

Implementing Database Methods for Increasing the Performance of Intelligent CCTV

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Abstract

This paper is written for intelligent CCTV (Closed-Circuit Television) which has been important in the aspect of industrial value and social security these days. Because the intelligent CCTV can identify behavior and object automatically, and it has been used extensively. With spread use, the performance of the intelligent CCTV has been important. But a standard method to measure the performance of the intelligent CCTV is absence, therefore this paper is described about methods for implementing and measuring of the intelligent CCTV performance.

Keywords: intelligent CCTV, intelligent CCTV database, intelligent CCTV performance

1. Introduction

The industry and technology of CCTV (Closed-Circuit Television) has been increased and moved to an important position for over decades, because terrors, anti-social behaviors and arsons have been happened rapidly.

After the advent of CCTV in 1950s, technology transforming into digital files which can be stored in hard drive has been developed to see the files by Internet. Recently, the CCTV converged with network and IT technologies has been progressed to watch behaviors of objects and human and identify them automatically. And the CCTV namely intelligent CCTV has applied to multi-area.







(※ Source: IMS research, 2007)

[Picture 1] Progress of CCTV

That is, the intelligent CCTV is a system to inform special objects and behaviors by identifying them automatically through software program attached to the intelligent CCTV. It has benefits for not watching everything manually, but automatically. Therefore, it can be operated by minimum operators.

Current CCTV namely simple CCTV and intelligent CCTV comparison is as below:

Table 1. Simple CCTV VS Intelligent CCTV

	Simple CCTV	Intelligent CCTV
Feature	<ul style="list-style-type: none"> Watching everything manually 	<ul style="list-style-type: none"> Watching everything automatically
Example		 ※ Automatically the S/W identify the behavior of assault
Benefits & Weakness	<ul style="list-style-type: none"> Easy maintenance 24hr monitoring by human Identify special behavior by human 	<ul style="list-style-type: none"> Minimum operator Automatic inform to operator when happening a special situation Hard implementation
Function	<ul style="list-style-type: none"> Monitoring road 24hr by human manually 	<ul style="list-style-type: none"> Monitoring road 24hr by video surveillance solution automatically 

The intelligent CCTV shall be substituted for current 3G and 4G CCTV rapidly. That is, more than 45% of the video contents will be missed after someone watch video for 12 min. continuously, which was studied by “Buyer beware”. And also Sandia national lab found that when human watch video, only one video can be watched for 20 min. and important events shall be missed.

The USA appointed the intelligent CCTV technology as one of four major technologies in 2005. Because the intelligent CCTV technology will be expected for rapid market growth.

Therefore, the USA, UK and other counties implemented the intelligent CCTV test lab and made policy to enhance the performance of it by issuing certification for the excellent performance of intelligent CCTV.

In Korea, the intelligent CCTV has been applied to video surveillance control center but false alarms have been happened frequently. So these systems are not applied to the center for 24 hours perfectly.

Hence, this paper reviews status of market and technology stage and deducts to enhance the performance of intelligent CCTV.

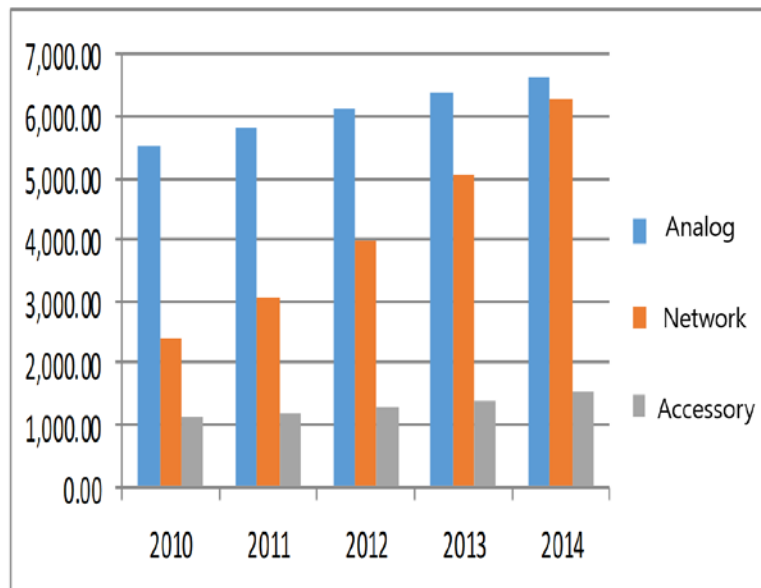
2. Status of Market

2.1. Status of World Market

Globally at video surveillance market shows that it picked up 9 billion dollars in 2010, it is expected 11.3 billion in 2012 and 14.4 billion in 2015. CARG is about 11.9%.

Especially it is expected that area of analogue CCTV will grow slowly and IP based network CCTV quickly.

Among them, the intelligent CCTV market shows that it aggregates 0.2 billion dollars in 2010, 0.3 billion in 2012 and 0.6 billion in 2015.



(※ Source: IMS research, 2011)

Figure 1. World Video Surveillance Market

2.2. Status of Korean Market

In case of Korean market, it is aggregated 1,856 billion won in 2010 and 2,118 billion won in 2012. Therefore CARG is about 7.1%.

Especially, DVR market growth shows minus and IP based network CCTV shall be expected to be high growth.

Also, in the area of video surveillance software and intelligent solution intelligent based automatic system will be grown more than human based video surveillance software.

Table 2. Status of Korean Market

(Monetary unit: 100 million wond)

	2009	2010	2011	2012	CAGR
DVR	5,938	5,819	5,550	5,680	-1.5%
Camera	6,708	7,332	8,030	8,450	8.0%
IP-based facility	1,031	1,260	1,560	1,850	21.5%
Engine/Chipset	650	780	960	1,140	20.6%
Solution	1,220	1,533	1,750	1,905	16.2%
Accessory	653	754	870	980	14.5%
Etc.	1,051	1,083	1,070	1,180	4.0%
Total	17,251	18,561	19,790	21,185	7.1%

(※ Source: KISA, 2012)

3. Status of Technology

The intelligent CCTV is the most developed in the USA and UK where diverse image data has been implemented for identifying and testing special behaviors to enhance the performance the intelligent CCTV solution.

3.1. Status of America and Europe

The study and research has been on the intelligent CCTV in the USA and EU countries. And the technology is tested and certificated.

Especially government of UK found i-LIDS(Imagery Library for Detection Systems) a decade ago, implemented diverse image data and tested diverse behaviors of human and objects. And then excellent performance of the intelligent CCTV is given to certification of i-LIDS mark.



Figure 2. i-LIDS Certification Mark

That is, in the USA and EU countries diverse behavioral image data has been implemented and these are given to many related companies. And these companies will use them and enhance the performance.

The image data implemented by each governments and academies is as follows.

Table 3. Status of American and European image data for intelligent CCTV

Name	Place	Size	Event	Screenshot
PETS2002	Shopping mall	640x240	Man watching show window	
PETS-ICVS 2003	Meeting room	720x576	Man attending to meeting	
VS-PETS 2003 - INMOVE	Soccer field	720x576	Players	
PETS ECCV2004-CAVIAR	Shopping mall	384x288	Man moving, fighting and etc.	
PETS2006 - ISCAPS	Train station	720x576	Man walking	
PETS2007 - REASON	Airport	720x576	Thief	
PETS2009 - CROWD	Road	768x576	Moving	

3.2. Status of Korea

There are no cases to implement image data for the intelligent CCTV by Korean government. Only CCTV manufacturers got images from Internet or implemented images for their own in Korea.

Therefore, it is needed that official image data shall be implemented by authorized organization in Korea.

4. Methods to Enhance the Performance in Korea

To enhance the performance of intelligent CCTV in Korea, diverse behavioral image data shall be implemented.

Therefore, this paper will suggest the methods to enhance it, which was derived from Korean intelligent CCTV experts committee in 2012.

4.1. Scenario based Image Data Implementation

Image data shall be implemented three kinds of type for purpose such as train, test and certificate. For train, the image data shall be provided to all companies and for test it shall be provided to the applicant who wants to receive certification.

For certificate, it shall not be opened and be used for only certificate the solution.

Table 4. Image Data Scenario for Intelligent CCTV

Purpose	Scenario	Description
Train	Shadow	Identifying objects in circumstance of a shadow
	Light	Identifying objects in circumstance of diverse lights (Streetlamp, camera flash, car headlight, etc.)
	Low degree	Identifying objects in circumstance of no lights
	Camera Shaking	Identifying objects in circumstance of camera shaking because of winds
	Overlap	Identifying objects in circumstance of overlapping objects
	Dynamic	Identifying objects in circumstance of background moving
	Crowd	Identifying objects in circumstance of crowd
	Color	Identifying objects in circumstance of diverse color clothes
	Weather	Identifying objects in circumstance of weather changing
	Business	Identifying objects in circumstance of people in line, entering gate, etc.
	New tech.	Image data shoot by IR, 3D
Test	Wander	Identifying objects in circumstance of people wandering
	Left	Identifying objects in circumstance of things left for a long time
	Thief	Identifying objects in circumstance of thing thief

	Tracking	Identifying and tracking objects
	Invasion	Identifying objects in circumstance of people entering a gate and climbing over the wall
	Behavior	Identifying behavior
	Crowd	Identifying objects in circumstance of crowd
Certificate	Multi-event	Identifying multi behaviors and objects

4.2. Diverse Specification Image Data Implementation

The specification of image data for intelligent CCTV solution has no common standard in Korea. Therefore, it is needed that most used type of image data shall be implemented in Korea.

Table 5. Image Data Specification for Intelligent CCTV

Item	Specification	Description
Type	Video clip	Diverse format such as avi, mov, mpg and etc.
Resolution	Full HD (1920x1080)	HD, D1, SD
Frame	30fps ~ 10fps	- Shoot for 30fps - Convert to 10~15fps
Ground Truth	xml or txt type	File name, lens, camera info., time, weather, event

5. Future Plan

As mentioned above, in order to enhance the performance of intelligent CCTV in Korea, diverse image data implementation shall be preceded and a certification to excellent products. Therefore, these are promoted and extend its business abroad.

Korean government and KISA (Korea Internet & Security Agency) is planning to implement image data for the intelligent CCTV in 2013, and provide certification service in 2014. This will help to promote and develop the related industry and companies.

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