AUTOTRACKING

Video analytics for continuous tracking of moving objects

Revision 2

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Document history

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Intended audience

This document is written for the person in charge of configuration of the Autotracking application. It describes in detail the different settings used on installing and setting this analysis application.

Getting technical support

You can ask questions and make product suggestions to ACIC by email at support@acic.eu. Please don't forget to include your contact and project information in your request.
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1 Introduction

ACIC Autotracking is a video analytics application for autonomous and continuous tracking of moving objects. It implements a smooth control of pan-tilt-zoom (PTZ) cameras, compatible with major brands and video management systems. The main application field is high end video surveillance projects, when video analytics tools are used to increase the awareness of the operators. With ACIC Autotracking, the target will remain in the field of view of the PTZ camera after the first detection.
2 Compatibility and requirements

ACIC Autotracking is a server based application. It gets the video from the (IP or analog) camera and takes remote control of the pan, tilt and zoom. Conventional (visible) or thermal imaging devices can be used.

The video should meet the following requirements:

- minimum VGA (640x480) resolution for conventional cameras and CIF (352x288) resolution for thermal cameras
- 25 frames per second recommended for best tracking performance.
- At least 12 pixels on the target (width or height)
- At least 20 grayscale levels for the target contrast (over 255 shades)

In terms of directional control, the camera must support variable speed pan and tilt control. Zoom is optional.

The following brands are compatible with ACIC Autotracking:

- Axis PTZ cameras: P54 series, P55 series, P56 series, Q60 series
- Sony PTZ cameras: SNC-WR series
- FLIR PT series
- Hikvision DS-6701 encoder with PTZ camera
- PTZ camera integrated with Genetec Security Center 5.3 or better (through ACIC Security Center gateway)
3 Use cases

ACIC Autotracking can be used in various scenarios. These are the 3 mains setups:

- Autotracking as stand alone autonomous application: starting at the Home position, the object detection is configured to detect a moving object in the given area (Automatic initialization). After a limited time tracking, the camera is back to his Home position and the initialization start again. Such a setup extend the perception of a PTZ camera, by tracking and zooming on object.

- Autotracking activated by an external detection system, like an instrumented fence of a perimeter protection installation. When a detector raises an alarm, the video management system or the supervisor, orders a preset for the PTZ camera and then starts the autotracking (External trigger initialization). The Autotracking application performs object detection on the current view and when the target is found (as moving object inside the area), starts the tracking. If the operator take control of the PTZ camera, the autotracking is stopped by a notification from the VMS.

- Autotracking following a detection by ACIC ActivityDetection. ACIC ActivityDetection can express many scenarios like people entering an area, vehicle crossing a line, left or remove object… At ActivityDetection alarm, it is possible to activate the autotracking with exactly the subject of the detection (ActivityDetection initialization). So the PTZ camera will start following and zooming on the target. When the tracking ends (by time limit or operator control) and the camera returns to the Home position, ActivityDetection will resume the detection.
4 Principle and setup

ACIC Autotracking could start in two ways:

- following an external trigger. In that case, the target position is not known and an automatic object detection (by motion detection) must be performed to initialize the tracking.
- coupled with another analytics application operating on the same camera (like ACIC ActivityDetection). After the detection, the tracking is initialized with the coordinates of the object.

The tracking stops when the target is lost or when an external signal is received. The external signals (to start and stop the tracking) use an HTTP request, as explained in the next chapter.

The configuration of the application is edited with a standard ACIC applet. Three mains sections expose the parameters:

- **Tracking** for the attributes related to the initialization and the tracking process
- **PTZ control** for the parameters used to access the camera and adjust the pan, tilt and zoom control
- **Display settings** to choose the overlay (On Screen Display) elements

4.1 Tracking section

The “Initialization” parameter control the way the Autotracking starts:
• **“Automatic”**: an object detection (as configured below) is used to detect the target to follow. If the object meets the detection criteria, it is set as the target and the tracking starts.

• **“External trigger”**: the application is waiting for a trigger to start the object detection. When the target is found, the tracking starts. That trigger typically comes from a VMS. Use that option when the autotracking should start after a detection made by another system (electronic fence, presence sensor, video analytics on another camera...). The VMS must aim to camera to the area where the detection occurs, before sending the start signal. The object detection will then extract the object and the tracking will start.

• **“ActivityDetection”**: choose that option when the Autotracking is initialized by a detection made by ACIC ActivityDetection on the same camera. In that scenario, the exact coordinates of the target are passed from ActivityDetection to Autotracking.

Sometimes, a delay is required before starting the initialization process: for object detection, the camera must be fixed and stable. The parameter **“Delay before initialization”**, expressed in second, introduce a delay before the detection starts. It is very useful when the camera is coming from another position and need to focus.

Use **“Maximum tracking duration”** to limit the tracking time (and release the control of the camera) and check **“Return Home after tracking”** to automatically go to the Home preset when autotracking ends.

The group **“Object detection”** is for parameters related to the target extraction, used to initialize the tracking. After that initial step, the object detection is no more used.

- **“Detection area”** defines a polygon where the object detection occurs
- **“Min/Max object size”** are the smallest and largest possible size for the detected object
- **“Extraction method”** could be “Reference” or “Difference”. That's two different processes for object extraction, Reference is preferred.
- **“Image noise filtering”** should be used when the image is noisy (low light situations)
- **“Grayscale threshold”** defines the extraction sensibility. Reduce up to 8 when object contrast is poor and increase for thermal imaging with good target contrast.
- **“Detection time/distance”**, these two parameters control when an object is selected as the tracking target. If an object is observed for such duration and have been moving at least that distance, the initialization stage is over and the tracking starts.
- **“Area/Object overflow”** disable the detection process when too much pixels or objects are extracted.
4.2 PTZ control section

The PTZ Control group is for the setup of the PTZ driver. Choose the right “Driver” according to the brand and model of the PTZ camera:

- Generic for a control inherited from the ACIC video acquisition setup. Could be a specific brand, a VMS or a generic video stream.
- Axis, Sony, FLIR or Hikvision for dedicated driver. These drivers have been optimized for an autotracking usage.
- “IP Address/Port” are used to access the camera on the network
- “User and password” are optional and must be used when the PTZ control is restricted to some users.
- “Device ID” is used only with PelcoD driver.
- “Allow zoom control” enable or disable the control of the zoom
- “Pan/tilt/zoom speed” (between 1 and 100) is used to affect the speed of the control, e.g the way the corrections are made to keep the target at the center of the image.
- “Test PTZ control” starts a sequence of pan, tilt and zoom commands lasting the given time. Every time the setup is applied, the tests will run if the duration is not 0, so use it only for initial validation, not during production.

4.3 Display settings section

Display settings expose the different elements that can be drawn over the video (using ACIC streaming or VMS overlay):

- the rectangle over the target
- the current autotracking status: Disable, Init or Running
- some processing statistics
- During the initialization stage:
  - the minimum and maximum object sizes and other elements
  - the object detection area
  - the extracted objects (during the initialization phase)
5 Integration

Integration with third party systems like sensors and VMS are possible through HTTP requests and notification events.

5.1 Initialize the tracking

The following requests are used to trigger and stop the autotracking:

\[\text{http://<ACIC server ip>/cgi-bin/AppParam.cgi?stream=<ID>&run=<auto | region | stop>}\]

The analytics server that runs the Autotracking application is referenced by the ip address and the analytics stream ID choose a specific channel.

The run parameter can take 3 values:

- \textit{auto} starts the autotracking after the automatic object detection have selected a valid object
- \textit{region} is a value with the syntax \textit{x_min, y_min, x_max, y_max}. The 4 values are the coordinates of the bounding rectangle of the target in the current image. The autotracking starts immediately.
- \textit{stop} stops the tracking

5.2 Notification events

ACIC Autotracking application produce events on status changes:

- When the Autotracking starts (after explicit initialization or automatic object detection), the event \textit{AcicAutotrackingStart} is generated
- When the Autotracking stops (explicit stop or time out), the event \textit{AcicAutotrackingStop} is generated
- When the Object detection starts (initialization process), the event \textit{AcicAutotrackingInit} is generated
- When the Object detection ends, without triggering the tracking, the event \textit{AcicAutotrackingCancel} is generated

So, up to 4 atomic events can be generated by the analytics application. These events can be used in the VMS to trigger some actions or with the standard ACIC output generators (HTTP, TCP, FTP...).

5.3 Integration with Genetec Omnicast

It is possible to use macro in Genetec Omnicast to automatically stop the autotracking when the operator take the control (using a joystick for example). A macro will perform an HTTP request when an Omnicast PTZ event occurs:
The code of the macro Suspend ACIC analytics is below:

```vba
" IP Address of ACIC autotracking server
Const ACIC_server = "192.168.20.144"

Dim m_objVirtualMatrix
Dim oXMLHTTP

Sub Initialize( in_VirtualMatrixSDK )
    Set m_objVirtualMatrix = in_VirtualMatrixSDK
    Set oXMLHTTP = CreateObject("MSXML2.XMLHTTP.3.0")
End Sub

Sub Shutdown()
    Set m_objVirtualMatrix = Nothing
    Set oXMLHTTP = Nothing
End Sub

Sub ExecuteNextStep()
    On error Resume Next
    ' Get the current encoder entity, should be one of the PTZ
    Dim encoderID
    Dim encoderGUID
    Dim encoderEntity
    encoderID= m_objVirtualMatrix.CurrentEncoder
    encoderGUID= m_objVirtualMatrix.GetEntityGuid(encoderID, GX_ENTITY_VIDEOENCODER)
    Set encoderEntity = m_objVirtualMatrix.GetEntity(encoderGUID)
    If ( Err.Number <> 0 ) Then
        m_objVirtualMatrix.LogError 1,2,"Failed to get current encoder entity"
        m_objVirtualMatrix.ScriptCompleted
    End If
    m_objVirtualMatrix.LogError 1,2,"Encoder  ID:  "  &  CStr(encoderID)  &  "  Name:  "  &  CStr(encoderEntity.Name)
    ' match the encoder ID to the ACIC analytics streams
    ' this code should be edited to match the deployment
    Dim analytics_stream
    Select Case encoderID
        Case 20
            analytics_stream=1
        Case 16
            analytics_stream=2
        Case Else
            analytics_stream=0
    End Select
    If (analytics_stream <> 0) Then
        ' build the http request
        Dim query
        query  =  "http://"  +  ACIC_server  +  "/cgi-bin/AppParam.cgi?stream="  +
        CStr(analytics_stream) + "&suspend=true"
        m_objVirtualMatrix.LogError 1,2,query
        oXMLHTTP.Open "GET", query, False
        oXMLHTTP.Send

    End If
End Sub
```
Besides triggering start and stop autotracking, Omnicast will receive custom event described in section 5.2. Refer to ACIC Omnicast integration manual for further information.

5.4 Integration with Genetec Security Center

It is possible to have a complete integration between Security Center and ACIC Autotracking. The video stream comes from the VMS and the PTZ camera is controlled through the VMS. When the operator takes and locks the PTZ for manual control, the Autotracking will not be able to make any operations.

To start the autotracking on specific event (coming from a third party detection system for example), a macro can be used:

```csharp
using System;
using System.Data;
using System.Xml;
using Genetec.Sdk;
using Genetec.Sdk.Scripting;

public sealed class AutotrackStartMacro : UserMacro
{
    public String AnalyticsServer { get; set; }
    public String AnalyticsStream { get; set; }
    public String AutotrackingAction { get; set; }

    /// <summary>
    /// Entry point of the macro. Provide an implementation of this method.
    /// </summary>
    public override void Execute()
    {
        if (String.IsNullOrEmpty(AnalyticsServer))
            throw new ArgumentException("Analytics server IP must be defined");
        if (String.IsNullOrEmpty(AnalyticsStream))
            throw new ArgumentException("Analytics stream ID must be defined");
        if (String.IsNullOrEmpty(AutotrackingAction))
            throw new ArgumentException("Autotracking action must be start or stop");

        try
        {
            System.Uri uri = new Uri("http://" + AnalyticsServer + "+" + AnalyticsStream + "+?" + AutotrackingAction);
            httpWebRequest.Timeout = 1000;
            httpWebRequest.ReadWriteTimeout = 1000;
            httpWebResponse.Close();
        }
    }
}
```
Besides triggering start and stop autotracking, Security Center will receive a custom event described in section 5.2. Refer to ACIC Security Center integration manual for further information.