VTrack-FaceDetection

Video analysis for automatic real time detection and notification of covered and/or uncovered human faces inside a virtual area

Pandemic management	Security	Safety	Retail

TECHNICAL SPECIFICATIONS

General features

- Modular, scalable and hardware-independent software solution, available for Windows o.s server-based
- Integrating the most advanced self-adaptive algorithms, based on DeepLearning, Self Learning Background Modeling and Multi-Target Tracking, for the most robust and reliable detection and classification performances with any environmental conditions (light changes, WDR, atmospheric phenomena, vegetation, camera noise, …)
- Acquisition from:
  o IP optical cameras, through standard protocols RTSP ONVIF with encoding formats Mjpeg, mpeg2, mpeg4, h264, h265
  o analogue optical cameras, through video encoders or hybrid NVR/DVR, compatible with standard protocols RTSP ONVIF with encoding formats Mjpeg, mpeg2, mpeg4, h264, h265
  o compatible VMS/DVR/NVR platforms
  o off-line videos, in all standard formats (avi, asf, mpg, mov, mkv, …)
  o single images, in jpeg format
  o USB or integrated web cams
- Automatic and real time notifications to:
  o TechnoAware-CentralManager client, local or remote
  o compatible VMS/DVR/NVR platforms
  o I/O contacts, through Modbus protocol
  o http or TCP network sender, customizable
  o e-mail, with in attachment the image related to the notified alarm
  o FTP client, saving the video clip related to the notified alarms
- Real time or off-line fruition of the processed data through:
  o TechnoAware-CentralManager client, local or remote
  o cgi call, for receiving automatically an xml file through http with the required data
  o compatible third-party platforms
  o automatic periodical report in pdf format, customizable by project
- Ability to process the acquired video stream at a lower resolution and frame rate
- Ability to crop and process independently unlimited image portions of the acquired video flow
- Ability to configure unlimited independent active rules, by drawing in the image virtual polygonal areas or lines of any shape and size
- Detection, tracking and management of unlimited faces in the scene
- Ability to set up and activate unlimited configurations of cameras, functions, rules and parameters, according to:
  o planned timetable
  o manual trigger
  o time-based trigger
  o time duration trigger
- Ability to import/export configurations previously set up
- Ability to manage different configurations for different configured presets of a PTZ camera
- Ability to manage redundant architectures, by active FailOver function (both cases n:n or n:1)
- Ability to work in virtualized environments

- Enabling/disabling of the modules by:
  o an interrupt from an external input, through cgi call
  o time scheduling, by timetabled configuration
  o manual command, through VTrack-CentralManager client
  o polling the status of an external I/O, through http or TCP call
- Built-in database for the storage of processed events and data
- API for streaming out, by rtsp protocol, the real time processed video flow with the overlays of targets' bounding boxes and trajectories, for being acquired by compatible third-party platforms
- Ability to provide the position of each detected target in georeferenced coordinates (GPS, GIS), by calibrating the processed cameras on georeferenced maps, when available
- VirtualAlertRule function, for configuring a notification by correlating the occurring of multiple alarms configured on the same camera or on other cameras connected locally
- Tampering function, to trigger an alarm on detection of camera obscured, dazzled or moved for longer than a configured time
- QualityCam function, to trigger an alarm on the reduction of visibility of the camera (i.e. because of dirt)
- VideoLoss function, to trigger an alarm notification in case of a loss of communication with a video source
- PrivacyBlur function, for the streaming of the video flow with the image blurred in accordance with the privacy law
- Active diagnostic monitoring of the working status, through:
  o Watchdog function, for the automatic restart of the module in case of critical error or restart of the processing unit
  o HeartBeat function, for the periodical notification of the correct working of the module to an external device
  o CheckConfig function, for checking by a html/xml request the status of the active configuration
  o writing and storing of log files for each main process of the module
  o VTrack-Monitor Client, for configuring automatic notifications in case of misfunctioning events of the connected VTrack modules
- TechnoAware-CentralManager Client, for:
  o centralized configuration of unlimited local or remote VTrack modules
  o centralized live view of the connected local and/or remote VTrack modules
  o centralized real time visualization and management of the alarms and data, notified by unlimited connected local and/or remote VTrack modules
  o real time or off-line simulation of the processing results, to verify the behavior of the configured video processing parameters
  o visualization of the bounding box and trajectory of the detected targets, either in the live view and in the alarms panel
  o ability to record and store video clips from the acquired video sources, in continuous or based on specific events
  o ability to configure different user profiles, allowing to enable or to inhibit for each one the access to specific views or functionalities
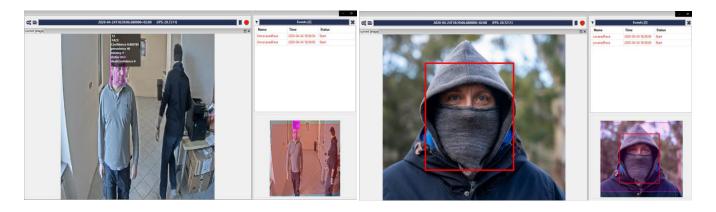
Functional features

- Ability to configure unlimited virtual areas, of any polygonal shape and size
- For each configured virtual area, ability to detect and notify the presence of a human target with covered or partially covered (only eyes visible) face
- For each configured virtual area, ability to detect and notify the presence of a human target with uncovered face, by search of biometric features
- For each configured virtual area, ability to configure independent alarm notifications for:
  o start of alarm condition
  o end of alarm condition
- For each configured active zone, ability to configure an absence alarm notification in case of no alarm event occurred within a defined timeframe
- Filtering of target faces by linear size

- Ability to detect faces with angles of inclination up to ±80° in pan and up to ±45° in tilt with respect to the frontal plane
- Ability to configure a time of confidence for the target detection
- Unlimited configurable no-processing areas, to inhibit not-of-interest areas in the image
- Unlimited configurable no-initialization areas, to filter the targets initialized where no targets of interest are expected to appear
- Alarm recurrence filter, for disabling the alarm notifications for a configured time after an already notified previous one
- Gradient-based low-level algorithm, for the extraction of the contours of the scene
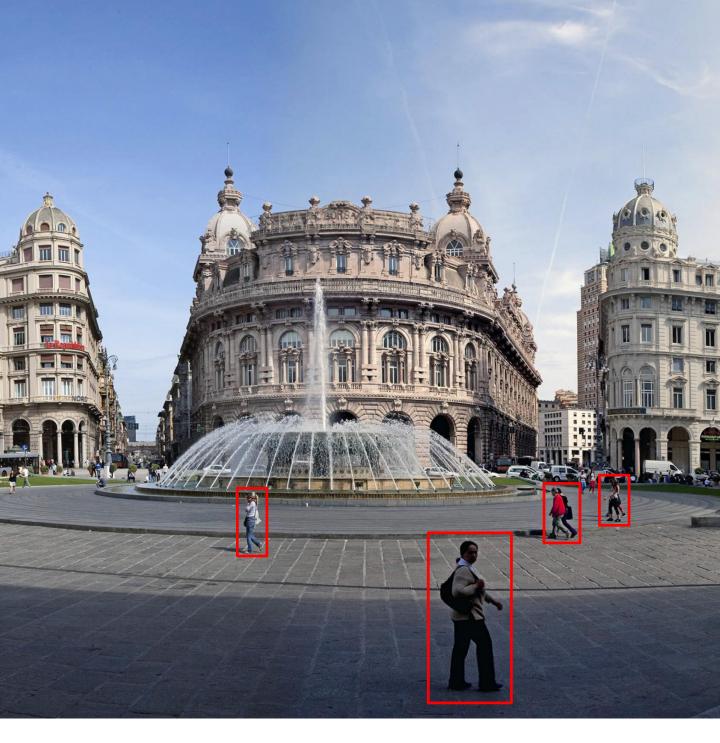- GammaCorrection filter for adjusting the quality of the image contrast

TECHNICAL REQUIREMENTS

Image and video streaming requirements

- Conditions of the target faces in the image for maximizing the detection performances:
  o clearly visible to the naked eye in the image, even in difficult environmental conditions (backlight, night, sun glare, reflections, artificial lights, underexposed or overexposed camera, obstacles, …)
  o entirely visible in the image for at least 10-15 continuous frames
  o maximum angle of inclination with respect to the frontal plane: inclination up to ±80° in pan and up to ±45° in tilt

  o minimum face size: in order to have at least about 30 pixels eye-to-eye (thus, area of about 5000 pixels), at the farthest point where the detection is required
  o minimum contrast between the target face's contours and its surrounding area: 15 levels of color difference
- Minimum resolution: about 400 pixel/meter, at the farthest point where the detection is required
- Minimum frame rate: 15 frames per second for moving and/or not-collaborative targets; 5 frames per second for still or collaborative targets scenarios

Processing requirements

- Computational need:
  o CPU: considering, as reference, a single core with 2,8GHz base speed
    - up to 4 streams in parallel processing in CIF resolution (352x288) at 12 frames per second
    - up to 2 streams in parallel processing in VGA resolution (640x480) at 10 frames per second
    - up to 2 streams in parallel processing in 4CIF resolution (704x576) at 8 frames per second

    - up to 2 stream in parallel processing in 800x600 resolution at 6 frames per second
    - up to 1 stream processing in FullHD (1080p) resolution (1920x1080) at 5 frames per second
  o RAM: about 80MB for each function processed in parallel
  o GPU: NVIDIA CUDA with at least:
    - 4GB RAM DDR5,
    - 768 CUDA cores
- Supported OS: Windows 10 or later

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TECHNOLOGIES FOR AMBIENT INTELLIGENCE

TechnoAware researches and develops technologies, products and solutions for video analysis and Artificial Intelligence.

Founded in 2003 from the University of Genoa's ISIP40 Research Group, with more than 35 years of experience, competence and know how TechnoAware's Team is one of the foremost experts worldwide in video analysis and Artificial Intelligence.