International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

F.743.7

(05/2019)

SERIES F: NON-TELEPHONE TELECOMMUNICATION SERVICES

Multimedia services

Requirements for big data-enhanced visual surveillance services

Recommendation ITU-T F.743.7

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Recommendation ITU-T F.743.7

Requirements for big data-enhanced visual surveillance services

Summary

Recommendation ITU-T F.743.7 specifies requirements for visual surveillance enhanced by big data (VSBD) services. It promotes the value of visual surveillance services by using big data analytics method and tools. Massive video, event and sensing data are analysed to support enhanced visual surveillance services, including video retrieval, event detection and status prediction.

Recommendation ITU-T F.743.7 provides application scenarios, service requirements, functional requirements, performance and security requirements for VSBD services.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T F.743.7	2019-05-14	16	11.1002/1000/13897

Keywords

Big data, requirement, visual surveillance.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

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1 Scope

This Recommendation specifies requirements for big data-enhanced visual surveillance service.

The scope of this Recommendation includes:

– application scenarios;
– service requirements;
– functional requirements;
– performance requirements;
– security requirements.

2 References

None.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following term defined elsewhere:

3.1.1 visual surveillance [b-ITU-T F.743]: A telecommunication service focusing on video (but including audio) application technology, which is used to remotely capture multimedia (such as audio, video, image, alarm signals, etc.) and present them to the end user in a friendly manner, based on a managed broadband network with quality, security and reliability ensured.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

ETL Extract-Transform-Load

ML Machine Learning

PTZ Pan/Tilt Zoom

VSBD Visual Surveillance enhanced by Big Data

5 Conventions

In this Recommendation:

The keywords "is required to" indicate a requirement which must be strictly followed and from which no deviation is permitted if conformance to this document is to be claimed.

The keywords "is recommended" indicate a requirement which is recommended but which is not absolutely required. Thus this requirement needs not be present to claim conformance.

The keywords "can optionally" and "may" indicate an optional requirement which is permissible, without implying any sense of being recommended. These terms are not intended to imply that the vendor's implementation must provide the option and the feature can be optionally enabled by the network operator/service provider. Rather, it means the vendor may optionally provide the feature and still claim conformance with the specification.

6 Application scenarios

6.1 Intelligent video retrieval

It is difficult for traditional video surveillance to retrieve a specific object in massive video data. However, a user can use text, picture or video as input to search in a large number of videos according to the various characteristics of the objects in visual surveillance enhanced by big data (VSBD). Two examples follow.

a. Using the image of the target person as input, users can quickly search for similar objects in massive videos according to the facial, clothing colour distribution or body features of the image.

b. Using characteristic information such as licence plate, vehicle type, colour, brand type or body feature of the target vehicle as input, users can retrieve similar objects in multiple videos with the trajectories displayed.

6.2 Intelligent event detection

VSBD can automatically identify specific events (fire, fake licence plate, etc.) that users are interested in based on various data. The data can be derived from multiple video sources or video and sensor data combinations. The criteria for identifying specific events can be predefined rules or models learned from machine learning (ML).

For example, VSBD can detect a fire disaster by analysing the related real-time videos as well as sensing data from smoke detectors and temperature sensors in areas of concern to users.

6.3 Status prediction

The value of traditional video surveillance data has not been explored. VSBD can effectively exploit the value of historical data. It can extract a large amount of effective information from video surveillance data and be used in many aspects of prediction. For example, according to the data collected by cameras, VSBD can analyse the rules and forecast future traffic flow in order to achieve efficient traffic control.

7 Service requirements

7.1 Video retrieval

7.1.1 Object retrieval

SRV001: VSBD is required to support various conditional retrieval inputs and search objects in massive video data across cameras by different abstract features rapidly.

SRV002: VSBD is required to support continuous video capture for selected objects.

SRV003: VSBD is required to adapt automatically despite scenarios, illumination, camera angles and position.

7.1.2 Event retrieval

SRV004: VSBD is required to support retrieval of the characteristics for particular events, such as people gathering in time and space. A VSDB is required to support the statistics for the selected range of alarm events.

7.1.3 Integrated retrieval

SRV005: VSBD is recommended to support real-time and historical trajectories video retrieval from real-time video and historical database by the conditions of time, space, hot events, features marks and object people or vehicles.

7.2 Statistical analytics

SRV006: VSBD is required to support data collection for vehicle classification, trajectory tracking and monitoring, and registration location.

SRV007: VSBD is required to support data collection of the flow of vehicle or people in certain locations or time periods, and output the alarm information according to the results from big data analytics.

SRV008: VSBD is required to support using big data-processing capabilities to identify suspected fake plate vehicles from the massive licence plate data captured every day.

SRV009: VSBD is required to support identification of trailing vehicles from video data features.

7.3 Behaviour analytics

SRV010: VSBD is required to support people behaviour analytics, such as trajectory reappearance and frequent entry and exit.

SRV011: VSBD is required to support vehicle behaviour analytics, such as fake plate vehicle scanning, first time appearance within the specified range, one vehicle multiple plates, similar licence plate differentiation, frequent overtaking, trajectory reappearance, vehicles travelling together and user-defined collision.

7.4 Status prediction

SRV012: VSBD is required to support the display of different kinds of status predictions, such as the incidence of certain types of criminal case trend prediction, for decision aids through statistical analytics from huge network-wide data.

7.5 Event analytics

SRV013: VSBD is required to find valuable clues from massive historical cases.

SRV014: VSBD is required to support analytics of specific events from a large number of video data and alarm information.

7.6 Data mining and analytics

SRV015: VSBD is required to support the retrieval of system metadata, data mining and analytics function.

SRV016: VSBD is required to support integration of non-video data, mine events correlation and production mode, so as to increase the value of video data.

7.7 Import of special analytics model

SRV017: VSBD is required to support import of the special analytics model that is to computerize, streamline and populate the analytics thinking method and process from the expert manual work and provide a unified interface to system users.

SRV018: VSBD is required to provide methods for analytics to system users to increase the application value of the video surveillance system through encapsulation of the analytics model.

7.8 Visual display

SRV019: VSBD is required to display highly efficient retrieval comparison results.

SRV020: VSBD is required to improve the practicability of the video data by integrated display with a third-party platform, such as the intelligence analytics platform and the emergency processing platform.

8 Functional requirements

8.1 Data collection requirement

8.1.1 Real-time data

FUN001: VSBD is required to support collection of real-time audio and video data from premises units.

FUN002: VSBD is required to support collection of real-time data of pan/tilt zoom (PTZ) control messages.

8.1.2 Non-real-time data

FUN003: VSBD is required to support analysis of events (intrusion, stranded, etc.) and use of the resulting information.

FUN004: VSBD is required to support collection of alarming information.

FUN005: VSBD is recommended to support acquisition and analysis of historical case information databases.

FUN006: VSBD is recommended to support acquisition and use of characteristic image databases (crime picture, etc.).

FUN007: VSBD can optionally support use of digital map information databases.

FUN008: VSBD can optionally support using traffic signal databases.

8.2 Data-processing requirement

Based on computer image-processing technology and image recognition algorithm, a visual surveillance system based on big data application can have the capability to understand and analyse the content of videos or images, generate description information from the content in a structured or semi-structured description language, and provide the basis for video big data analytics and application.

8.2.1 Image processing and recognition requirement

FUN009: VSBD is required to extract key frames from videos and restructure the synthesis of new videos.

FUN010: VSBD is recommended to automatically monitor moving objects in videos, extract object trajectories, and combine them into concentrated videos optimally.

FUN011: VSBD is recommended to unify the format and structures of object information in the video in a timely fashion, and extract important information from objects in the video as the meta-data to save, such as colour, people/car classification and perimeter prevention rules.

8.2.2 Parallel computing or distributed processing requirement

FUN012: VSBD is required to support parallel computing or distributed processing technology, so as to provide real-time batch processing and extract-transform-load (ETL) operations.

8.3 Data storage requirement

FUN013: VSBD is required to support persistent storage and operations for massive data.

FUN014: VSBD is required to support storage of various types of structured data, including image index information, vehicle characteristics, human characteristic information, facial feature information and all kinds of characteristic information for the subject research-analytics.

FUN015: VSBD is required to support the storage of a feature-related object image or video in order to assist display and analytics in characteristic information retrieval processes.

FUN016: VSBD is recommended to support localized storage with external or auxiliary data sources.

9 Performance requirements

PRF001: VSBD is required to support object detection index: minimum detectable object size, detection rate, miss rate, error recognition rate and recognition speed.

PRF002: VSBD is required to support analytical prediction: prediction accuracy, mistaken correlated event rate.

PRF003: VSBD is required to support intelligent analytics of high-throughput real-time video. The average processing and response time is recommended to be less than 1 s.

PRF004: VSBD is required to support parallel analytics of single videos by loading multiple algorithms.

10 Security requirements

SEC001: VSBD is required to support security of the video data itself, including data confidentiality, data integrity and authentication.

SEC002: VSBD is required to support security of data protection including the data security during storage and transmission processes.

Bibliography

[b-ITU-T F.743] Recommendation ITU-T F.743 (2009), *Requirements and service description for visual surveillance*.

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Printed in Switzerland
Geneva, 2019