

## Contents

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- [Question 2. Part A](#)
- [Question 2. Part B](#)

### Question 2. Part A

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```

clear all;
close all;

vidSky1 = VideoReader('hw1_data/hw1_sky_1.avi');
vidSky2 = VideoReader('hw1_data/hw1_sky_2.avi');

numFrames1 = get(vidSky1, 'NumberOfFrames');
numFrames2 = get(vidSky2, 'NumberOfFrames');

% Read in 1st frame
fAvg1(:,:,:,:1) = im2double(read(vidSky1, 1));
fAvg2(:,:,:,:1) = im2double(read(vidSky2, 1));

for i = 2 : numFrames1
    frame1 = im2double(read(vidSky1, i));
    fAvg1(:,:,:,:i) = (i-1)/i * fAvg1(:,:,:,:i-1) + 1/i * frame1;

    frame2 = im2double(read(vidSky2, i));
    fAvg2(:,:,:,:i) = (i-1)/i * fAvg2(:,:,:,:i-1) + 1/i * frame2;

    if( i == 30)
        frame1_30 = frame1;
        frame2_30 = frame2;
    end
end

figure; imshow(fAvg1(:,:,:,:30));
title('Frame 30 with running average');
figure; imshow(frame1_30);
title('Frame 30 without running average');

figure; imshow(fAvg2(:,:,:,:30));
title('Frame 30 with running average');
figure; imshow(frame2_30);
title('Frame 30 without running average');

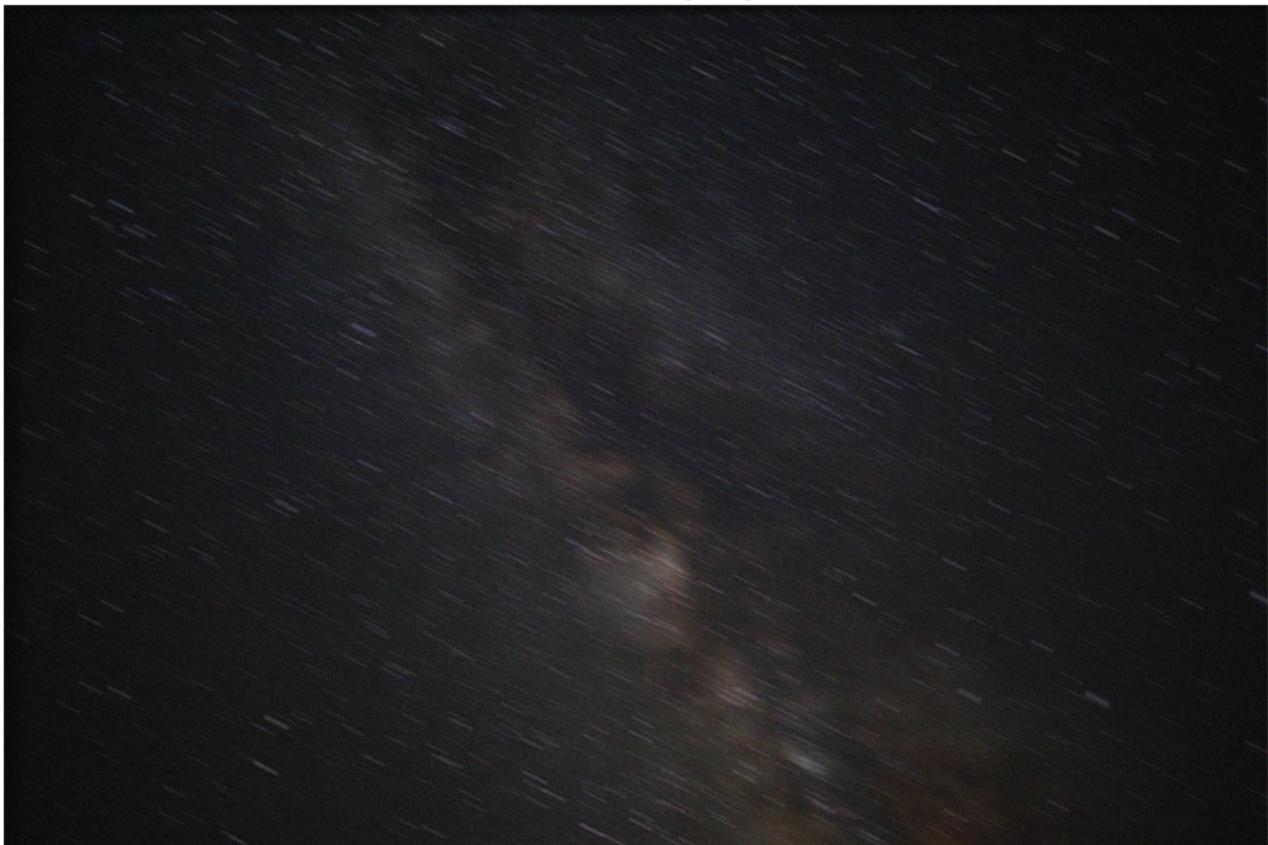
% From the images below we can see that computing the running average of
% the frames significantly reduces the noise in the video. This is most
% noticeable in sky_2, the video with the moon, where in the un-processed
% video we see a lot of noise surrounding the moon. In the processed video,
% we see that all of that noise is removed. This is less obvious in sky_1,
% the video of the stars, because the noise was blended into the stars.

% However, we can see that because we did not align the images we
% introduced a significant amount of blurring into the video. This is very
% obvious in sky_2, where the edges of the moon are blurry, as well as in
% sky_1 where we see "shooting stars" almost.

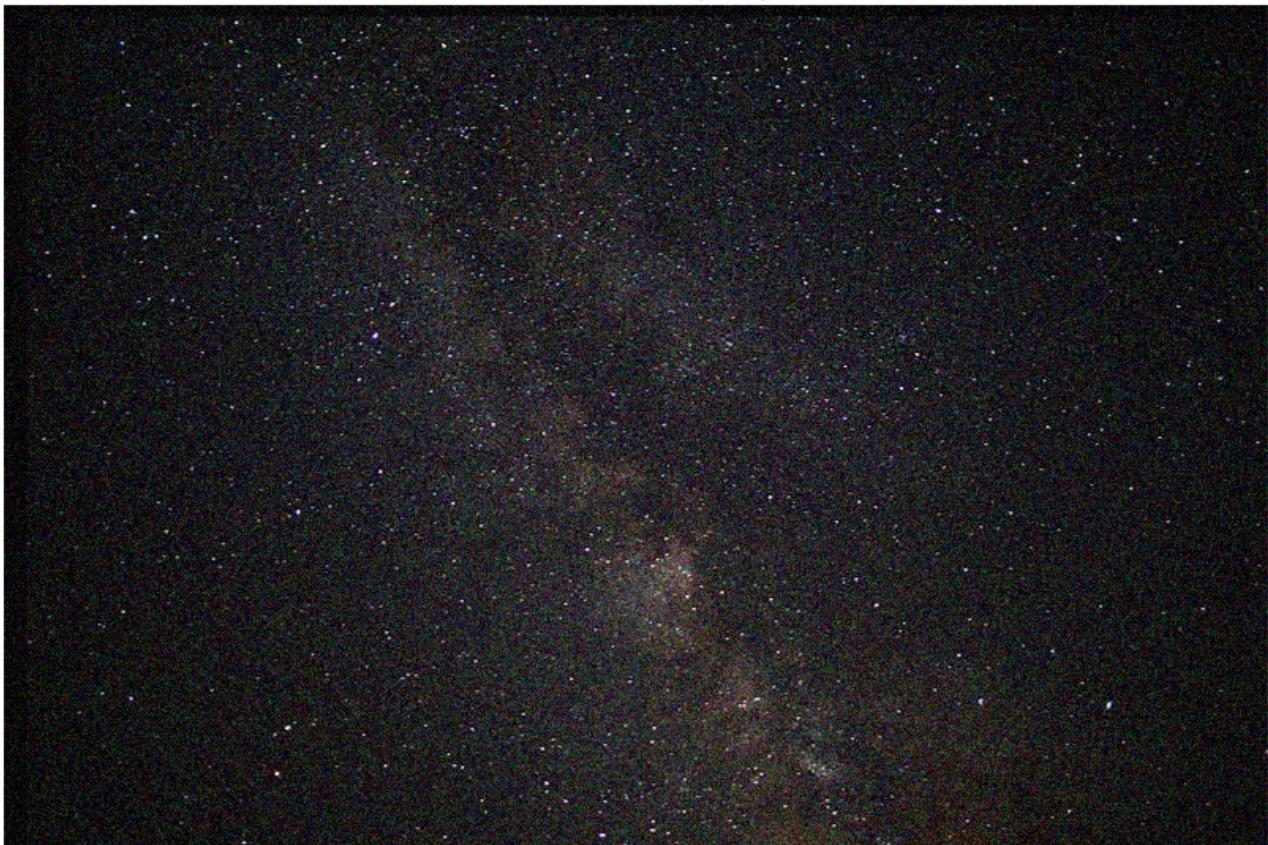
```

---

Frame 30 with running average



Frame 30 without running average



**Frame 30 with running average**

Frame 30 without running average



## Question 2. Part B

```
% Read in 1st frame
fAvg_align1(:,:,1) = im2double(read(vidSky1, 1));
fAvg_align2(:,:,1) = im2double(read(vidSky2, 1));

for i = 2 : 30
    frame1 = im2double(read(vidSky1, i));
    fAvg_align1(:,:,:,:i) = (i-1)/i * fAvg_align1(:,:,:,:i-1) + 1/i * Align(frame1, fAvg_align1(:,:,:,:i-1));

    frame2 = im2double(read(vidSky2, i));
    fAvg_align2(:,:,:,:i) = (i-1)/i * fAvg_align2(:,:,:,:i-1) + 1/i * Align(frame2, fAvg_align2(:,:,:,:i-1));

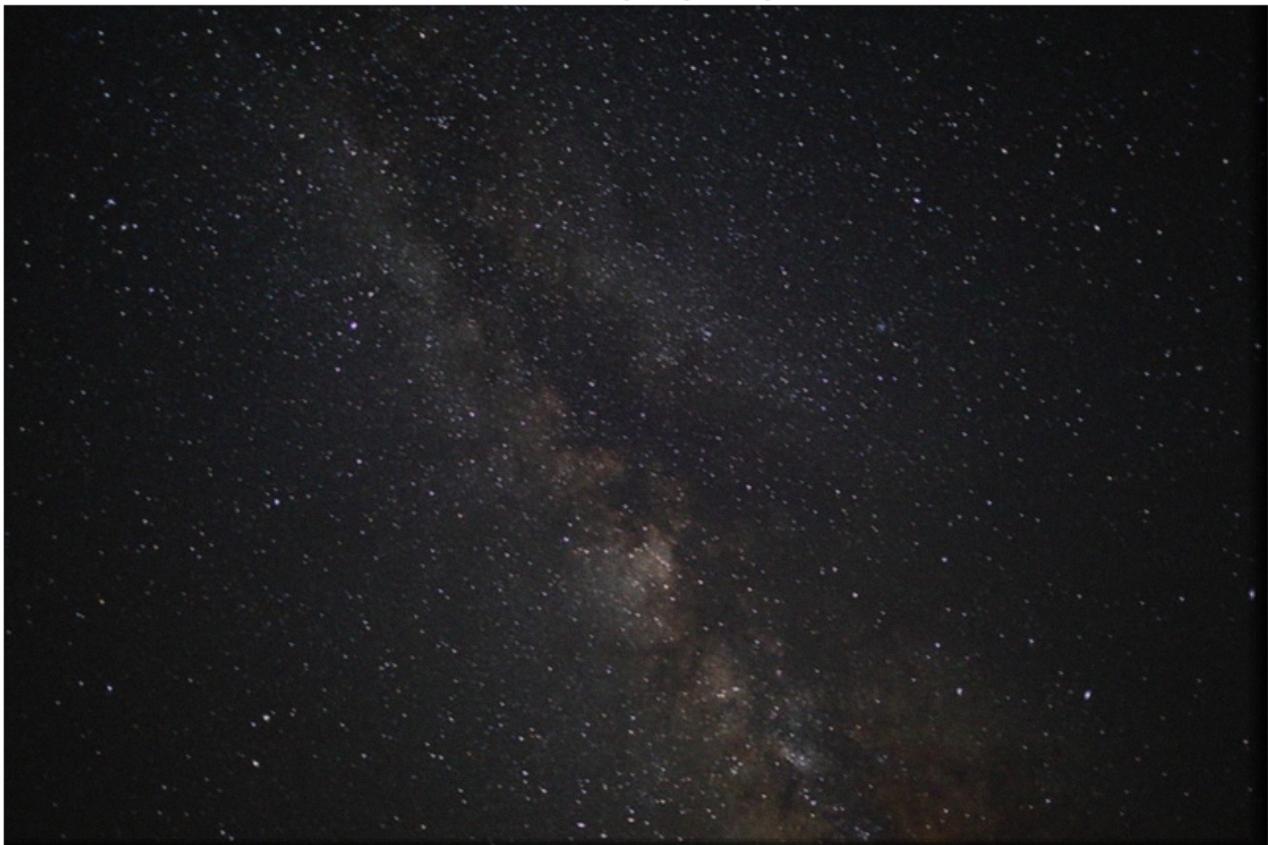
    if( i == 30)
        frame1_30 = frame1;
        frame2_30 = frame2;
    end
end

figure; imshow(fAvg_align1(:,:,:,:30));
title('Frame 30 with running average and alignment');
figure; imshow(frame1_30);
title('Frame 30 without running average');

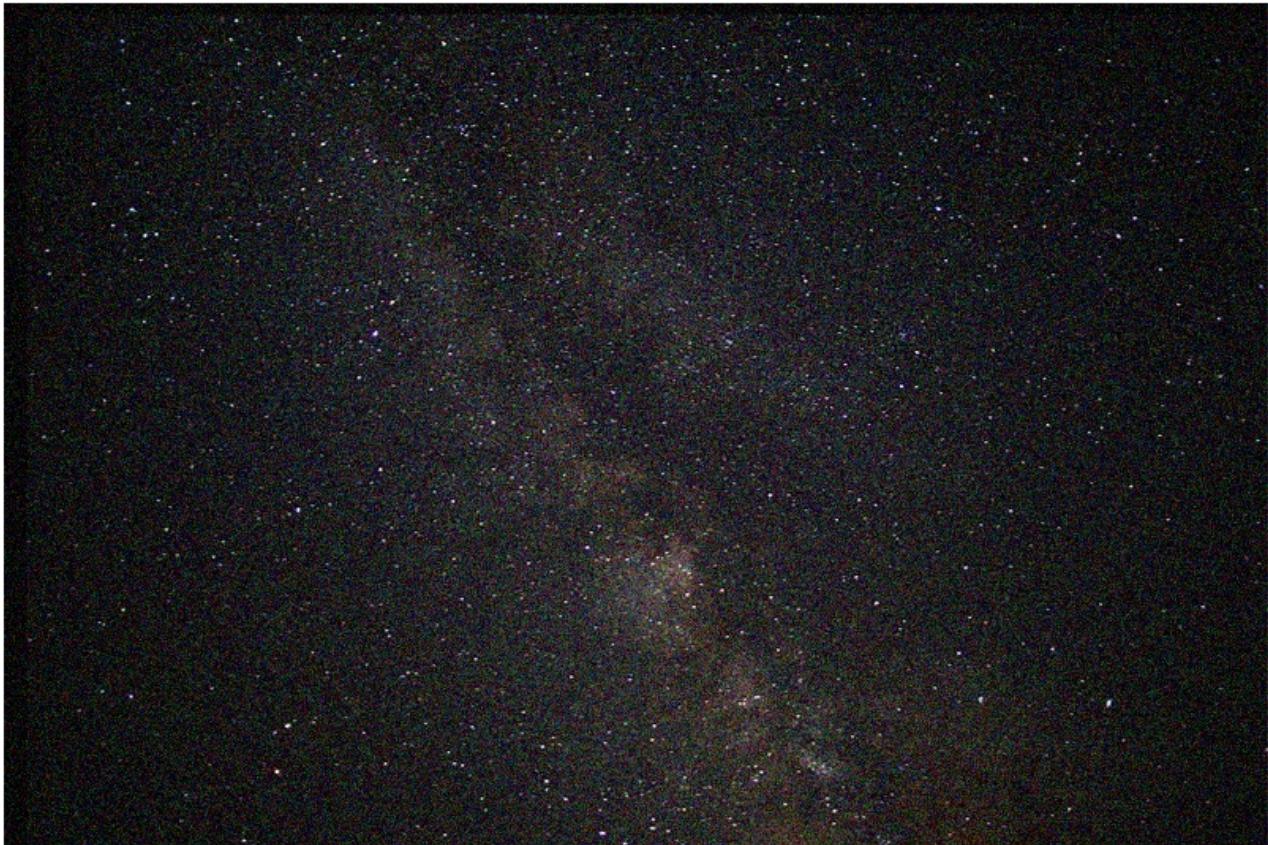
figure; imshow(fAvg_align2(:,:,:,:30));
title('Frame 30 with running average and alignment');
figure; imshow(frame2_30);
title('Frame 30 without running average');

% We can see that the sharpness of the image is preserved, while the noise
% is effectively removed. The alignment tracks the movement of the camera
% and removes the blurriness.
```

Frame 30 with running average and alignment



Frame 30 without running average



Frame 30 with running average and alignment



Frame 30 without running average



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