Question 1: Image Extraction at Best Quality

Qn.1A, if you used the supplied replay software:
please save and submit your results using the filename:
'Q1A_ReplayDescribed_YOURINITIALS' or

Please specify (i) the investigation method used to a) examine the video sequence and b) extract and examine the frame, and (ii) all steps executed. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

Provided software did not work on my Desktop PC (Intel Core i7 920 @ 2.67 Hz, 12 Gb RAM, Windows 7 SP1 64-bit).

Qn.1A, if you used another method:
Please save and submit your results using the filename: Q1A_Player1.0.12.0_ID23.png

Please specify (i) the investigation method used to a) examine the video sequence and b) extract and examine the frame, (ii) all tools used, and (iii) all steps executed. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

1. New software version: http://preservesafetyandaccess.com/psa/surveillance.html
2. Version number: 1.0.12.0 (as opposed to version number 1.0.8.0 provided)
3. Play software in same way as described
4. Take screenshot (display resolution: 1600x1200) (not the snapshot function from the software, because it blurs somehow the edges – so you loose information in this case)
5. Crop the screenshot with Pixelmator and save as PNG
6. Use MATLAB to further shrink the image (own script to check for "double" columns and rows and remove these) – in this case the labels (e.g. time/cam, etc.) have to be masked out in Pixelmator

Qn.1B, if you used the supplied replay software:
Please save and submit your results using the file name:
'Q1B_ReplayDescribed_YOURINITIALS'

Please specify (i) <u>the investigation method</u> used to <u>a) examine the video sequence</u> and <u>b) extract and examine the frame</u>, and (ii) <u>all steps executed</u>. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

Software version is updated, see below.

Qn.1B, if you used another method:
Please save and submit your results using the filename: Q1B_Player1.19.5_ID23.png

Please specify (i) <u>the investigation method</u> used to <u>a) examine the video sequence</u> and <u>b) extract and examine the frame</u>, (ii) <u>all tools used</u>, and (iii) <u>all steps executed</u>. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

1. New version: 1.19.5 (instead of provided version number 1.18.59)
2. Same procedure as Q1A except that there are no labels printed on the cropped screenshot

Qn.1C

Frame Size of source file recording used in Qn.1A				Frame Size of source file recording used in Qn.1B			
700	x	284	pixels	700	x	295	pixels

What are your conclusions about the raw, encoded quality of the provided video frame/sequence in Q1A and Q1B?

Quality of frame Q1A is better than Q1B for the following reasons: brightness is better (able to distinguish more details) and less compression artefacts (so less heavy compression?). Only drawback is that because of the higher brightness, more saturation is occurring due to low dynamic range.

Question 2: Super-Resolution from supplied sequence of 249 .bmp files

Qn.2A

Please select your best result, i.e.: a single best quality super-resolution image:
Please save and submit your results using filename: "Q2A_SuperRes_YOURINITIALS"

1. How have you ingested the material into your enhancement system and super-resolution software tools?
   Please detail all steps of any conversion performed including all software tools and settings used. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

   I did not submit any result here: 1) because lack of time and 2) after careful inspection of the data set, there is almost no motion except in a small ROI (see Question 3). Fast sub-pixel registration yields only a very small amount of extra information, so I did not further process the data set.

2. Please specify all software tools and all Enhancement Filters used (in order) and specific parameter settings; e.g. Super-Resolution Filter (Method? Zoom factor? Number of Iterations? Interpolation?......)

   NA

3. Did you select a "region of interest" for directing the super-resolution tool? If so please specify co-ordinates of the region (if used) in the format given by the tool.

   ROI for SR (area with small movements): [10:34,16:21]

4. Did you select any specific frames or image? If so, please provide details of range of frames or specific frames you used.

   NA

5. Please provide any other information that would be needed so that others would be able to repeat and reproduce your work.

   NA

Qn.2B

Please select your best result, i.e.: a single best quality super-resolution image:
Please save and submit your results using filename: "Q2B_SuperRes_ID23.png"

1. How have you ingested the material into your enhancement system and super-resolution software tools?
   Please detail all steps of any conversion performed including all software tools and settings used. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

   1) Use attached player to convert file to .AVI
   2) FFMPEG conversion to sequence of PNG (readable in Matlab)

2. Which of the 5 number plates have you concentrated your efforts on (1=closest number plate, ..., 5=most distant) and how did you decide on selecting this number plate?

   Selected no. plate: 1

   Decision reached how: most readable, so more certain what to expect

3. Please specify all software tools and all enhancement filters used (in order) and specific parameter settings; e.g. Super-Resolution Filter (Method? Zoom factor? Number of Iterations? Interpolation?......)

   1. Sub-pixel affine registration (see PhD H. Luong, p. 191) of Lanczos interpolated version (8x zoom)
   2. Fusion by averaging
   3. Blind deconvolution: 1) kernel estimation by "Blind Deconvolution using a Normalized Sparsity Measure", Dilip Krishnan, Terence Tay and Rob Fergus; 2) deconvolution using Wiener filter (NSR = 0.001)

4. Did you select a "region of interest" for directing the super-resolution tool? If so please specify co-ordinates of the region (if used) in the format given by the tool.

   ROI: [167:214, 94:191] (ROI is needed to approximate the motion in an affine transformation model, otherwise you will suffer from 3D motion)

5. Did you select any specific frames or image? If so, please provide details of range of frames or specific frames you used.

6. Please provide any other information that would be needed so that others would be able to repeat and reproduce your work.

   NA

   Remark: coding information is lost during conversion/ingestion. This information could improve reconstruction.

Qn2B. (continued): optional:

As indicated on the Collaborative Exercise webpage you may choose to submit multiple results. If this is the case then please specify how you obtained your results by replicating the previous 6 points for each Procedure/toolset used and/or each possible license plate you focussed on.

For example:

Please save and submit your results using filename:
'Q2B_SuperRes_Procedure1_PlateAll_YOURINITIALS' to indicate the best enhancement result you obtained for all plates using the Procedure1 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

and/or

Please save and submit your results using filename:
File name: 'Q2B_SuperRes_Procedure2_Plate1_YOURINITIALS' to indicate the best enhancement result you obtained for Plate 1 using the Procedure2 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

and/or

Please save and submit your results using filename:
File name: 'Q2B_SuperRes_Procedure2_Plate2_YOURINITIALS' to indicate the best enhancement result you obtained for Plate 2 using the Procedure2 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

etc.

Qn.2C (optional)

Please select your best result, i.e.: a single best quality super-resolution image:

please save and submit your results using filename: "Q2C_SuperRes_YOURINITIALS"

1. How have you ingested the material into your enhancement system and super-resolution software tools?
Please detail all steps of any conversion performed including all software tools and settings used. The information you provide should have sufficient detail so that anyone could independently reproduce your results.

Because of limited time, I did not try it...

2. Which of the 5 number plates have you concentrated your efforts on (1=closest number plate, ..., 5=most distant) and how did you decide on selecting this number plate?

Selected no. plate: NA

Decision reached how: NA

3. Please specify all software tools and all enhancement filters used (in order) and specific parameter settings; e.g. Super-Resolution Filter (Method? Zoom factor? Number of Iterations? Interpolation?......)

NA

4. Did you select a "region of interest" for directing the super-resolution tool? If so please specify co-ordinates of the region (if used) in the format given by the tool.

NA

5. Did you select any specific frames or image? If so, please provide details of range of frames or specific frames you used.

NA

6. Please provide any other information that would be needed so that others would be able to repeat and reproduce your work.

Qn2C. (continued): optional:

As indicated on the Collaborative Exercise webpage you may choose to submit multiple results. If this is the case then please specify how you obtained your results by replicating the previous 6 points for each Procedure/toolset used and/or each possible license plate you focussed on.

For example:

Please save and submit your results using filename:
'Q2C_SuperRes_Procedure1_PlateAll_YOURINITIALS' to indicate the best enhancement result you obtained for all plates using the Procedure1 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

and/or

Please save and submit your results using filename:
File name: 'Q2C_SuperRes_Procedure2_Plate1_YOURINITIALS' to indicate the best enhancement result you obtained for Plate 1 using the Procedure2 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

and/or

Please save and submit your results using filename:
File name: 'Q2C_SuperRes_Procedure2_Plate2_YOURINITIALS' to indicate the best enhancement result you obtained for Plate 2 using the Procedure2 you will describe using a cut-paste repetition of the 6 previous subquestions above, etc.

etc.

Question 3: Focal deblur test

Please specify (i) <u>all software tools or processing steps</u>, (ii) <u>all enhancement filters</u> used (in order) and (iii) <u>all specific parameter settings.</u> The information you provide should have sufficient detail so that anyone could independently reproduce your results.

125 cm chart:
Please save and submit your results using filename: 'Q3_125cm_ID23' or 'Q3_125cm_LineNUMBER_YOURINITIALS'

First remarks: there is not only focal blur, but also motion blur, which was varying spatially across the image and was different in each color channel.
My approach: 1) kernel estimation using multichannel blind deconvolution (code of Sroubek), 2) Wiener deconvolution (NSR = 0.01) and 3) unsharp masking (radius = 8.0, amount = 2.0).

75 cm, 4th line:
Please save and submit your results using filename: 'Q3_75cm_ID23.png'

See previous Q3 submission.

75 cm, 5th line:
Please save and submit your results using filename: Q3_75cm_Line5_YOURINITIALS'

See above.

any other results: optional:
Please save and submit your results using filenames: 'Q3_DISTANCEcm_LineNUMBER_YOURINITIALS'

NA

Question 4: Motion deblur test

Qn.4A:

Please specify (i) <u>all software tools or processing steps</u>, (ii) <u>all enhancement filters</u> used (in order) and (iii) <u>all specific parameter settings.</u> The information you provide should have sufficient detail so that anyone could independently reproduce your results.
If you wish to provide results for different regions of interest in the image, please specify their coordinates and/or indicate the region in a small thumbnail, and use the filenames: "Q4A_1_ID23.png".

Region NUMBER: coordinates and/or thumbnail:

Robust motion deblurring (http://www.cse.cuhk.edu.hk/~leojia/deblurring.htm) is applied on a very small region:

Remark: the motion blur is spatially varying, which means that the size of the region should be limited on the hand for training the kernel and on the other hand, the region should be large enough to train the kernel.

Qn.4B:

Please specify (i) <u>all software tools or processing steps</u>, (ii) <u>all enhancement filters</u> used (in order) and (iii) <u>all specific parameter settings.</u> The information you provide should have sufficient detail so that anyone could independently reproduce your results.
If you wish to provide results for different regions of interest in the image, please specify their coordinates and/or indicate the region in a small thumbnail, and use the filenames: "Q4A_RegionNUMBER_YOURINITIALS".

Region NUMBER: coordinates and/or thumbnail:

Robust motion deblurring software failed in recovering motion blur. Fall back solution: local blur kernels can be extracted "manually" from the image. However, this demands a lot of manual labor.