A Computer vision framework for detecting and preventing human elephant collision

Pushkar shukla, Isha Dua,Balasubramanian Raman and Ankush Mittal

Indian Institute of Technology, Roorkee

Raman classes,Roorkee

Introduction

- In this paper, we propose a framework that relies on computer vision approaches for detecting and preventing Human Elephant collision.
- The technique recognizes the area of conflict where the accidents are more likely to occur.
- This is followed by detecting and tracking elephant in the area of conflict using particle filtering algorithm.
- A warning message is displayed as soon as the position of the elephant overlaps with area of conflict.
- Goal is to build system capable of detecting and preventing HEC.

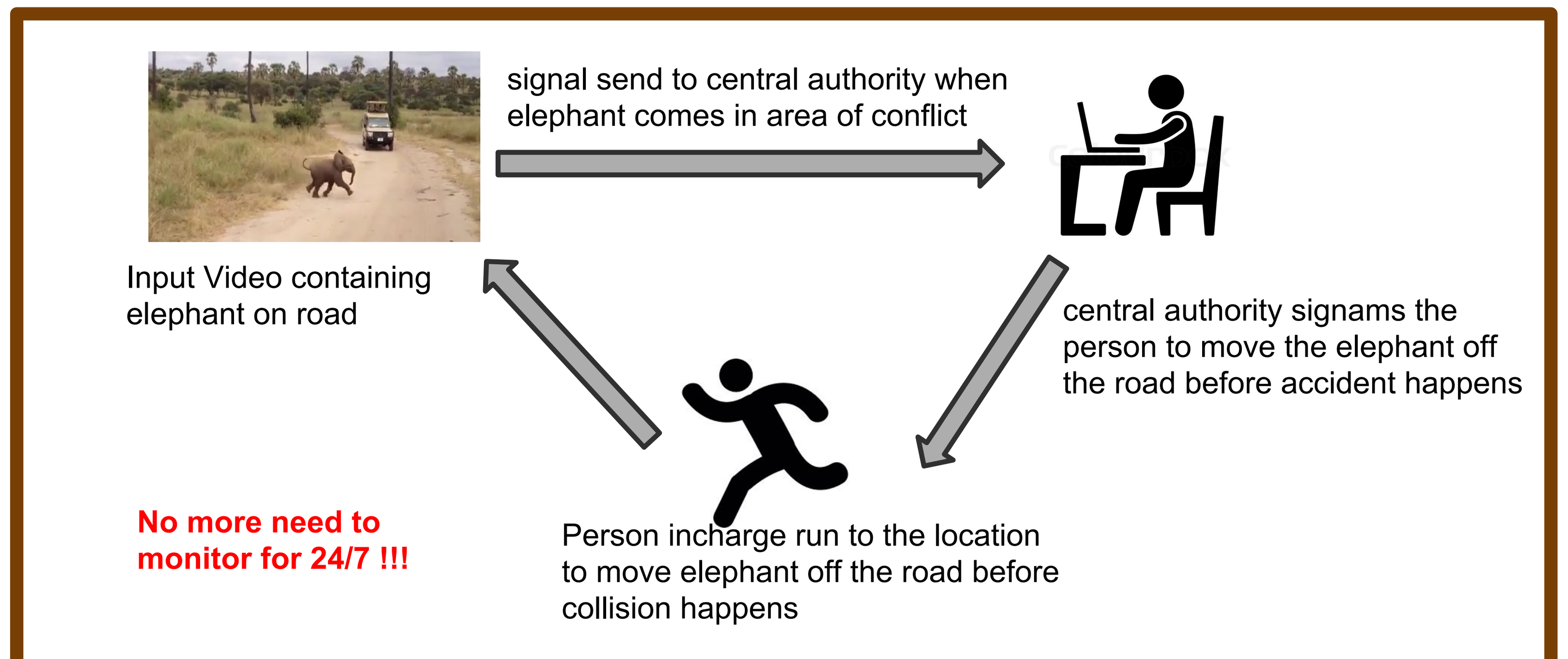


Fig1: Overview of the automated system capable of detecting and preventing Human Elephant collision.

Proposed Approach

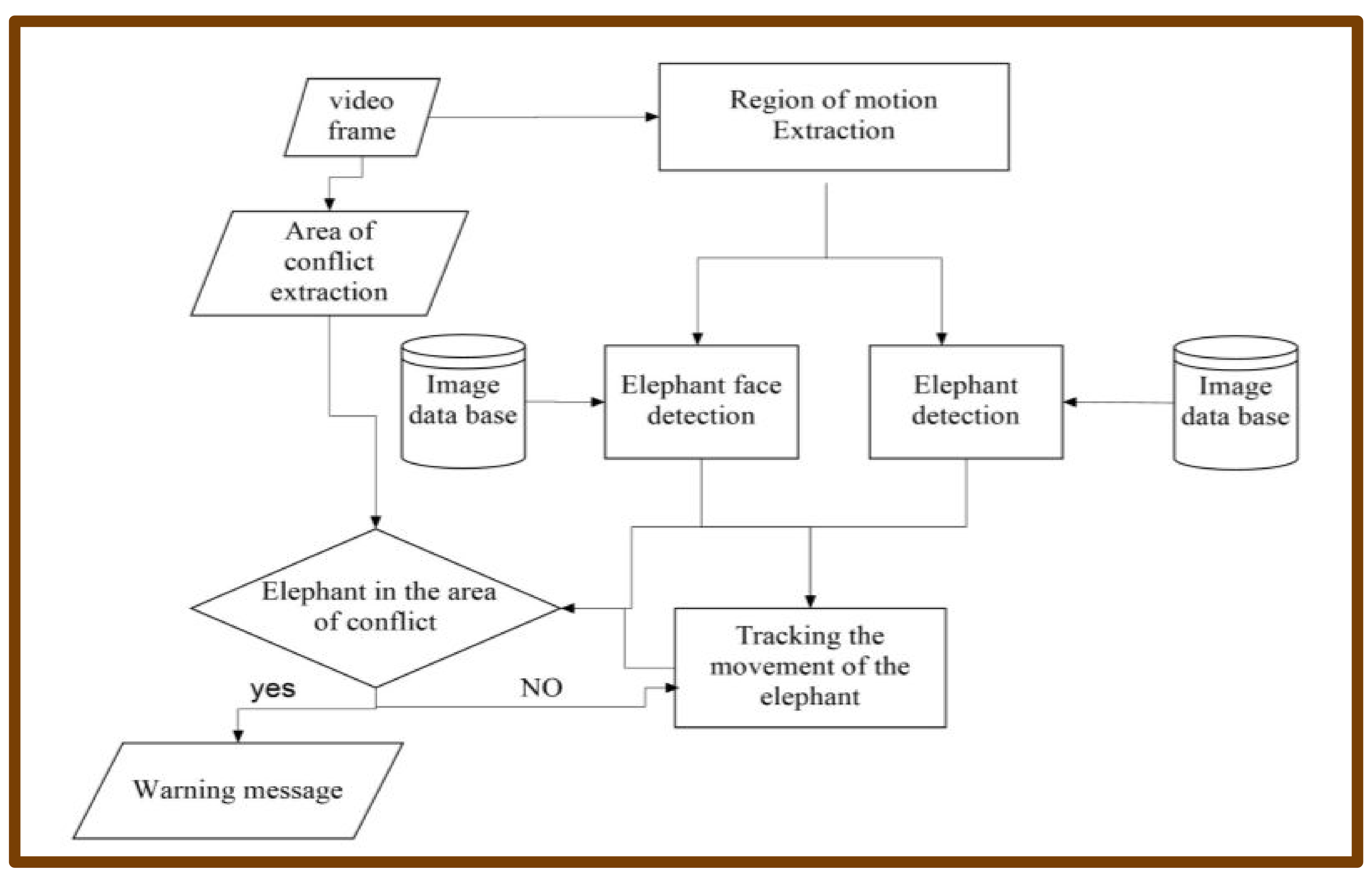


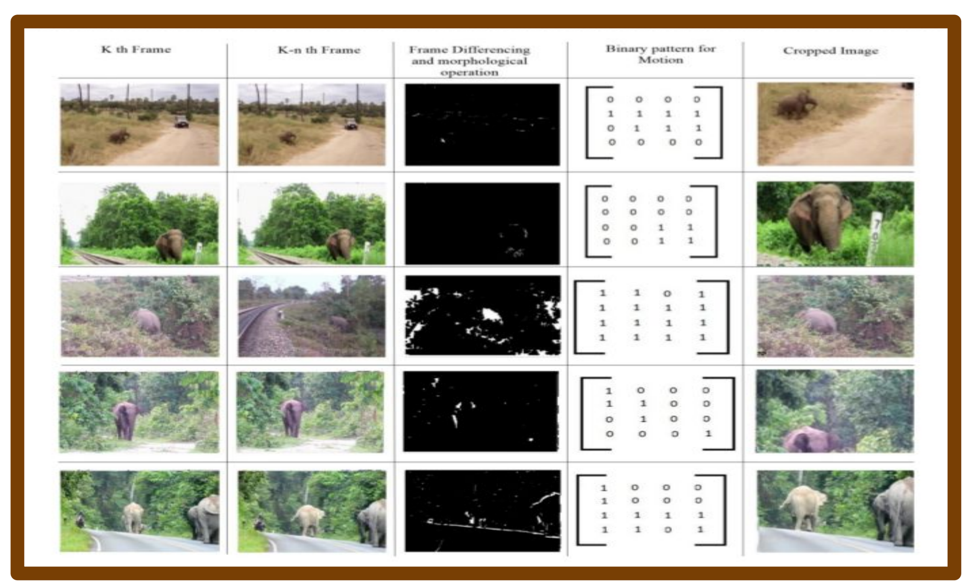
Fig2:; Block diagram representation of proposed approach

Method

Identify the region of conflict

Fig3: The above figure shows the extraction of area of conflict for two different scenarios.The railway track was identified as the area of conflict in the first scenario while the road was detected as the area of conflict in the second scenario. The coordinates of the area of conflicts that were extracted using the color+spatial property of image have been shown in the figure along with the super pixel cluster for the frame.

Binary Pattern for motion



- Biinary pattern of motion used to extract major areas of motion.
- The binary pattern of motion for binary image containing the difference of two frames is obtained by dividing the image into 16 cells. The total number of 1's in each cell is counted and stored in a motion matrix . The thresholding of the motion matrix into a binary pattern for motion

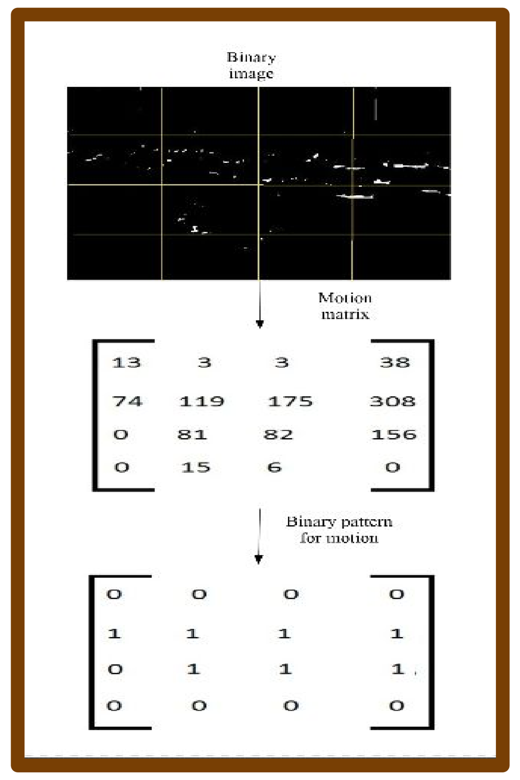


Fig4: Above fihgure shows the computation of binary pattern for motion.

Elephant Recognization using Deep CNN

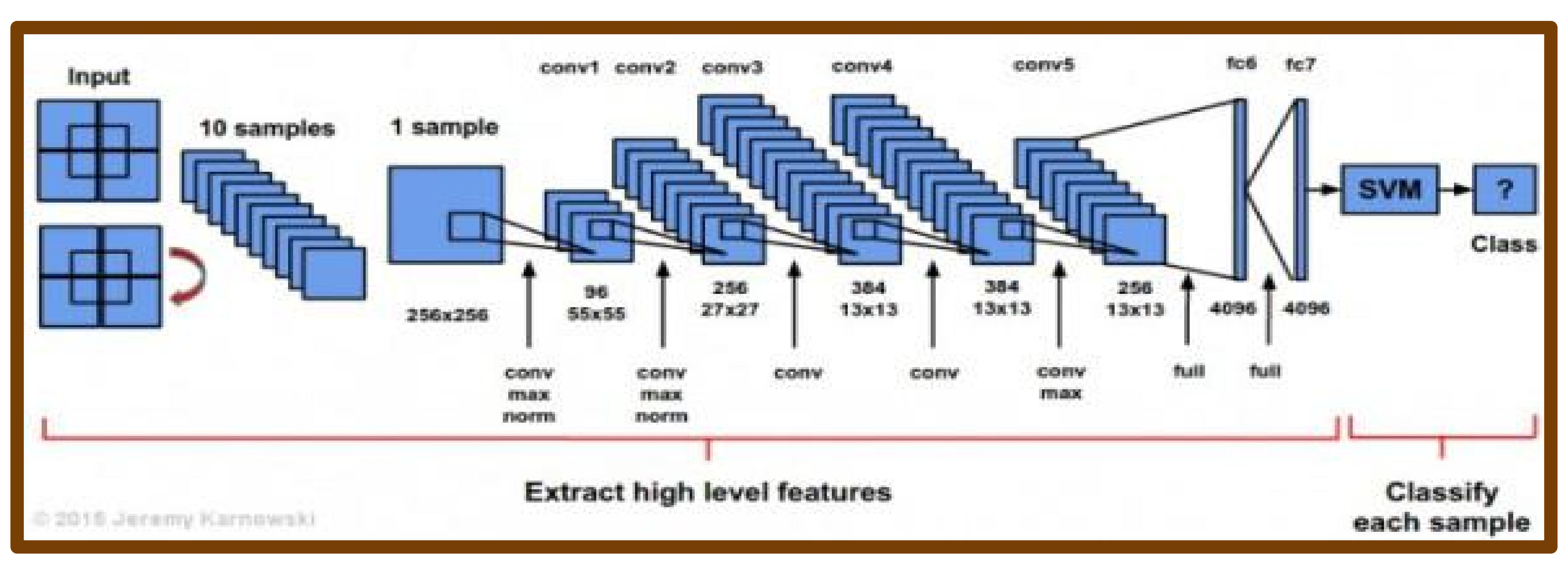


Fig5: The figure shows the deep convolutional neural network used for extracting high level features from the input cropped image.The extracted features are then fed into binary SVM classifier to classify into either elephant class or non elephant class

Experiments and Results

Dataset

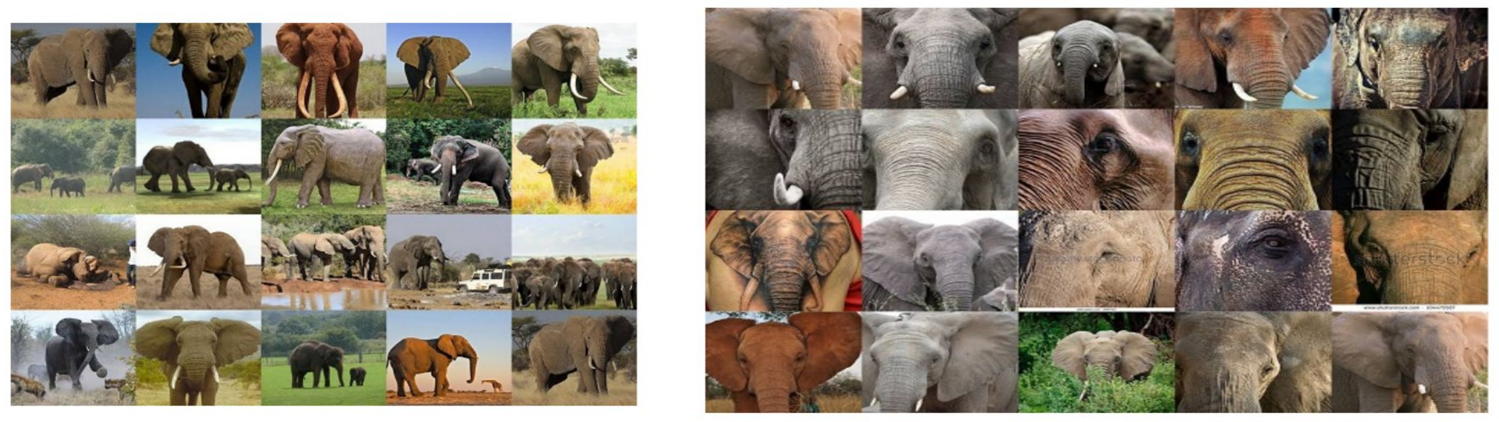


Fig6:Left image contains samples of images of elephants used for training the elephant recognition model..Right image contains samples of images of elephants face used for training the elephant recognition model.

Quantitative Results

Approach	MAP(%)	MAR(%)
LBP +KNN	28	82.353
LBP +SVM	80	57.97
LBP +Random Forest	86	78.12
SIFT + KNN	78	78.416
SIFT+ SVM	22	100
SIFT+ Random Forests	48	32.44
HOG+ KNN	32	82.353
HOG+ Random Forests	78	78.409
Dua .et.al	100	63.29
Proposed Approach	**98.621**	**97.279**

Approach	MAP	MAR
HOG+ KNN	72	63.158
HOG+ Random Forests	90	77.586
Dua .et.al	72	63.158
Proposed Approach	**98.67**	**96.109**

Table :Left image shows comparison of various approaches applied for elephant recognition. Right: image shows comparison of Various approaches applied for elephant face recognition

Qualitative Results

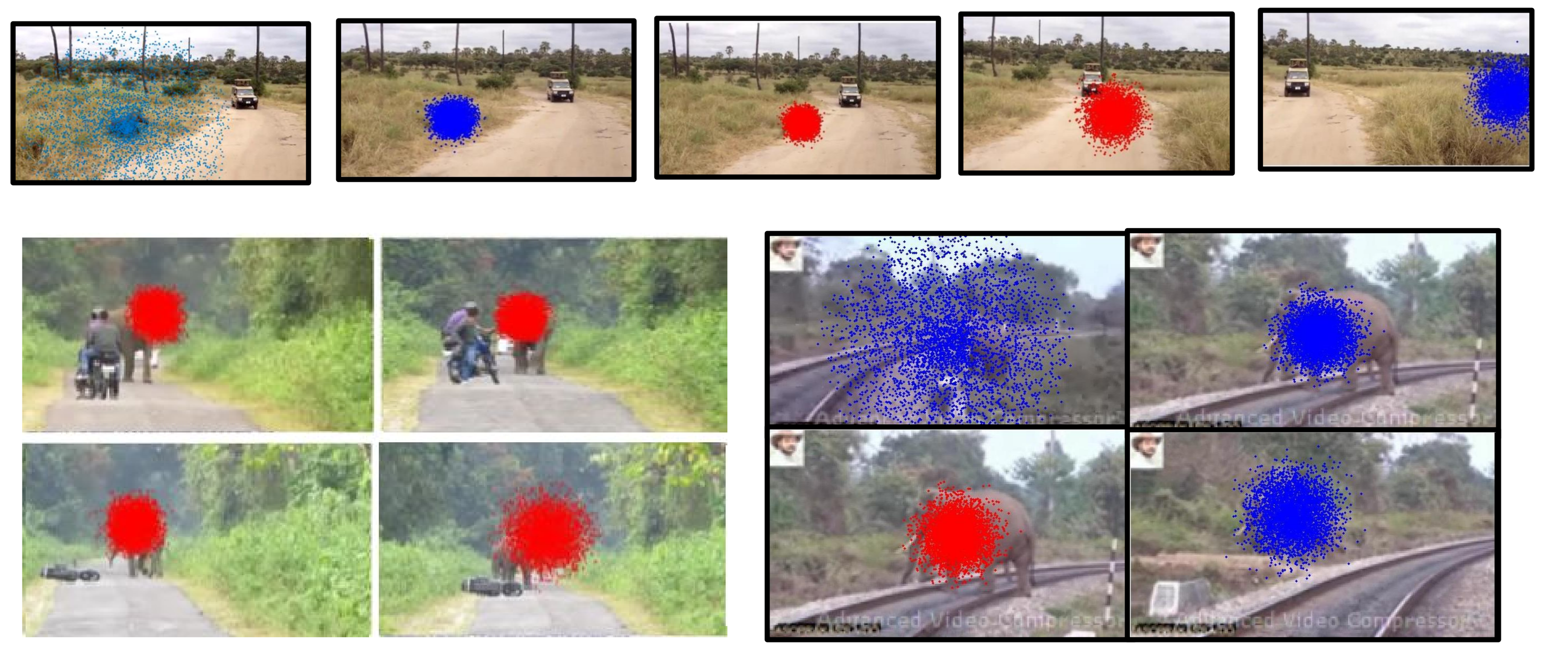


Fig:7 The particles successfully detected an elephant and change the color as soon as the elephant crosses the area of conflict..A scenario depicting elephant intrusion on raods and railway tracks. The scenario can be dangerous for the elephant, if it collides with fast moving car.

References

1. I. Dua, P. Shukla, and A. Mittal. A vision based human-elepahant collision detection system. In Image Information Processing (ICIIP), 2015 .
2. A. Karpathy, G. Toderici, S. Shetty, T. Leung, R. Sukthankar, and L. Fei-Fei. Large-scale video classification with convolutional neural networks,CVPR 2014.