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.

Not used

Qn.1A, if you used another method: Q1A_OtherMethod_ID02.bmp
Please save and submit your results using the filename:
'Q1A_OtherMethod_YOURINITIALS'

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.

Video was viewed using supplied replay software. Snapshot export quality examined.
Frame extracted using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = [000001].drv
Output file = [000001].drv-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First

Set position to first frame of video (frame 0)
Image Writer → Q1A_OtherMethod_ID02.bmp

```
ffmpeg started on 2015-04-09 at 13:59:58
Report written to "ffmpeg-20150409-135958.log"
Command line:
```

```
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i "V:/SFIVE Project/Qn1
Image Extraction/1a/20140508/184505/NORMAL/[000001].drv" -vcodec copy -acodec copy -n "V:/SFIVE
Project/Qn1 Image Extraction/1a/[000001].drv-converted.avi" -report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument 'V:/SFIVE Project/Qn1 Image
Extraction/1a/20140508/184505/NORMAL/[000001].drv'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn1 Image Extraction/1a/[000001].drv-converted.avi' ... matched
as output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file V:/SFIVE Project/Qn1 Image
Extraction/1a/20140508/184505/NORMAL/[000001].drv.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: V:/SFIVE Project/Qn1 Image
Extraction/1a/20140508/184505/NORMAL/[000001].drv.
[h264 @ 024f2a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f96c0] Unknown NAL code: 16 (135 bits)
[h264 @ 024f2a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 024f2a40] After avformat_find_stream_info() pos: 2932736 bytes read:2949120 seeks:0
frames:127
Input #0, h264, from 'V:/SFIVE Project/Qn1 Image
Extraction/1a/20140508/184505/NORMAL/[000001].drv':
  Duration: N/A, bitrate: N/A
    Stream #0:0, 127, 1/1200000: Video: h264 (Baseline), yuv420p, 720x288, 25 fps, 25 tbr, 1200k
tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn1 Image Extraction/1a/[000001].drv-
converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn1 Image Extraction/1a/[000001].drv-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn1 Image Extraction/1a/[000001].drv-converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 720x288, q=2-31, 25 fps, 50
tbn, 50 tbc
```

```
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
frame=  146 fps=0.0 q=-1.0 size=    3277kB time=00:00:05.82 bitrate=4612.7kbits/s
frame=  187 fps=162 q=-1.0 size=    4190kB time=00:00:07.46 bitrate=4601.3kbits/s
frame=  227 fps=135 q=-1.0 size=    5071kB time=00:00:09.06 bitrate=4585.1kbits/s
frame=  273 fps=124 q=-1.0 size=    6096kB time=00:00:10.90 bitrate=4581.4kbits/s
frame=  319 fps=114 q=-1.0 size=    7124kB time=00:00:12.74 bitrate=4581.0kbits/s
No more output streams to write to, finishing.
frame=  381 fps=122 q=-1.0 Lsize=    8506kB time=00:00:15.22 bitrate=4578.2kbits/s

video:8474kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 0.373097%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 024fa100] Statistics: 9 seeks, 436 writeouts
[AVIOContext @ 00334300] Statistics: 8677640 bytes read, 0 seeks
```

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.

Not used

Qn.1B, if you used another method: Q1B_OtherMethod_ID02.bmp
Please save and submit your results using the filename:
'Q1B_OtherMethod_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>, (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.

Unzip TestE_7mDistance_HighElevation.zip
Copy file TestE_7mDistance_HighElevation.PAR and rename
TestE_7mDistance_HighElevation[1].PAR
Video was viewed using supplied replay software. Snapshot export options and quality
examined. Frame number of the first frame from timestamp 4:43:30 PM GMT
determined to be frame #240 (beginning frame is frame 0).
Frame extracted using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestE_7mDistance_HighElevation[1].PAR
Output file = TestE_7mDistance_HighElevation[1].PAR-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First

Set position to frame 240 of video
Image Writer → Q1B_OtherMethod_ID02.bmp

`ffmpeg started on 2015-04-09 at 14:21:59`

```
Report written to "ffmpeg-20150409-142159.log"
Command line:
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f mjpeg -i
"C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/V98WFDUS/TestE_7mDistance_HighElevation[1].PAR" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn1 Image Extraction/1b/TestE_7mDistance_HighElevation[1].PAR-converted.avi" -
report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'mjpeg'.
Reading option '-i' ... matched as input file with argument
'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/V98WFDUS/TestE_7mDistance_HighElevation[1].PAR'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn1 Image Extraction/1b/TestE_7mDistance_HighElevation[1].PAR-
converted.avi' ... matched as output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary
Internet Files/Content.IE5/V98WFDUS/TestE_7mDistance_HighElevation[1].PAR.
Applying option f (force format) with argument mjpeg.
Successfully parsed a group of options.
Opening an input file: C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/V98WFDUS/TestE_7mDistance_HighElevation[1].PAR.
[mjpeg @ 026a2a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[mjpeg @ 026a94a0] marker=d8 avail_size_in_buf=19200
[mjpeg @ 026a94a0] marker parser used 0 bytes (0 bits)
[mjpeg @ 026a94a0] marker=e0 avail_size_in_buf=19198
[mjpeg @ 026a94a0] marker parser used 16 bytes (128 bits)
[mjpeg @ 026a94a0] marker=fe avail_size_in_buf=19180
[mjpeg @ 026a94a0] marker parser used 272 bytes (2176 bits)
[mjpeg @ 026a94a0] marker=db avail_size_in_buf=18906
[mjpeg @ 026a94a0] index=0
[mjpeg @ 026a94a0] qscale[0]: 3
[mjpeg @ 026a94a0] marker parser used 67 bytes (536 bits)
[mjpeg @ 026a94a0] marker=db avail_size_in_buf=18837
[mjpeg @ 026a94a0] index=1
[mjpeg @ 026a94a0] qscale[1]: 7
[mjpeg @ 026a94a0] marker parser used 67 bytes (536 bits)
[mjpeg @ 026a94a0] marker=c0 avail_size_in_buf=18768
[mjpeg @ 026a94a0] sof0: picture: 720x288
[mjpeg @ 026a94a0] component 0 2:2 id: 0 quant:0
[mjpeg @ 026a94a0] component 1 1:1 id: 1 quant:1
[mjpeg @ 026a94a0] component 2 1:1 id: 2 quant:1
[mjpeg @ 026a94a0] pix fmt id 22111100
[mjpeg @ 026a94a0] marker parser used 17 bytes (136 bits)
[mjpeg @ 026a94a0] marker=c4 avail_size_in_buf=18749
[mjpeg @ 026a94a0] class=0 index=0 nb_codes=12
[mjpeg @ 026a94a0] marker parser used 31 bytes (248 bits)
```

```
[mjpeg @ 026a94a0] marker=c4 avail_size_in_buf=18716
[mjpeg @ 026a94a0] class=1 index=0 nb_codes=251
[mjpeg @ 026a94a0] marker parser used 181 bytes (1448 bits)
[mjpeg @ 026a94a0] marker=c4 avail_size_in_buf=18533
[mjpeg @ 026a94a0] class=0 index=1 nb_codes=12
[mjpeg @ 026a94a0] marker parser used 31 bytes (248 bits)
[mjpeg @ 026a94a0] marker=c4 avail_size_in_buf=18500
[mjpeg @ 026a94a0] class=1 index=1 nb_codes=251
[mjpeg @ 026a94a0] marker parser used 181 bytes (1448 bits)
[mjpeg @ 026a94a0] escaping removed 400 bytes
[mjpeg @ 026a94a0] marker=da avail_size_in_buf=18317
[mjpeg @ 026a94a0] component: 0
[mjpeg @ 026a94a0] component: 1
[mjpeg @ 026a94a0] component: 2
[mjpeg @ 026a94a0] marker parser used 17916 bytes (143327 bits)
[mjpeg @ 026a94a0] marker=d9 avail_size_in_buf=323
[mjpeg @ 026a94a0] decode frame unused 323 bytes
[mjpeg @ 026a2a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[mjpeg @ 026a2a40] After avformat_find_stream_info() pos: 2452480 bytes read:2457600 seeks:0
frames:127
Input #0, mjpeg, from 'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/V98WFDUS/TestE_7mDistance_HighElevation[1].PAR':
  Duration: N/A, bitrate: N/A
    Stream #0:0, 127, 1/1200000: Video: mjpeg, yuvj420p(pc), 720x288 [SAR 50:25 DAR 5:1], 25 fps,
25 tbr, 1200k tbn, 25 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn1 Image
Extraction/1b/TestE_7mDistance_HighElevation[1].PAR-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn1 Image
Extraction/1b/TestE_7mDistance_HighElevation[1].PAR-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn1 Image
Extraction/1b/TestE_7mDistance_HighElevation[1].PAR-converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: mjpeg (MJPG / 0x47504A4D), yuvj420p, 720x288 [SAR 50:25 DAR
5:1], q=2-31, 25 fps, 50 tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
No more output streams to write to, finishing.
frame=  370 fps=0.0 q=-1.0 Lsize=    6945kB time=00:00:14.78 bitrate=3849.5kbits/s

video:6922kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 0.336420%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 0274fd80] Statistics: 9 seeks, 377 writeouts
[AVIOContext @ 02a74420] Statistics: 7088160 bytes read, 0 seeks
```

Qn.1C

Frame Size of source file recording used in Qn.1A				Frame Size of source file recording used in Qn.1B			
720	x	288	pixels	720	x	288	pixels

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

Encoded HD1 – less than full frame. Display requires interpolation.

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:
Q2A_SuperRes_ID02.bmp
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.

   Ingested as series of BMP files using Motion DSP Ikena Forensic

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: SuperRes0000.bmp – SuperRes0248.bmp

resolution:	48x40	
duration:	0:00:49.59	*user: XXX*
frame rate:	5.00 fps	*computer: [XXXXXXX]*
file size:	5814 bytes	
file date:	Tuesday, September 30, 2014	
MD5 hash:		

Snapshots:

File name: *Q2A_SuperRes_ID02.bmp*

Time: 0:00:33.79	*Settings:*
Preset Profile: None	
Resize Input: Default	**Input Setup:** off
Aspect Ratio: Default	
	Crop: off
MD5 Hash Codes:	
Enhanced:	**ROI:** off
Original:	
	Deinterlacing: off
	Denoising: off
	Resolution:
	Frames: 51
	Super resolution: 3
	Fusion: 10
	SR accuracy: 1.0

	ROI Mode:	off
	Detail Mode:	on
	Light & Color:	off
	Contrast:	off
	Sharpen:	off
	Deblurring:	off

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?......)

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: SuperRes0000.bmp – SuperRes0248.bmp

resolution:	48x40	
duration:	0:00:49.59	*user: XXX*
frame rate:	5.00 fps	*computer: [XXXXXXX]*
file size:	5814 bytes	
file date:	Tuesday, September 30, 2014	
MD5 hash:		

Snapshots:

File name: *Q2A_SuperRes_ID02.bmp*

Time:	0:00:33.79	*Settings:*	
Preset Profile:	None		
Resize Input:	Default	**Input Setup:**	off
Aspect Ratio:	Default		
		Crop:	off
MD5 Hash Codes:			
Enhanced:			
Original:		**ROI:**	off
		Deinterlacing:	off
		Denoising:	off

Resolution:	
Frames:	51
Super resolution:	3
Fusion:	10
SR accuracy:	1.0
ROI Mode:	off
Detail Mode:	on
Light & Color:	off
Contrast:	off
Sharpen:	off
Deblurring:	off

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.

No region of interest selected

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

51 frames selected beginning at frame 169 (0:00:33.79)

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

N/A

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_YOURINITIALS"
Q2B_SuperRes_Procedure1_ID02.bmp

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.

Video ingested using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestP_7mDistance_MidElevation.dav
Output file = TestP_7mDistance_MidElevation.dav-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First

```
ffmpeg started on 2015-04-21 at 10:47:13
Report written to "ffmpeg-20150421-104713.log"
Command line:
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i "V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn2 SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-
converted.avi" -report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
```

```
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi' ... matched as
output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav.
[h264 @ 029d2a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Unknown NAL code: 0 (0 bits)
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d2a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 029d2a40] After avformat_find_stream_info() pos: 349184 bytes read:360448 seeks:0
frames:127
Input #0, h264, from 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav':
  Duration: N/A, bitrate: N/A
    Stream #0:0, 127, 1/1200000: Video: h264 (Constrained Baseline), yuv420p, 352x288, 25 fps, 25
tbr, 1200k tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 352x288, q=2-31, 25 fps, 50
tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
```

```
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
frame=  981 fps=0.0 q=-1.0 size=    2580kB time=00:00:39.22 bitrate= 538.9kbits/s
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
No more output streams to write to, finishing.
frame= 1251 fps=0.0 q=-1.0 Lsize=    3331kB time=00:00:50.02 bitrate= 545.5kbits/s

video:3265kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 2.015816%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 029d9f40] Statistics: 9 seeks, 1267 writeouts
[AVIOContext @ 02b744c0] Statistics: 3343360 bytes read, 0 seeks
```

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: I felt that the nearest number plate had the best possibility for achieving a good result from super resolution enhancement. Therefore, this was the number plate that I focused on while doing the enhancement although the other plates were also enhanced.

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?......)

   Procedure 1

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: TestP_7mDistance_MidElevation.dav-converted.avi

resolution:	384x288		
duration:	0:00:50.02		*user: XXX*
frame rate:	50.00 fps		*computer: [XXXXXXX]*
file size:	3410756 bytes		
file date:	Friday, April 10, 2015		
MD5 hash:			

Snapshots:

File name:　　　*Q2B_SuperRes_Procedure1_ID02.bmp*

Time:　　　　　　0:00:29.11	*Settings:*
Preset Profile:　None	
Resize Input:　　Default	**Input Setup:**　　　　off
Aspect Ratio:　　Default	
	Crop:　　　　　　　off
MD5 Hash Codes:	
Enhanced:	**ROI:**　　　　　　　off
Original:	

Settings	Value
Input Setup:	off
Crop:	off
ROI:	off
Deinterlacing:	off
Denoising:	off
Resolution:	
Frames:	47
Super resolution:	3
Fusion:	10
SR accuracy:	0.9
ROI Mode:	off
Detail Mode:	on
Light & Color:	
Shadows:	46
Highlights:	255
Gamma:	1.26
Saturation:	100 %
Auto WB:	off
Color:	6600 K
Contrast:	off
Sharpen:	off
Deblurring:	
Level:	78
Focus:	0.56
Denoise:	0.36
Camera type:	Gauss

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.

No region of interest specified

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

47 frames selected beginning with frame 728 (0:00:29.11)

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

n/a

Qn2B. (continued): optional: Q2B_SuperRes_Procedure2_ID02.bmp

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.

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.

Video ingested using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestP_7mDistance_MidElevation.dav
Output file = TestP_7mDistance_MidElevation.dav-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First

```
ffmpeg started on 2015-04-21 at 10:47:13
Report written to "ffmpeg-20150421-104713.log"
Command line:
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i "V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn2 SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-
converted.avi" -report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
```

```
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi' ... matched as
output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav.
[h264 @ 029d2a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Unknown NAL code: 0 (0 bits)
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 029d96c0] unknown SEI type 229
[h264 @ 029d2a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 029d2a40] After avformat_find_stream_info() pos: 349184 bytes read:360448 seeks:0
frames:127
Input #0, h264, from 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav':
  Duration: N/A, bitrate: N/A
    Stream #0:0, 127, 1/1200000: Video: h264 (Constrained Baseline), yuv420p, 352x288, 25 fps, 25
tbr, 1200k tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn2
SuperResolution/2b/04212015/TestP_7mDistance_MidElevation.dav-converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 352x288, q=2-31, 25 fps, 50
tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
```

```
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
frame=  981 fps=0.0 q=-1.0 size=    2580kB time=00:00:39.22 bitrate= 538.9kbits/s
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
[NULL @ 029d96c0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 029d96c0] unknown SEI type 229
No more output streams to write to, finishing.
frame= 1251 fps=0.0 q=-1.0 Lsize=    3331kB time=00:00:50.02 bitrate= 545.5kbits/s

video:3265kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 2.015816%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 029d9f40] Statistics: 9 seeks, 1267 writeouts
[AVIOContext @ 02b744c0] Statistics: 3343360 bytes read, 0 seeks
```

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: I felt that the nearest number plate had the best possibility for achieving a good result from super resolution enhancement. Therefore, this was the number plate that I focused on while doing the enhancement although the other plates were also enhanced.

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?......)

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: TestP_7mDistance_MidElevation.dav-converted.avi

resolution:	384x288
duration:	0:00:50.02
frame rate:	50.00 fps
file size:	3410756 bytes
file date:	Friday, April 10, 2015
MD5 hash:	

user: XXX
computer: [XXXXXXX]

Snapshots:

File name: Q2B_SuperRes_Procedure1_ID02.bmp

Time:	0:00:29.11
Preset Profile:	None
Resize Input:	Default
Aspect Ratio:	Default

MD5 Hash Codes:
Enhanced:
Original:

Settings:

Input Setup:	off

Crop:	off

ROI:	off

Deinterlacing:	off

Denoising:	off

Resolution:

Frames:	47
Super resolution:	3
Fusion:	10
SR accuracy:	0.9
ROI Mode:	off
Detail Mode:	on

Light & Color:

Shadows:	46
Highlights:	255
Gamma:	1.26
Saturation:	100 %
Auto WB:	off
Color:	6600 K

Contrast:	off

Sharpen:	off

Deblurring:

Level:	78
Focus:	0.56
Denoise:	0.36
Camera type:	Gauss

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Exported Images

Chain 21

21. Image Loader: *Loads an image from file.* (File)
22. Rotate: *Rotates the image.*
23. Correct Perspective: *Removes the perspective effect on a plane of interest in the image.*
24. Image Writer: *Writes the current image to a new file.* (File)

Details:

Summary:

Chain 21

21. Image Loader
 Loads an image from file.

Details:

>The *Image Loader* tool renders an image file that can be encoded in a variety of formats to a bitmap that can be displayed and processed.

Parameters:

- **File**: Q2B_SuperRes_Procedure1_ID02.bmp

 The path of the file to load.

---

22. Rotate
Rotates the image.

Details:

The *Rotate* filter rotates the image by the given angle. If the rotation angle is not multiple of 90 degrees, the selected interpolation algorithm is used, otherwise the original pixel values are only transposed.

Parameters:

- **Angle**: -180

    Rotation angle.

- **Resize Image to Fit**: true

    If unchecked, the image remains of the original size, although part of the actual data could render outside of the visible area.

- **Interpolation**: Bicubic

    Interpolation algorithm.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 253-255, 1989.

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

23. Correct Perspective
Removes the perspective effect on a plane of interest in the image.

Details:

> *Correct Perspective* maps a desired quadrangular region to a rectangular one, which allows seeing the plane of interest as the plane of the image were parallel to it. Pixel values are interpolated with a bicubic algorithm. The ratio between width and height of the region is not kept fixed, but is chosen by the user with the proper selection.

Parameters:

- **Source Points**: 467, 313 - 590, 309 - 589, 338 - 468, 342

  Quadrilateral to transform into a rectangle.

- **Target Selection**: 467 309 124 34

  Target rectangle to map the source points to.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

24. Image Writer
Writes the current image to a new file.

Details:

> The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: Q2B_SuperRes_Procedure2_ID02.bmp

  Path of the image to save.

- **Format**: Bitmap

Format used to encode the image file.

---

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.

   No region of interest specified

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

   47 frames selected beginning with frame 728 (0:00:29.11)

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

n/a

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"
Q2C_SuperRes_Procedure1_ID02.bmp

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.

   Video ingested using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestH_7mDistance_HighElevation.dav
Output file = TestH_7mDistance_HighElevation.dav-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No

Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First


```
ffmpeg started on 2015-04-16 at 07:50:32
Report written to "ffmpeg-20150416-075032.log"
Command line:
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i
"C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi" -
report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument
'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi' ... matched as output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary
Internet Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
[h264 @ 02672a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Unknown NAL code: 0 (0 bits)
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 02672a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 02672a40] After avformat_find_stream_info() pos: 317440 bytes read:327680 seeks:0
frames:127
Input #0, h264, from 'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav':
  Duration: N/A, bitrate: N/A
```

```
    Stream #0:0, 127, 1/1200000: Video: h264 (Constrained Baseline), yuv420p, 352x288, 25 fps, 25
tbr, 1200k tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 352x288, q=2-31, 25 fps, 50
tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
frame= 1146 fps=0.0 q=-1.0 size=    2720kB time=00:00:45.82 bitrate= 486.3kbits/s
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
No more output streams to write to, finishing.
frame= 1257 fps=0.0 q=-1.0 Lsize=    3027kB time=00:00:50.26 bitrate= 493.4kbits/s

video:2961kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 2.233000%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 047de7a0] Statistics: 9 seeks, 1265 writeouts
[AVIOContext @ 02974420] Statistics: 3032064 bytes read, 0 seeks
```

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: I felt that the nearest number plate had the best possibility for achieving a good result from super resolution enhancement. Therefore, this was the number plate that I focused on while doing the enhancement although the other plates were also enhanced.

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?......)

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: TestH_7mDistance_HighElevation.dav-converted.avi

resolution:	384x288	
duration:	0:00:50.26	***user:** XXX*
frame rate:	50.00 fps	***computer:** [XXXXXXX]*
file size:	3099770 bytes	
file date:	Thursday, April 16, 2015	
MD5 hash:		

Snapshots:

File name: Q2C_SuperRes_Procedure1_ID02.bmp

Time:	0:00:41.80	*Settings:*	
Preset Profile:	None		
Resize Input:	Default	**Input Setup:**	off
Aspect Ratio:	Default		
		Crop:	off
MD5 Hash Codes:			
Enhanced:		**ROI:**	off
Original:			
		Deinterlacing:	off
		Denoising:	off
		Resolution:	
		Frames:	51

Super resolution:	3	
Fusion:	10	
SR accuracy:	1.0	
ROI Mode:	off	
Detail Mode:	off	
Light & Color:		
Shadows:	0	
Highlights:	237	
Gamma:	1	
Saturation:	100 %	
Auto WB:	off	
Color:	6600 K	
Contrast:	off	
Sharpen:	off	
Deblurring:	off	

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.

   No region of interest selected

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

   51 frames selected beginning with frame 1045 (0:00:41.84)

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

   n/a

Qn2C. (continued): optional:
Q2C_SuperRes_Procedure2_ID02.bmp

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.

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.

   Video ingested using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestH_7mDistance_HighElevation.dav
Output file = TestH_7mDistance_HighElevation.dav-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)
Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First

```
ffmpeg started on 2015-04-16 at 07:50:32
Report written to "ffmpeg-20150416-075032.log"
Command line:
```

```
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i
"C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi" -
report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument
'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi' ... matched as output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary
Internet Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
[h264 @ 02672a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Unknown NAL code: 0 (0 bits)
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 02672a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 02672a40] After avformat_find_stream_info() pos: 317440 bytes read:327680 seeks:0
frames:127
Input #0, h264, from 'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav':
  Duration: N/A, bitrate: N/A
    Stream #0:0, 127, 1/1200000: Video: h264 (Constrained Baseline), yuv420p, 352x288, 25 fps, 25
tbr, 1200k tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Successfully opened the file.
```

```
Output #0, avi, to 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 352x288, q=2-31, 25 fps, 50
tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
frame= 1146 fps=0.0 q=-1.0 size=    2720kB time=00:00:45.82 bitrate= 486.3kbits/s
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
No more output streams to write to, finishing.
frame= 1257 fps=0.0 q=-1.0 Lsize=    3027kB time=00:00:50.26 bitrate= 493.4kbits/s

video:2961kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 2.233000%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 047de7a0] Statistics: 9 seeks, 1265 writeouts
[AVIOContext @ 02974420] Statistics: 3032064 bytes read, 0 seeks
```

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: I felt that the nearest number plate had the best possibility for achieving a good result from super resolution enhancement. Therefore, this was the number plate that I focused on while doing the enhancement although the other plates were also enhanced.

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?......)

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: TestH_7mDistance_HighElevation.dav-converted.avi	

resolution:	384x288	
duration:	0:00:50.26	*user: XXX*
frame rate:	50.00 fps	*computer: [XXXXXXX]*
file size:	3099770 bytes	
file date:	Thursday, April 16, 2015	
MD5 hash:		

Snapshots:

File name: Q2C_SuperRes_Procedure1_ID02.bmp

Time:	0:00:41.80	*Settings:*	
Preset Profile:	None		
Resize Input:	Default	**Input Setup:**	off
Aspect Ratio:	Default		
		Crop:	off
MD5 Hash Codes:			
Enhanced:		**ROI:**	off
Original:			
		Deinterlacing:	off
		Denoising:	off
		Resolution:	
		Frames:	51
		Super resolution:	3
		Fusion:	10
		SR accuracy:	1.0
		ROI Mode:	off
		Detail Mode:	off
		Light & Color:	

Shadows:	0	
Highlights:	237	
Gamma:	1	
Saturation:	100 %	
Auto WB:	off	
Color:	6600 K	
Contrast:	off	
Sharpen:	off	
Deblurring:	off	

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Project File:

Exported Images

Chain 1

1. Image Loader:	*Loads an image from file. (File)*
2. Rotate:	*Rotates the image.*
3. Correct Perspective:	*Removes the perspective effect on a plane of interest in the image.*
16. Image Writer:	*Writes the current image to a new file. (File)*

Details:

Summary:

Chain 1

1. Image Loader
Loads an image from file.

Details:

The *Image Loader* tool renders an image file that can be encoded in a variety of formats to a bitmap that can be displayed and processed.

Parameters:

- **File**: V:/SFIVE Project/Qn2 SuperResolution/2c/Q2C_SuperRes_Procedure 1_ID02.bmp

    The path of the file to load.

---

2. Rotate
Rotates the image.

Details:

The *Rotate* filter rotates the image by the given angle. If the rotation angle is not multiple of 90 degrees, the selected interpolation algorithm is used, otherwise the original pixel values are only transposed.

Parameters:

- **Angle**: 180

    Rotation angle.

- **Resize Image to Fit**: true

    If unchecked, the image remains of the original size, although part of the actual data could render outside of the visible area.

- **Interpolation**: Bicubic

    Interpolation algorithm.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 253-255, 1989.

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

3. Correct Perspective
Removes the perspective effect on a plane of interest in the image.

Details:

> *Correct Perspective* maps a desired quadrangular region to a rectangular one, which allows seeing the plane of interest as the plane of the image were parallel to it. Pixel values are interpolated with a bicubic algorithm. The ratio between width and height of the region is not kept fixed, but is chosen by the user with the proper selection.

Parameters:

- **Source Points**: 537, 528 - 630, 523 - 631, 543 - 538, 548

    Quadrilateral to transform into a rectangle.

- **Target Selection**: 537 523 95 26

    Target rectangle to map the source points to.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

16. Image Writer
Writes the current image to a new file.

Details:

The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: V:/SFIVE Project/Qn2 SuperResolution/2c/Q2C_SuperRes_Procedure2_ID02.bmp

  Path of the image to save.

- **Format**: Bitmap

  Format used to encode the image file.

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.

   No region of interest selected

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

   51 frames selected beginning with frame 1045 (0:00:41.84)

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

   n/a

Qn2C. (continued): optional:

Q2C_SuperRes_Procedure3_PlateNumber5_ID02.bmp

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.

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.

   Video ingested using Amped Five software "Convert DVR"
Amped FIVE version info:
 Build date: 20150325
 Revision: 6800
 Platform: Microsoft Windows, 32 bit
Input file = TestH_7mDistance_HighElevation.dav
Output file = TestH_7mDistance_HighElevation.dav-converted.avi
Files to convert: Only selected file
Conversion Type: Copy Stream if possible, or else Transcode
Copy Stream Output format: AVI
Transcode Output format: AVI; Output Video Codec: Raw; Output Audio Codec: copy
Autodetect Settings: Yes (Overwrite Current Settings)

Overwrite Existing File: No
Conversion Program: FFmpeg
Concatenate Files: No
Post Generation Event Open in FIVE
Files to Open: First


```
ffmpeg started on 2015-04-16 at 07:50:32
Report written to "ffmpeg-20150416-075032.log"
Command line:
"C:/Program Files (x86)/Amped FIVE/fivedata/ffmpeg/ffmpeg.exe" -f h264 -i
"C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav" -vcodec copy -acodec copy -n
"V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi" -
report
ffmpeg version 2.2.1 Copyright (c) 2000-2014 the FFmpeg developers
  built on Apr 11 2014 00:23:56 with gcc 4.8.2 (GCC)
  configuration: --enable-gpl --enable-version3 --disable-w32threads --enable-avisynth --enable-
bzlib --enable-fontconfig --enable-frei0r --enable-gnutls --enable-iconv --enable-libass --
enable-libbluray --enable-libcaca --enable-libfreetype --enable-libgsm --enable-libilbc --enable-
libmodplug --enable-libmp3lame --enable-libopencore-amrnb --enable-libopencore-amrwb --enable-
libopenjpeg --enable-libopus --enable-librtmp --enable-libschroedinger --enable-libsoxr --enable-
libspeex --enable-libtheora --enable-libtwolame --enable-libvidstab --enable-libvo-aacenc --
enable-libvo-amrwbenc --enable-libvorbis --enable-libvpx --enable-libwavpack --enable-libx264 --
enable-libxavs --enable-libxvid --enable-zlib
  libavutil      52. 66.100 / 52. 66.100
  libavcodec     55. 52.102 / 55. 52.102
  libavformat    55. 33.100 / 55. 33.100
  libavdevice    55. 10.100 / 55. 10.100
  libavfilter     4.  2.100 /  4.  2.100
  libswscale      2.  5.102 /  2.  5.102
  libswresample   0. 18.100 /  0. 18.100
  libpostproc    52.  3.100 / 52.  3.100
Splitting the commandline.
Reading option '-f' ... matched as option 'f' (force format) with argument 'h264'.
Reading option '-i' ... matched as input file with argument
'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav'.
Reading option '-vcodec' ... matched as option 'vcodec' (force video codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-acodec' ... matched as option 'acodec' (force audio codec ('copy' to copy
stream)) with argument 'copy'.
Reading option '-n' ... matched as option 'n' (never overwrite output files) with argument '1'.
Reading option 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi' ... matched as output file.
Reading option '-report' ... matched as option 'report' (generate a report) with argument '1'.
Finished splitting the commandline.
Parsing a group of options: global .
Applying option n (never overwrite output files) with argument 1.
Applying option report (generate a report) with argument 1.
Successfully parsed a group of options.
Parsing a group of options: input file C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary
Internet Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
Applying option f (force format) with argument h264.
Successfully parsed a group of options.
Opening an input file: C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav.
[h264 @ 02672a40] Before avformat_find_stream_info() pos: 0 bytes read:32768 seeks:0
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Unknown NAL code: 0 (0 bits)
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[h264 @ 026794a0] unknown SEI type 229
[h264 @ 02672a40] max_analyze_duration 5000000 reached at 5000000 microseconds
[h264 @ 02672a40] After avformat_find_stream_info() pos: 317440 bytes read:327680 seeks:0
frames:127
Input #0, h264, from 'C:/Users/XXX/AppData/Local/Microsoft/Windows/Temporary Internet
Files/Content.IE5/Z1E3JA6H/TestH_7mDistance_HighElevation.dav':
  Duration: N/A, bitrate: N/A
```

```
    Stream #0:0, 127, 1/1200000: Video: h264 (Constrained Baseline), yuv420p, 352x288, 25 fps, 25
tbr, 1200k tbn, 50 tbc
Successfully opened the file.
Parsing a group of options: output file V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Applying option vcodec (force video codec ('copy' to copy stream)) with argument copy.
Applying option acodec (force audio codec ('copy' to copy stream)) with argument copy.
Successfully parsed a group of options.
Opening an output file: V:/SFIVE Project/Qn2
SuperResolution/2c/TestH_7mDistance_HighElevation.dav-converted.avi.
Successfully opened the file.
Output #0, avi, to 'V:/SFIVE Project/Qn2 SuperResolution/2c/TestH_7mDistance_HighElevation.dav-
converted.avi':
  Metadata:
    ISFT            : Lavf55.33.100
    Stream #0:0, 0, 1/50: Video: h264 (H264 / 0x34363248), yuv420p, 352x288, q=2-31, 25 fps, 50
tbn, 50 tbc
Stream mapping:
  Stream #0:0 -> #0:0 (copy)
Press [q] to stop, [?] for help
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
frame= 1146 fps=0.0 q=-1.0 size=    2720kB time=00:00:45.82 bitrate= 486.3kbits/s
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
[NULL @ 026794a0] Current profile doesn't provide more RBSP data in PPS, skipping
[NULL @ 026794a0] unknown SEI type 229
No more output streams to write to, finishing.
frame= 1257 fps=0.0 q=-1.0 Lsize=    3027kB time=00:00:50.26 bitrate= 493.4kbits/s

video:2961kB audio:0kB subtitle:0 data:0 global headers:0kB muxing overhead 2.233000%
0 frames successfully decoded, 0 decoding errors
[AVIOContext @ 047de7a0] Statistics: 9 seeks, 1265 writeouts
[AVIOContext @ 02974420] Statistics: 3032064 bytes read, 0 seeks
```

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: 5

    Decision reached how: This procedure was an attempt to clarify the furthest number plate.

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?......)

Software: *Ikena Forensic, version 5.0.0 Build 55F6106*	

Video: TestH_7mDistance_HighElevation.dav-converted.avi		
resolution:	384x288	
duration:	0:00:50.26	***user: XXX***
frame rate:	50.00 fps	***computer: [XXXXXXX]***
file size:	3099770 bytes	
file date:	Thursday, April 16, 2015	
MD5 hash:		

Snapshots:

File name: Q2C_SuperRes_Procedure1_ID02.bmp

Time: 0:00:41.80		*Settings:*	
Preset Profile: None			
Resize Input: Default		**Input Setup:**	off
Aspect Ratio: Default			
		Crop:	off
MD5 Hash Codes:			
Enhanced:		**ROI:**	off
Original:			
		Deinterlacing:	off
		Denoising:	off
		Resolution:	
		Frames:	51
		Super resolution:	3
		Fusion:	10

SR accuracy:	1.0
ROI Mode:	off
Detail Mode:	off
Light & Color:	
Shadows:	0
Highlights:	237
Gamma:	1
Saturation:	100 %
Auto WB:	off
Color:	6600 K
Contrast:	off
Sharpen:	off
Deblurring:	off

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Project File:

Exported Images

Details:

Summary:

Chain 1

1. Image Loader
 Loads an image from file.

Details:
 The *Image Loader* tool renders an image file that can be encoded in a variety of formats
 to a bitmap that can be displayed and processed.

Parameters:

- **File**: V:/SFIVE Project/Qn2 SuperResolution/2c/Q2C_SuperRes_Procedure 1_ID02.bmp

   The path of the file to load.

---

2. Rotate
 Rotates the image.

Details:

The *Rotate* filter rotates the image by the given angle. If the rotation angle is not multiple of 90 degrees, the selected interpolation algorithm is used, otherwise the original pixel values are only transposed.

Parameters:

- **Angle**: 180

   Rotation angle.

- **Resize Image to Fit**: true

   If unchecked, the image remains of the original size, although part of the actual data could render outside of the visible area.

- **Interpolation**: Bicubic

   Interpolation algorithm.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 253-255, 1989.

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

3. Correct Perspective
Removes the perspective effect on a plane of interest in the image.

Details:

Â *Correct Perspective* maps a desired quadrangular region to a rectangular one, which allows seeing the plane of interest as the plane of the image were parallel to it. Pixel values are interpolated with a bicubic algorithm. The ratio between width and height of the region is not kept fixed, but is chosen by the user with the proper selection.

Parameters:

- **Source Points**: 537, 528 - 630, 523 - 631, 543 - 538, 548

  Quadrilateral to transform into a rectangle.

- **Target Selection**: 537 523 95 26

  Target rectangle to map the source points to.

References:

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 320-322, 1989.

- H.S. Hou and H.C. Andrews, Cubic spline for image interpolation and digital filtering, in IEEE Transactions on Acoustic, Speech, and Signal Processing, vol. 26, pp. 508-517, 1978.

---

14. Turbulence Deblurring
Corrects the blur caused by air turbulence on long distances or on shorter distances due to high ambient air temperature.

Details:

Parameters:

- **Strength**: 0.0002

  Intensity of the correction effect.

- **Noise**: 0.0242

  Estimate of the noise-to-signal power ratio.

References:

- J.S. Lim, Two-Dimensional Signal and Image Processing, Englewood Cliffs, Prentice Hall, NY, p. 548, equations 9.44 -- 9.46, 1990.

- Anil. K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, pp. 276-284, 1989.

- R. E. Hufnagel and N. R. Stanley, Modulation Transfer Function Associated with Image Transmission through Turbulent Media, J. Opt. Soc. Am. 54, 52-60 (1964).

---

15. Image Writer
Writes the current image to a new file.

Details:
The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: V:/SFIVE Project/Qn2 SuperResolution/2c/Q2C_SuperRes_Procedure3_PlateNumber5_ID02.bmp

  Path of the image to save.

- **Format**: Bitmap

Format used to encode the image file.

---

7. 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.

   No region of interest selected

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

   51 frames selected beginning with frame 1045 (0:00:41.84)

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

   n/a

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: Q3_125cm_ID02.bmp
Please save and submit your results using filename: 'Q3_125cm_YOURINITIALS' or 'Q3_125cm_LineNUMBER_YOURINITIALS'

    Photoshop CC

    Open file Random_Focus_150cm_from_lens.JPG

    Image → Mode → 16-bits per channel

    Filter → Sharpen → Shake Reduction

    Filter → Sharpen → Smart Sharpen (Amount: 71%; Radius: 30.2 px; Reduce Noise: 50%; Remove Lens Blur)

    Save as 125_step1.tif

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Project File:

Details:

Summary:

Chain 1

1. Image Loader
Loads an image from file.

Details:
>The *Image Loader* tool renders an image file that can be encoded in a variety of formats to a bitmap that can be displayed and processed.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/125_step1.tif

    The path of the file to load.

---

2. Crop
Crops a region of interest of the image.

Details:
>The *Crop* tool produces an output image which is only the selected region of the input image.

Parameters:

- **Selection**: Static Region
Reference Selection(s)
0: 1136 294 568 1180

    Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest.

3. Image Writer
Writes the current image to a new file.

Details:

        The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/04212015/Q3_125cm_ID02.bmp

        Path of the image to save.

- **Format**: Bitmap

        Format used to encode the image file.

75 cm, 4th line: Q3_75cm_Line4_ID02.bmp
Please save and submit your results using filename: 'Q3_75cm_Line4_YOURINITIALS'

        Photoshop CC

        Open file Random_Focus_150cm_from_lens.JPG

        Image → Mode → 16-bits per channel

        Filter → Sharpen → Shake Reduction

Filter → Sharpen → Smart Sharpen (Amount: 252%; Radius: 3.7 px; Reduce Noise: 50%; Remove Lens Blur)

Save as 75_step1.tif

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Project File:

Details:

Summary:

Chain 4

4. Image Loader
 Loads an image from file.

Details:

        The *Image Loader* tool renders an image file that can be encoded in a variety of formats to a bitmap that can be displayed and processed.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/75_step1.tif

        The path of the file to load.

---

5. Crop
Crops a region of interest of the image.

Details:

        The *Crop* tool produces an output image which is only the selected region of the input image.

Parameters:

- **Selection**: Static Region
  Reference Selection(s)
  0: 366 44 689 1346

        Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest.

---

6. Image Writer
Writes the current image to a new file.

Details:

        The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/04212015/Q3_75cm_Line4_ID02.bmp

        Path of the image to save.

- **Format**: Bitmap

Format used to encode the image file.

---

75 cm, 5ᵗʰ line: **This was marked as optional – not completed
Please save and submit your results using filename: Q3_75cm_Line5_YOURINITIALS'

any other results: optional: Q3_150cm_Line3_ID02.bmp
Please   save   and   submit   your   results   using   filenames:
'Q3_DISTANCEcm_LineNUMBER_YOURINITIALS'

Photoshop CC

Open file Random_Focus_150cm_from_lens.JPG

Image → Mode → 16-bits per channel

Filter → Sharpen → Shake Reduction

Filter → Sharpen → Smart Sharpen (Amount: 223%; Radius: 12.7 px; Reduce Noise: 100%; Remove Lens Blur)

Save as 150_step1.tif

Amped FIVE version info:
Build date: 20150325
Revision: 6800
Platform: Microsoft Windows, 32 bit

Project File:

Details:

Summary:

Chain 7

7. Image Loader
 Loads an image from file.

Details:

The *Image Loader* tool renders an image file that can be encoded in a variety of formats
to a bitmap that can be displayed and processed.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/150_step1.tif

The path of the file to load.

---

8. Crop
 Crops a region of interest of the image.

Details:

The *Crop* tool produces an output image which is only the selected region of the input
image.

Parameters:

- **Selection**: Static Region
  Reference Selection(s)
  0: 3843 366 564 1032

  Selection where the filter is applied. It may be the whole image, a static region, or a region containing a tracked object of interest.

---

9. Image Writer
Writes the current image to a new file.

Details:

The *Image Writer* tool encodes the current frame to the specified file with the chosen format.

Parameters:

- **File**: V:/SFIVE Project/Qn3 Focal Deblur/04212015/Q3_150cm_Line3_ID02.bmp

  Path of the image to save.

- **Format**: Bitmap

  Format used to encode the image file.

Question 4: Motion deblur test

Qn.4A: Q4A_Region1_ID02.bmp, Q4A_Region2_ID02.bmp

Please specify (i) all software tools or processing steps, (ii) all enhancement filters used (in order) and (iii) all specific parameter settings. 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:

Region 1

Photoshop CC

Open file Qn4A.png

Image → Mode → 16-bits per channel

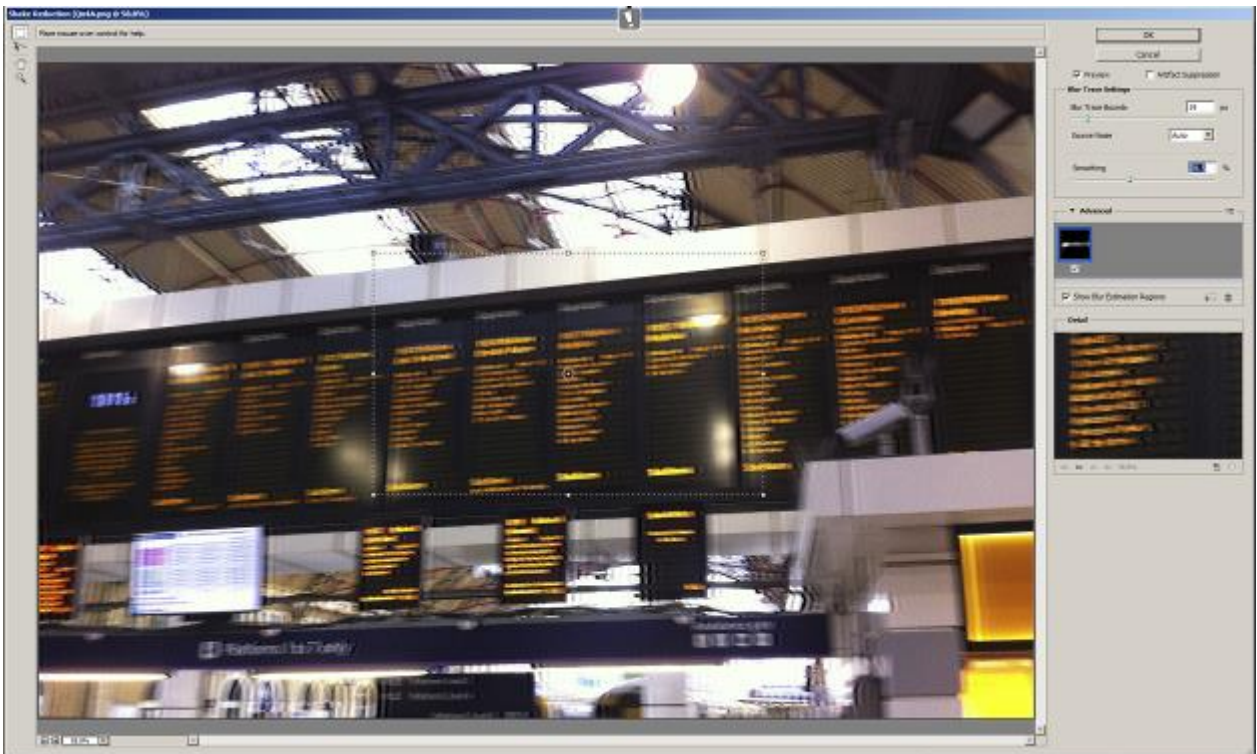Filter → Sharpen → Shake Reduction

Save as Q4A_Region1_ID02.bmp

Region 2

Photoshop CC

Open file Qn4A.png

Image → Mode → 16-bits per channel

Filter → Sharpen → Shake Reduction

Save as Q4A_Region2_ID02.bmp

Qn.4B: Q4B_RegionALL_ID02.tif, Q4B_Region1_ID02.tif

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:

Region 1

Photoshop CC

Open file Qn4B.png

Image → Mode → 16-bits per channel
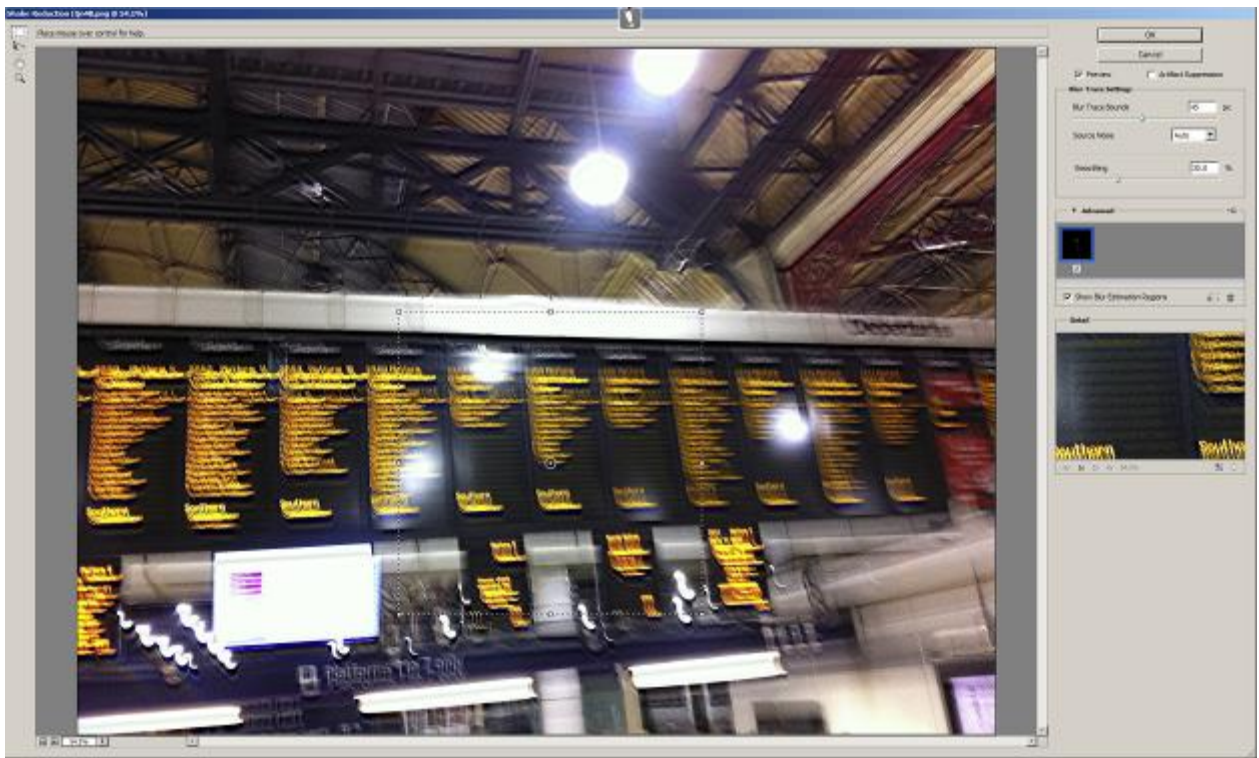
Filter → Sharpen → Shake Reduction

Region ALL

Photoshop CC

Open file Qn4B.png

Image → Mode → 16-bits per channel

Filter → Sharpen → Shake Reduction

Save as Q4B_RegionALL_ID02.tif