

Video System

Status Report

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TINE Video Conference
July 2013



What happened in the last months?

> Name of the Video System

- AVINE: **A**dvanced **V**ideo and **I**maging **N**etwork **E**nvironment
- for now and future
- formerly known as TINE Video System or Video System, Release 3 (VSv3)

> Video Website shortcut

- <http://avine.desy.de>



What happened in the last months?

> ported MS DirectShow video server to Win7/64

- project updated to MS VS2010
- works without limitations



> Live video via TINE or sequence from disk to standard video file

- prototype / proof of concept implementation
- .mp4 works in VLC out of the box



sequence.mp4

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What happened in the last months? (cont'd)

Video Client 3

The screenshot shows a video client interface with a central video display area. A large white watermark 'Video Client 3' is overlaid on the video. The interface includes a toolbar at the top with buttons for 'xScale', 'yScale', 'xRMS', and 'yRMS'. Below the toolbar are several panels: 'Live Image Source' with a dropdown menu, 'Statistics' showing 'Pulled Frames' and 'Dropped Frames', 'Normalization' with a 'Mode' dropdown and 'x-Ray Filtering' percentage, and 'Image Buffer' settings. The video display area shows a dark image with a green and red overlay, and a coordinate system with values like '0.00' and '-1.664'. The bottom status bar shows the date and time: '07.07.2013 00:58:16 (7/5) VIL drop 1 frame(s) on display, source display (last)'. The DESY logo is visible in the bottom right corner.

What happened in the last months? (cont'd)

The screenshot displays the Video Client 3 software interface. At the top, a 'False Colour Table' panel shows a color scale from LSB (1) to MSB (10). Below it, the main application window shows a 'Toolbar' with various settings for xScale, yScale, and normalization. A 'Zoom Panel' is visible in the top right, showing a zoomed-in view of a circular object. A 'Side Panel' is on the right, containing settings for Image Buffer, Area of Interest (AOI), Statistics, Normalization, X-Ray Filtering, and CSV File Writing. The main display area shows a large image with a smaller zoomed-in view of a circular object.

What happened in the last months? (cont'd)

> Video Client 3

- uses TINE data transport for video images (old version used raw VSV2 TCP sockets)
- JPEG, RGB24 on TINE input possible (will be converted to grayscale)
- XY scale factors, event number (from TINE image header)
- redesigned User interface
- Zoom Panel, Side Panel, False Colour Table Panel
- area of interest possible to move, resize via keyboard
- improved compatibility with remote desktop software (UltraVNC, Timbuktu)
- in production at PITZ, Regae



What happened in the last months? (cont'd)

- > investigations on TINE video transport
 - TINE micro cycle delay
 - test in Zeuthen reached 56 MB/s (20 Hz, 2.8 MB per video frame) via UDP multicast using micro cycle delay
 - *requires fast network up to clients and no disturbance of server (e.g. TCP access to the same property)*
 - nearly no losses (boundaries: drop <1% <0,1% of video frames)

 - mixed environment (fast and slow clients, TCP and UDP multicast via TINE) requires special setup
 - slow clients disturb fast delivery to fast clients (if all are subscribed to the same scheduled video property)

- > still, in general UDP (multicast) requires more effort than TCP

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What happened in the last months? (cont'd)

- > AVINE client library (see <http://avine.desy.de> -> API)
 - C/C++ shared library, foreseen to be supported long-term

 - getting (live) single images, video image sequences from TINE CF_IMAGE properties via TINE data transport
 - loading/saving of image file formats (IMM/IMC/BKG/BKC/Windows BMP)
 - enumerating facility markup file (SysList.xml)
 - X-Ray filtering, normalizing of video frames (like Video Client)

 - multiplatform 32/64 bit: libvideosystem3.so (Linux: SL5, SL6), videosystem3-x64.dll (Windows 64 bit: Win7/64), videosystem3.dll (Windows 32-bit: WinXP)
 - fundament for Matlab external functions (mex), Labview, Video System clients like EMWIZ/Fastscan...
 - uses TINE library (libtine.so, tine32.dll, tine64.dll as fundament)

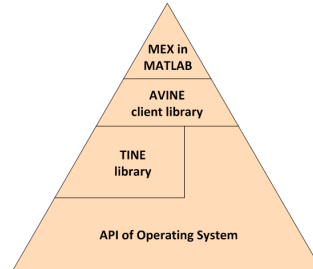
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What happened recently: Matlab

> AVINE MATLAB external functions (see <http://avine.desy.de> -> API)

- foreseen to be supported long-term
- uses AVINE client library as fundament
- Matlab 7.1+ (up to R2012b tested)
- multiplatform (Linux, Windows, 32, 64 bit)
- in production at PITZ, Regae



> avine_tine_read_images()

- acquire fresh image(s) and headers from video server into Matlab as cell of matrices

> avine_load_video_images_from_file()

- load Video System image files (.imc, .bkc, .imm, .bkg) into Matlab as cell of matrices

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What happened recently: Matlab (cont'd)

```
[a, h] = avine_tine_read_images(
```

```
    string tineAddress,
    int numImages=1,
    int sequenceIndicator=0,
    int unlockLimitation=0,
    int tineAccessRate=1000,
    string tineAccessModes='TIMER|SYNCNOTIFY|CONNECT',
    int verbose=0
```

```
);
```

return-values:

a - cell of matrices with the image(s)

h - cell of strings containing headers of each of the image(s)
contains timestamp and so on...

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What happened recently: Matlab (cont'd)

```
>> avine_tine_read_images
Error using avine_tine_read_images
Error: No arguments given.

usage:
[a,h] = avine_tine_read_images('<context>/<server>/<device>[<property>]'  
,numImages=1  
,sequenceIndicator=0  
,unlockLimitation=0  
,tineAccessRate=1000  
,tineAccessModes='TIMER|SYNCNOTIFY|CONNECT'  
,verbose=0]);

returns:
a - images (cell of matrices),
h - image headers (cell of matrices)

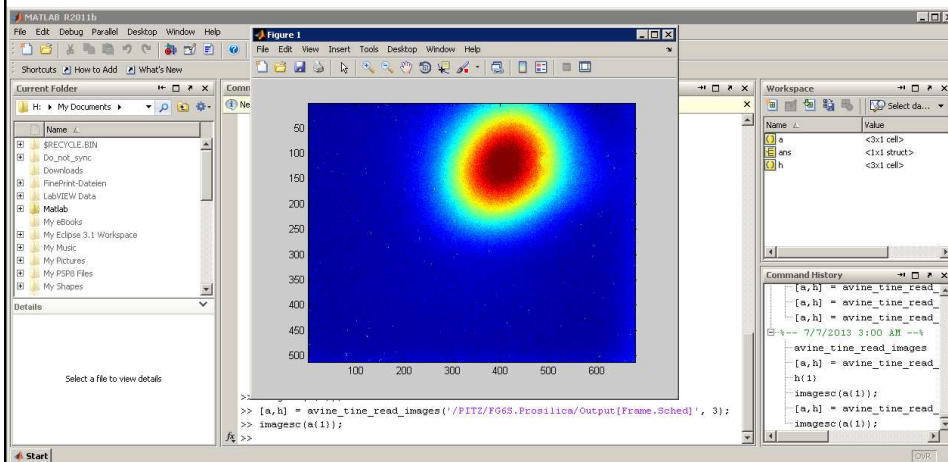
version:
v0.9.1
timestamp of matlab external function build: May 24 2013 17:54:21
underlying avine library version: **** VSv3 shared client library,  
win64(msvc2010,x64), v0.99.0, b238(Release) (May 24, 2013) ****
```

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What happened recently: Matlab (cont'd)

```
>> [a,h] = avine_tine_read_images('/PITZ/FG6S.Prosillica/Output[Frame.Sched]', 3);
>> imagesc(a{1});
```



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What happened recently: Matlab (cont'd)

```
>> h{1}

ans =

        baseTag: 861295446
    cameraPortId: 147
        versionTag: 1
        totalLength: 696508
    timestampSeconds: 1.3732e+009
    timestampMicroseconds: 554599
    humanReadable_timestamp: '[07.07.13 03:10:16:554599 us LTM]'
    cameraPortName: 'Low.Scr3 (Bin2x2)''
        sourceWidth: 680
        sourceHeight: 512
            aoiWidth: -1
            aoiHeight: -1
                xStart: 0
                yStart: 0
        bytesPerPixel: 2
    effectiveBitsPerPixel: 12
    horizontalBinning: 2
    verticalBinning: 2

...
```

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What happened recently: Matlab (cont'd)

```
...

        sourceFormat: 0
    humanReadable_sourceFormat: 'GRAY'
        imageFormat: 0
    humanReadable_imageFormat: 'GRAY'
        frameNumber: 4834
        eventNumber: 218407115
            xScale: 0.0280
            yScale: 0.0280
        imageRotation: 180
        scale_x_offset: -1
        scale_y_offset: -1
            fspare3: -1
        imageFlags: 35
    humanReadable_imageFlags: [1x58 char]
        ispare1: -1
        ispare2: -1
        ispare3: -1
    appendedFrameSize: 696320
    TineTimeStampDouble: 1.3732e+009
    TineSystemStampInt: 218407115
    TineUserStampInt: 0

>>
```

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What happened recently: Matlab (cont'd)

SYNOPSIS:

```
[a, h, n] = avine_load_video_images_from_file( string filename_and_path,
                                             int verbose=0);
```

RETURN-VALUES:

```
a - cell of matrices with the image(s)
h - cell of strings containing headers of each of the image(s)
n - number of images returned
```

PARAMETERS (M-mandatory O-optional):

```
M filename_and_path - filename (may contain path) to the file
                     which shall be loaded in (.imc, .bkc, .imm, .bkg)

O verbose           - 0: (default)
                     no verbose output

                     1: verbose output (some debug-like printf's) may be
                     added
```

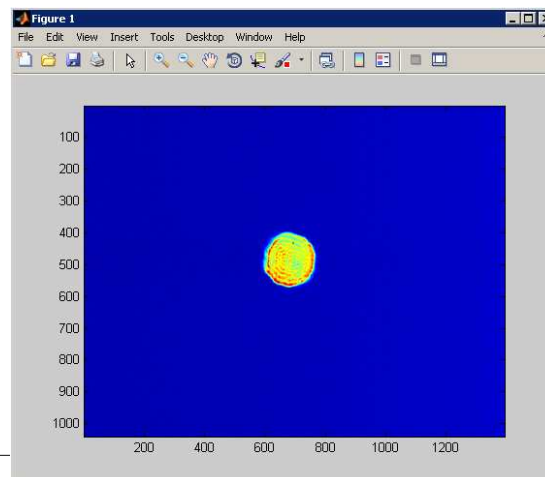


What happened recently: Matlab (cont'd)

```
>> [a,h,n] = avine_load_video_images_from_file('z:\Laser\VirtCath2\2012\20120225N\2333.imc');
>> h{1}
ans =
    width: 1392
    height: 1040
         bpp: 16
    bpp_effective: 10
         scale: 0.0047

>> n
n =
    10

>> imagesc(a{1});
>>
```



Current Field of Activity

> Establish first application example using TINE video event archive

GUN spark detection

▪ **server-side**

- a) sudden intensity increase is detected on fresh video image(s)
- b) event trigger is send to TINE event archive
- c) local video history is frozen (until TINE event archive server has been successfully picked up the frozen local history of video images)
- d) TINE event archive server downloads the sequence of video images from frozen local video history (backlog, event frame and some frames after that)
- e) local video history is unfrozen (TINE event archive server informs the video server that sequence download was completed or timeout)

▪ **Later...**

physicist browses TINE event archive for trigger events that were recorded
video images at recorded events can be inspected...

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Current Field of Activity (cont'd)

> Based on user-feedback

- Video Client 3 Service Release 1
 - add decorations (spot center and size, mouse cross) to Zoom Panel
 - view / analyze each individual image of a sequence
 - enhance reliability, robustness and ease of use
- round corners of video system client library and Matlab external functions

> Work on TINE video transport

- enhance reliability and ease of use
- find a way that slow (TCP) consumers receiving live video no longer disturb fast consumers

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Next Topics

- > Final cut of legacy Video System 2 at PITZ
 - upgrading of user clients almost done
- > Considering video multicast at Regae
 - currently TCP is used (it works most stable out of the box)
 - of course using TCP with high bandwidth video transfers, Gigabit Ethernet is easily filled (n clients -> n*bandwidth)
 - network architecture upgrade earlier this year introduced possibility to consider high bandwidth video multicast
- > Migration of server-side at PITZ
 - move away from workstation XP rack-mount machines
 - considering Server Core 2008 R2 on Dell remote-management pizza-box-type-of server machine
 - Win7/64 workstation as fallback

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Future Prospects

- > Release AVINE (live video, sequence from disk) to MPEG4 video file
- > TINE video archive storage and retrieval
 - TINE video local history, TINE event archive
- > AVINE server components on Linux
- > Hamamatsu Streak Camera integration
- > Native 64 bit support on server-side
- > Analogue camera keep-alive option via Analogue-To-GigE/Vision+GenICam converter box
- > AVINE at EMBL Hamburg (Labview...)

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