

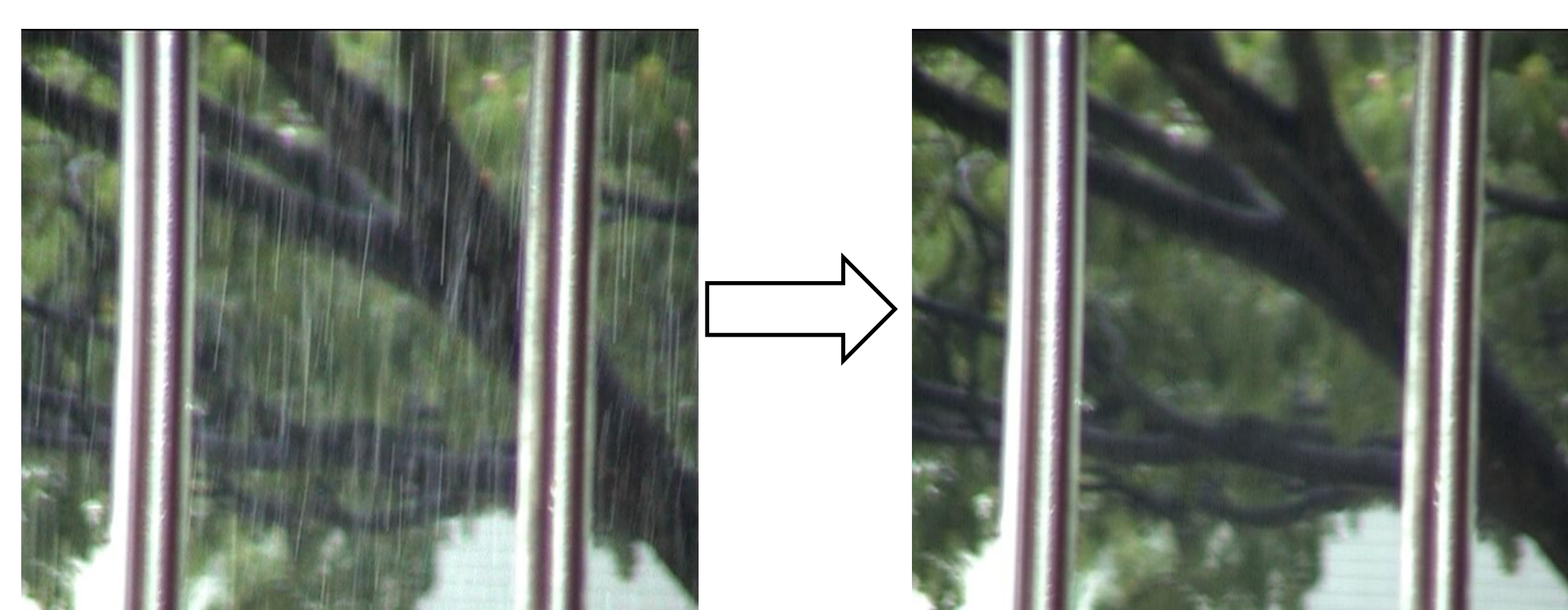
Phase Space Analysis to Detect and Remove Rain from Video

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Introduction

- Rain streaks in videos can be considered as dynamic noise that severely hampers the ability to extract information from a scene.
- Location of rain streaks in a frame is completely random.

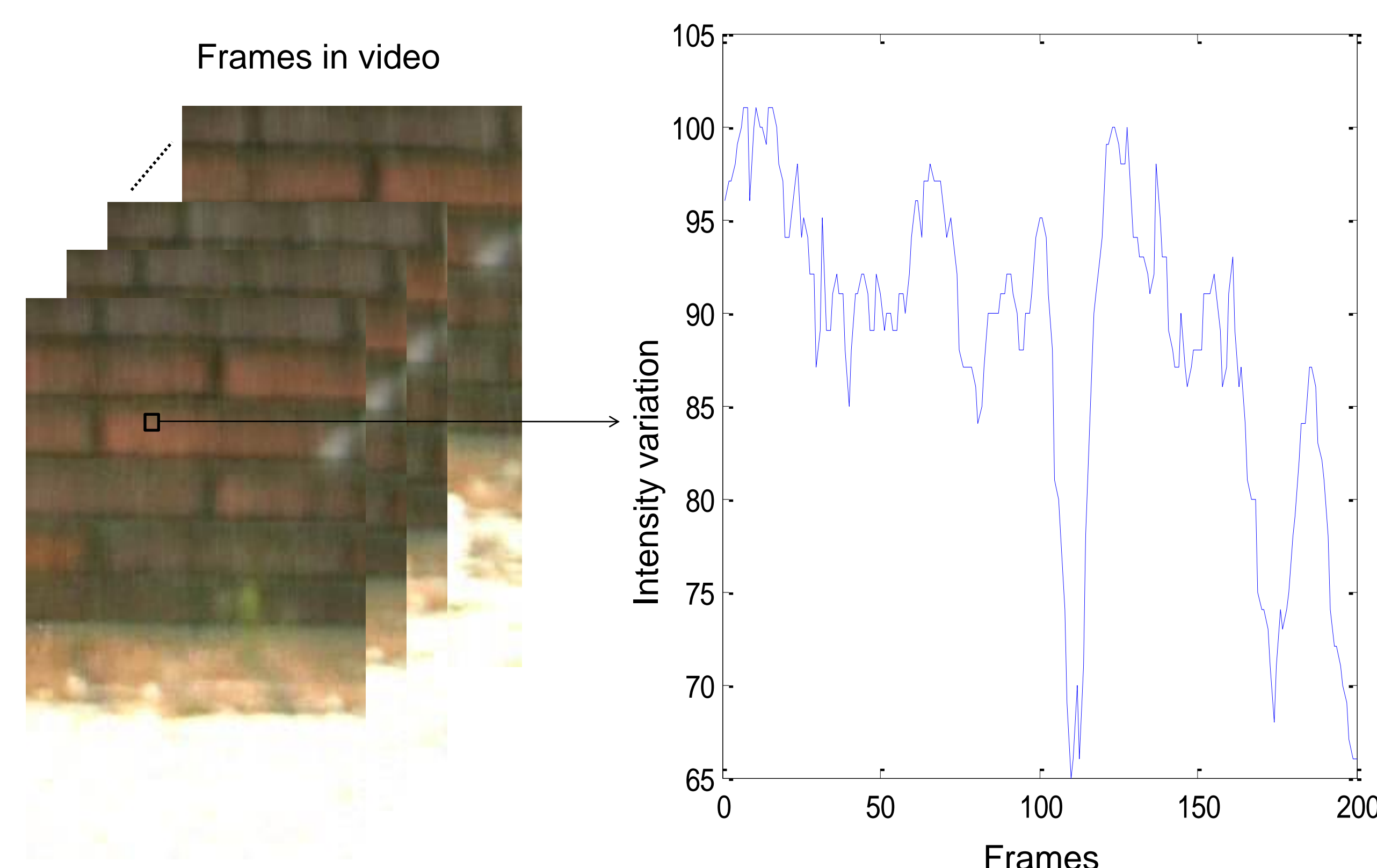


Frame with rain

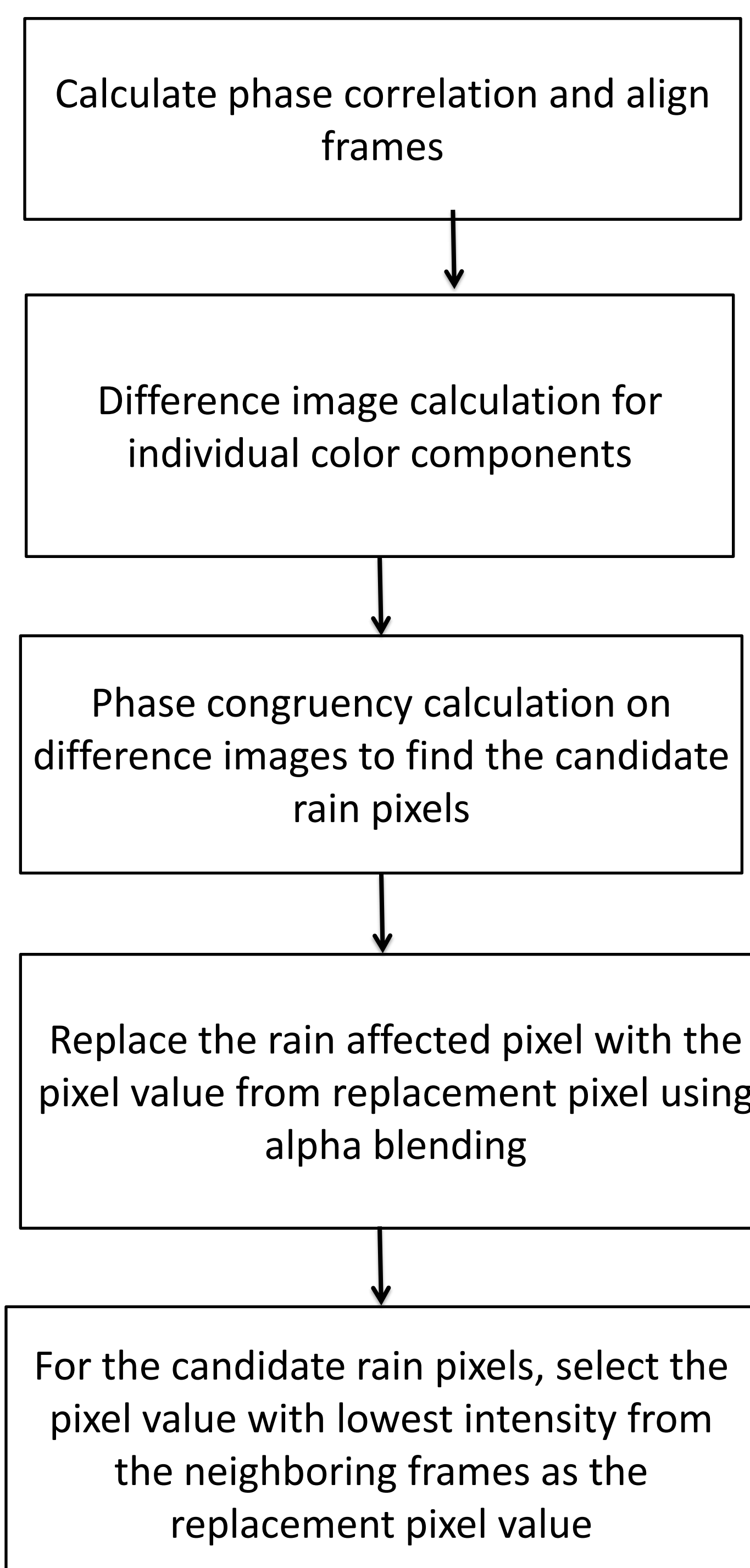
Frame with rain removed

Properties of Rain in Video

- Temporal property – Rain does not occlude all parts of the scene at all times.
- Chromatic property – Presence of a rain streak causes an increase in intensity at that particular pixel. The standard deviation of all the color components because of the presence of a rain streak will be similar.
- Directional property – Orientation of all the rain streaks in a frame will be in a single direction.

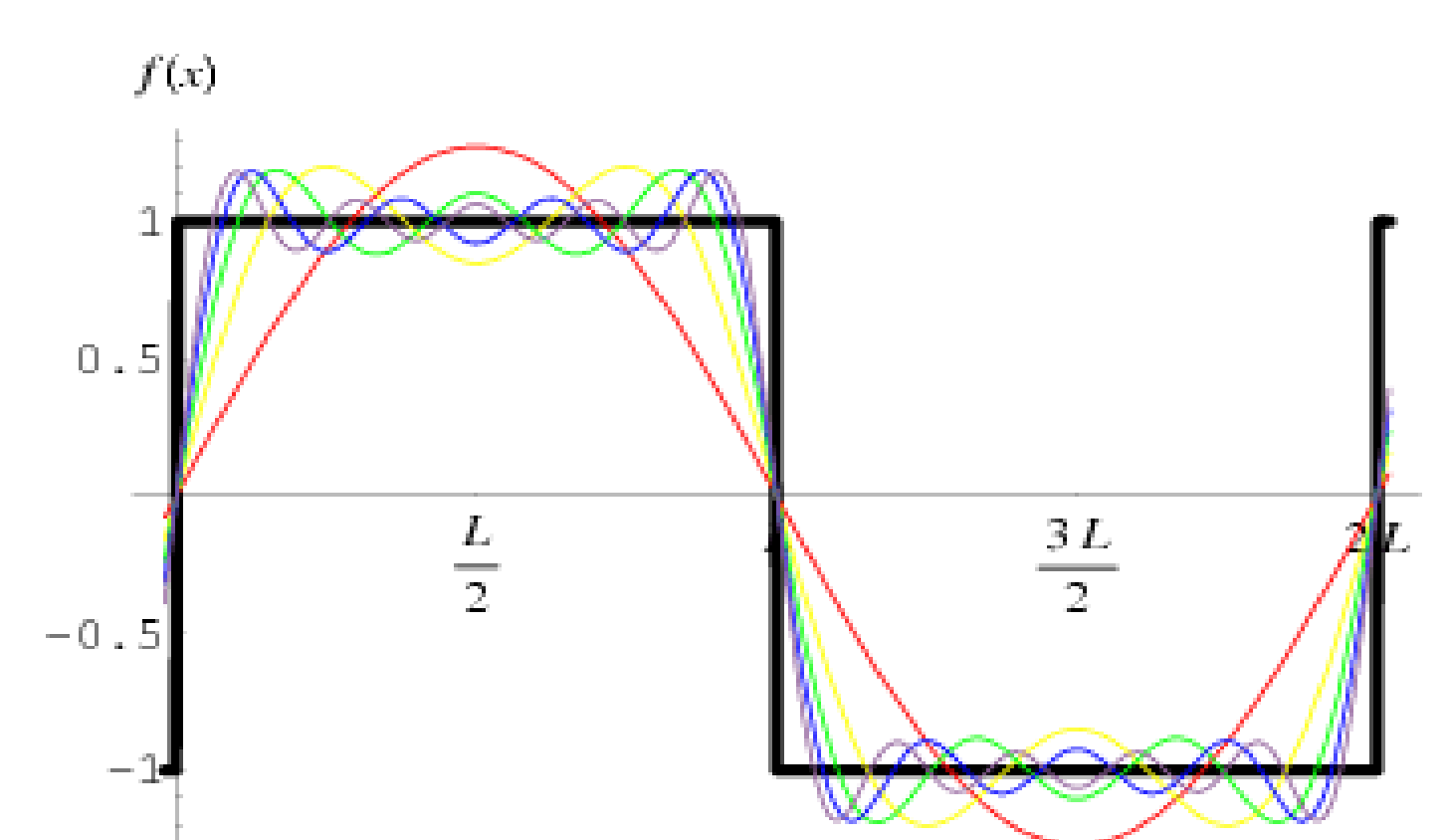


Algorithm



Phase Congruency Features

- Phase information of image contains the finer details.
- Key idea of Phase Congruency – Fourier components of an image are maximal in phase where there is an edge or line.



Results

- Results illustrated in following figures.



Frame with rain.
Notice the presence of vertical white structures in the scene



Frame with rain removed. The vertical white bars are preserved.



The rain component in the frame.

Conclusion

- Rain has been removed satisfactorily in different videos captured using a moving camera and containing rain with varying intensities.
- Research is in progress to improve the algorithm to account for object motion in the scene.