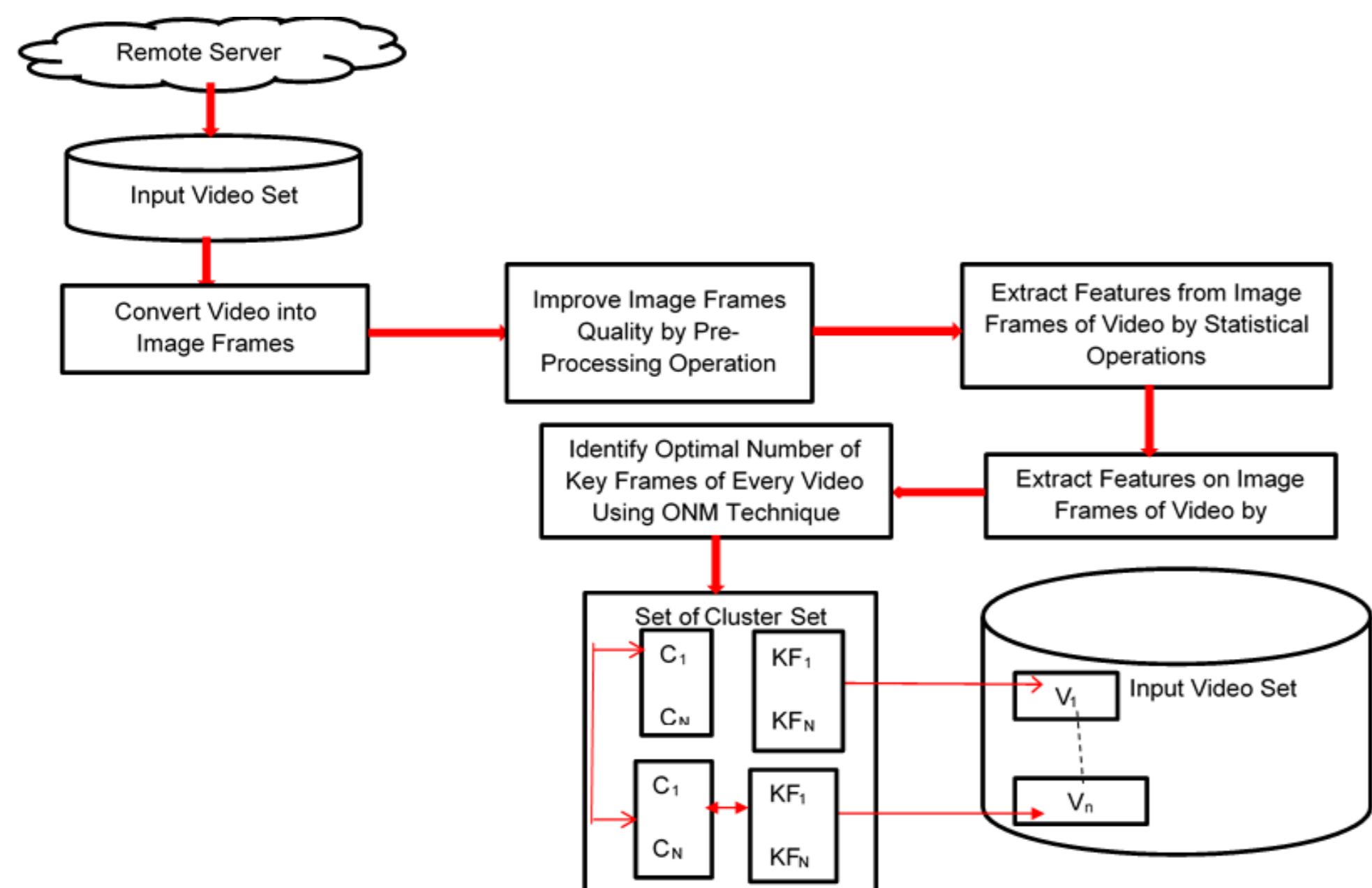


Figure 1: Proposed RIKFIS System Architecture

METHOD

The proposed RIKFIS system is containing five stages, in the beginning stage, the RIKFIS is converting the input video into sequence of image frames using standard open CV tool. Subsequently, the proposed system is improving the image frame quality through pre-processing every individual image frame from the result of previous stage. Afterward, the RIKFIS system is extracting highly relevant features from each image frame in the image frame set of input video using standard arithmetic operations. Consecutively, the proposed system is iteratively split the image frame vector set of image frame set of videos into finite number of clusters through the process of iteratively identify the optimal number of representative image frames over the input image frame set of input video using Optimal-N-Means clustering technique, where N is denoting optimal number of representative image frames in the image feature vector set of input video. In the final stage, the RIKFIS system is validating dissimilarity level among the key image frames which is identified in the clustering stage. The significant stages involved in the RIKFIS system have been illustrated in Figure 1.

RESULTS & DISCUSSION

For the examination reason, we have tested large number of dissimilar videos [1] with different fps rates through our proposed RIKFIS system and the details of the some of tested input video with results have been presented in the Figure 2, Figure 2 and Figure 3. The validation result of key frames identified in the input video has been illustrated in the Figure 4.

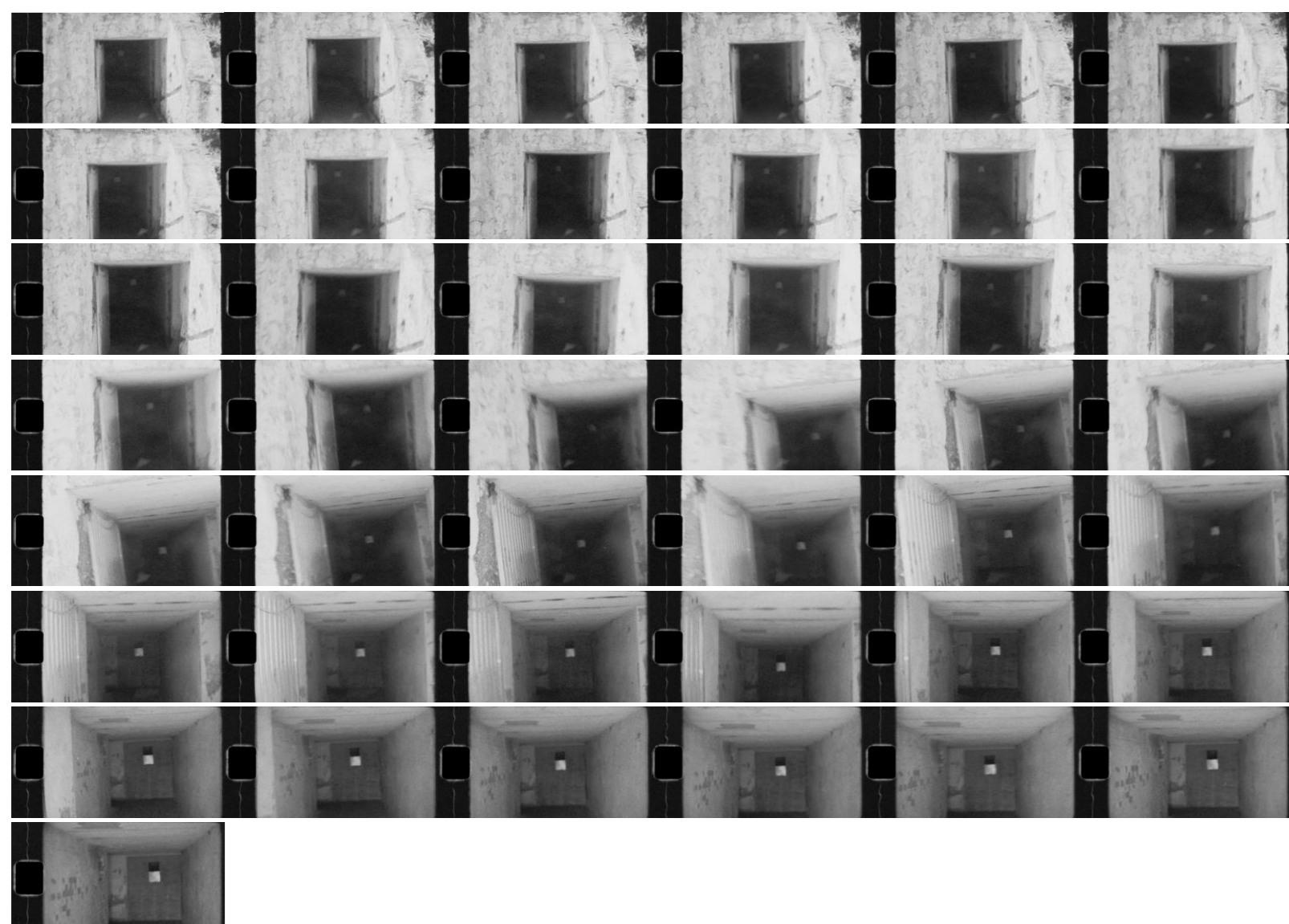


Figure 2: Sample Lesser Duration Input Video with 43 Original Image Frames with Size of 1280*720

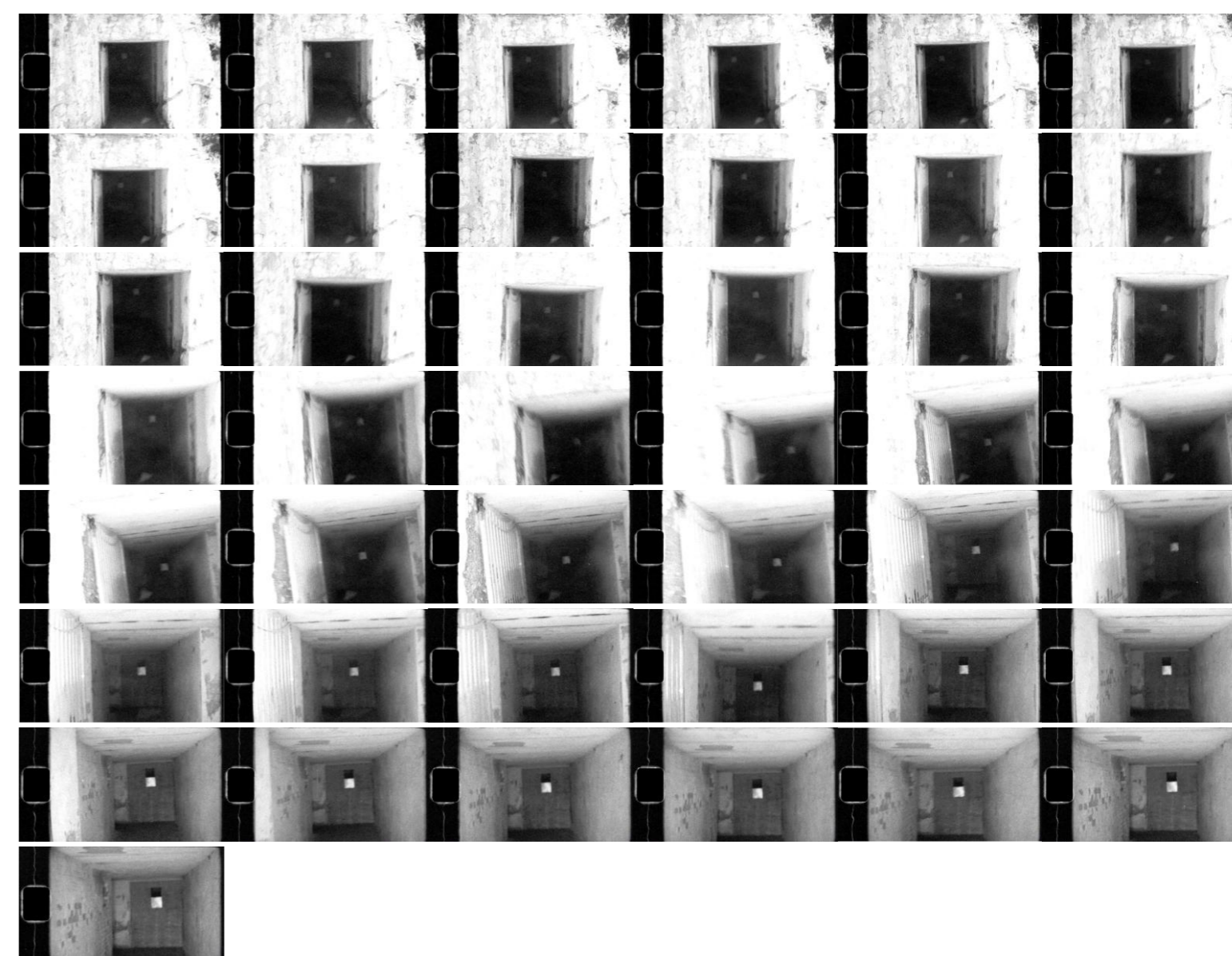
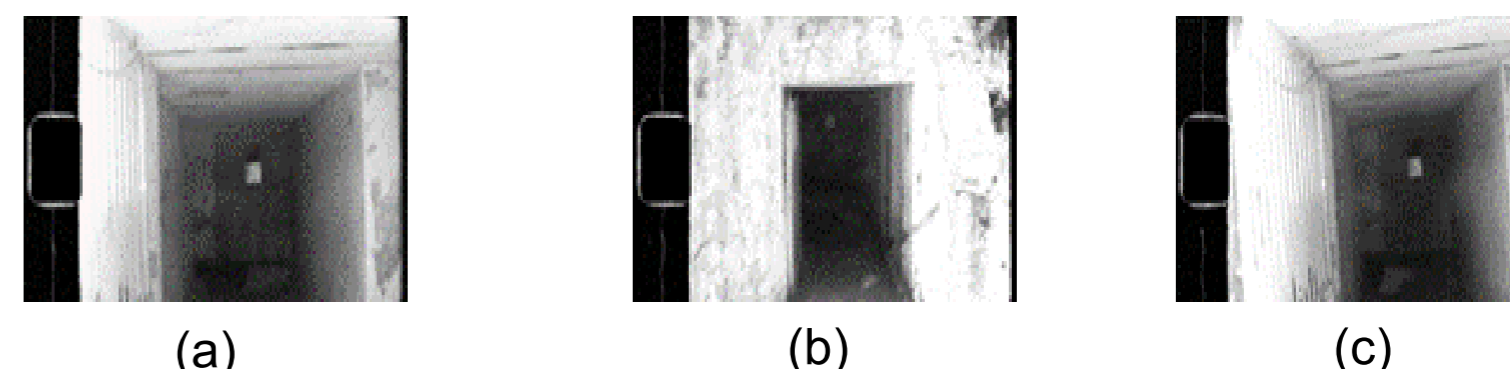
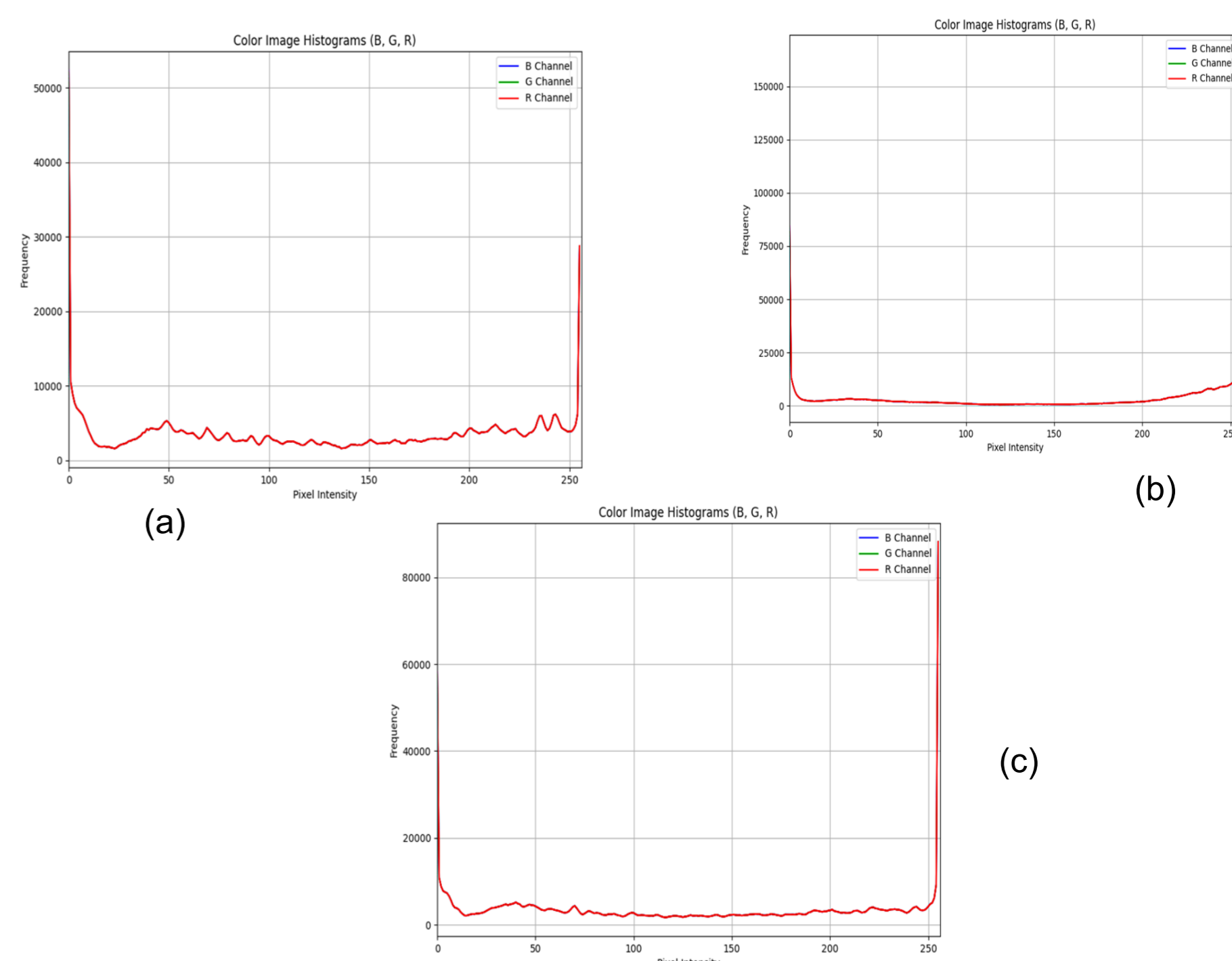


Figure 3: Pre-Processed Result of Sample Input Video with 43 Image Frames in Figure 2

Figure 4: Result of Clustering Stage in RIKFIS is Identified three Distinct Clusters with Different Size Including One Key Frame form each Cluster in Sample Input Video in Figure 3. (a) 1st Key Frame of Cluster 1, (b) 2nd Key Frame of Cluster 2 (c) 3rd Key Frame of Cluster 3Figure 5: Validation Result of Three Key Frames Identified Over Three Distinct Clusters in Sample Video in Figure 4; (a) Histogram of 1st Key Frame (b) Histogram of 2nd Key Frame (c) 3 Histogram of 1st Key Frame

CONCLUSION

This research work is presented a video retrieve related system called Robotically Image Key Frame Identification System (RIKFIS) and it aims to impulsively detect the optimal number of key image frames within the video by the process of separating the video frames into finest number of dissimilar clusters with diverse size using Optimal-N-Means (ONM) approach. The experimental results are showing that how the proposed RIKFIS system is thriving appropriate to spontaneously detect the vital key image frames on the various types of video data in the set of videos.

FUTURE WORK / REFERENCES

We have to extend our research work to complete video retrieve phase through the process of take any type of end user query input in form of image frame and respectively trace and generate highly related videos from the large different types of trained video set with key frames.

[1] <https://www.kaggle.com/datasets/>

[2] S. Sreedhar Kumar, Syed Thouheed Ahmed, Qin Xin, S. Sandeep, M. Madheswaran, Syed Muzamil Basha, Unstructured Oncological Image Cluster Identification Using Improved Unsupervised Clustering Techniques, Computers, Materials and Continua, Vol. 72, No.1, PP. 281-299, 2022 ISSN 1546-2218, <https://doi.org/10.32604/cmc.2022.023693>.