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CCTV or IP camera: For smart city surveillance system

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Abstract
For a security camera two different technologies like CCTV and IP cameras are used interchangeably. Although the objective of both the devices are quite similar but there execution is substantially different. Both the devices aimed to provide Physical security, crime prevention and enhanced safety at installed location and nearby areas that comes under the device coverage. The hardware composition and working patterns are of both the devices are substantially different. This research piece is a survey article where authors tries to analyze the utility of these devices in city surveillance. The comparative analysis will provide the base to enhanced functionality of both the devices.

Keywords: Physical security, crime, prevention

Introduction
IP cameras
The first IP camera was product by Axis communication and available in the market in 1996. Internet Protocol (IP) camera can send and receive digital video recordings over the network Like LAN (Local Area Network) through Wi-Fi or POE (Power Over Ethernet). Internally they use NVR (Network Video Recorder) or DVR (Digital Video Recorder) for recording and transmitting. The selection of NVR and DVR is based on many factors like pricing, security and daily requirements.

CCTV's (Close circuit Television)
The first CCTV was used in 1942 during wartime to monitor rocket launch in Germany. CCTV's can capture the sequence of images and show them to a specific place as real time videos. It's possible to have playback of same footages. These CCTV are different then broadcasting as signals are not openly transmitted. These cameras can be wired or wirelessly connected with a monitor where these sequential images are displayed in form of videos.

City Surveillance System
Now a days the current trend is to make every city a smart city. One of the key component of smart city to have a very efficient Video sur Veillance System (VVS). Where almost every actions of every part of city is recorded somewhere through some mechanism and processed. Along with this it is required to store the captures/records for future use [Ref: Diagram 1]. This activity is essential to ensure public safety, crime prevention, environmental protection, regulated traffic management and in short smooth functioning of the city. To attain the objective of mentioned, a city surveillance system should pose few properties [Ref: diagram 2] like privacy and security so the desired objectives can be accomplished during the process. There are variety of devices that are used for city surveillance: like CCTV, mobile cameras, drones, car dash cameras and many more devices. Lets analyze the requirements of two devices in reference to the process requirements of the city surveillance system: Although both CCTV and IP cameras can be used as surveillance device. In Delhi itself around 2, 75, 000 are installed around the city and system is planning to install around 1, 40,000 more as a smart surveillance system [1]. Despite this the system is not considered as complete secure system. The reason being observed is CCTV poses few limitation: like maintaining a CCTV is a costly affair which everyone cannot afford. It requires a lot of investment to arrange such infrastructure and requires forcible allocations for the same. CCTV cameras are quire vulnerable to weather conditions and Delhi faces extreme weather
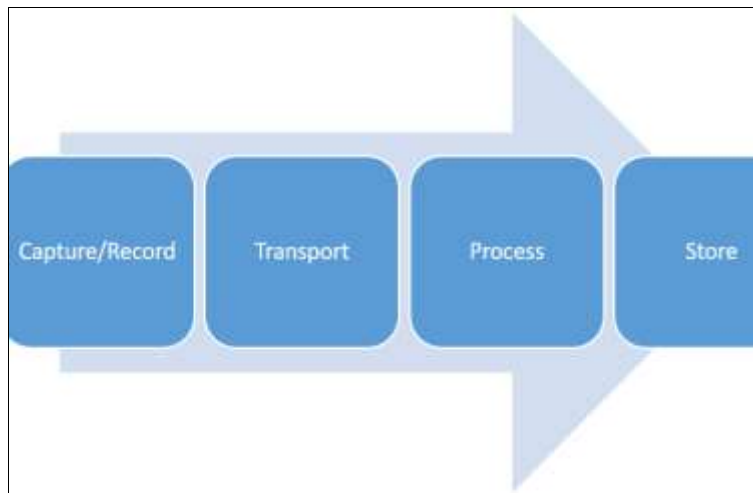
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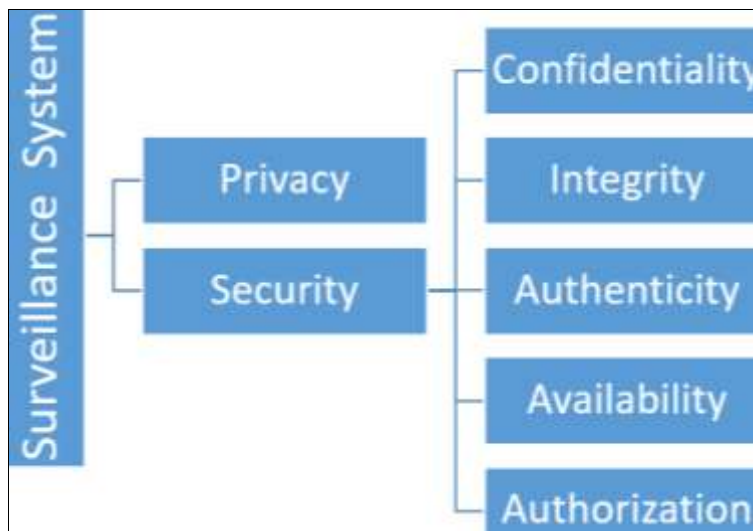**Diagram 1:** City Surveillance System Process

Diagram 2: Properties City Surveillance System devour

Table 1: Analyze the requirements of two devices in reference to the process requirements of the city surveillance system

Process	CCTV	IP Camera
Capture	Data is captured as the sequence of images.	Data is captures through video recorder.
Transport	Data can be transported till the screen through wired or wireless means.	Data can transported over the network through wi-fi over the LAN.
Process	Data recorded through these devices can monitored in real time or can play back.	The recorded through these devices are processed using various Ml devices.
Store	The data recorded through devices can only be stored on attached storage.	The data can be stored on cloud. Or one can attach any external storage device.

conditions in summers and winters. Data recorded through these devices can be viewed till screen and store only through attached devices which poses few challenges in processing it using Machine Learning Algorithms. As now a days ML algorithms are playing an important role in processing various types of applications like: Eyes strain [2, 3, 4, 5, 6], sentimental analysis [7], Pandemic Impacts [8] and even in education system [9].

Whereas IP cameras can offer you a broader prospects:
The first area where IP cameras score are cost effective and easily replaceable. Does not require heavy investments. The footages recorded through these devices can be view over the network or even a various mobile devices through one IP associated with them.
Multiple devices can simultaneously view these recordings

and they can be easily stored on cloud and any associated storage device. As they can be easily stored so they can be processed in a better manner using any ML or AI algorithm.

Conclusion and Future Scope
Keeping the surveillance requirements in mind it's better to opt for the infrastructure that does not require heavy investments, easily to store & use and can be easily processed using ML. But we have to take care of objectives as well it should the objectives associated with the activity.

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