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Image Processing Technique for Digital Camera Deactivation

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Abstract - Camera detection and deactivation using IR is a new technique for detecting and deactivating digital cameras in photography prohibited areas. This technique will locate a camera and then neutralize it. It uses image processing for detecting camera's lens. After locating camera's lens an infrared light will be directed towards that lens which will distort the image by overexposure. The directed infrared light causes strong reduction in the quality of the image. It does not interfere with camera's operation and it is harmless to the camera user. It's applications include preventing piracy at theaters and also beneficial at places such as museums, industries, historical monuments, exhibitions, changing rooms, shopping malls, jewelry stores where maintaining secrecy is big issue

INTRODUCTION

Smart phones with camera are very common these days. While visiting places such as museums, historical monuments, temples, exhibitions or places where maintaining secrecy is a big issue, user carries his smart phone with him. Though photography is prohibited in such areas, user tend to capture images of these sites secretly, which is not significant. Considering the piracy at theaters, Indian film industry suffers heavy losses due to it. To avoid such problems, we need to develop a system which will detect such smart phone camera or any digital camera and then neutralize image or video taken by that camera. At the same time the system should not cause any damage to camera or the user. So system design aims at a suitable technique which will not interfere with camera's operation along with being harmless for the user. System will simply detect camera in photography prohibited area and then it will emit a strong infrared beam at each device to neutralize it from capturing image or video .As we are using infrared beam for neutralizing digital camera, it is neither a health danger to human nor it will affect the detected camera's operation. This detection and deactivation method of camera or other optical device can be more useful in defense areas to identify possible attacks [1].

LITERATURE REVIEW

Existing System

System implementation includes use of Sony digital handy cam video camera placed in night shot mode .IR transmitter surrounds the lens and a narrow band pass filter IR filter covers the detector lens .This arrangement projects a IR radiations within field of view. Due to retro-reflection lens appears as a bright white circular sparkle through the handy cam. They detected reflection simply locating bright regions in handy cam's view above a certain luminance threshold. For neutralizing cameras, they used 1500 lumen projector which emits localized light beam at each detected camera lens. This cause strong reduction in the quality of taken image i. e concentrated light source overwhelms the picture taken. This system only tracks camera lens. Hence this method can be used against any type of digital camera. It will be useful against capture of still images and videos [2].

Outcomes of Literature Survey

This system uses projector of 1500 lumen for neutralizing camera. In case of false detection of camera it may happen that projector may project light towards the human standing in direction of false detection, which is undesirable.

PROPOSED SYSTEM

This paper aims at designing a technique for detecting and deactivating digital cameras in photography prohibited areas based on image processing .The system will consist of two parts: Camera detection unit and Camera deactivating unit. Camera detection unit includes web cam interfaced with PC

Web cam will be used to capture the images of prohibited area. The position of the camera lens will be monitored by identifying and tracking distinct features of the lens. An algorithm which is used for the detection of camera lens will be written in any image processing software like Python OpenCV. Position of the lens of camera will be tracked by referring its axis value as defined in image processing software. Second part is camera deactivating part which consists of Arduino, IR transmitter and servomechanism. Control signal from camera detection part will be generated and sent through serial communication to Arduino. IR transmitter will be used to reduce the quality of the captured image. IR transmitter will be fitted on to the servomechanism. Servomechanism will be interfaced with Arduino Mega 250. After detection of camera lens and its position a signal will be sent from pc to Arduino board and board will operate servomechanism such that IR transmitter will point in the direction of detected lens and emit strong IR rays which will reduce the quality of captured image. The number of lenses can be counted by using object counting algorithm based on raspberry pi and image processing on real time basis [8].

BLOCK DIAGRAM

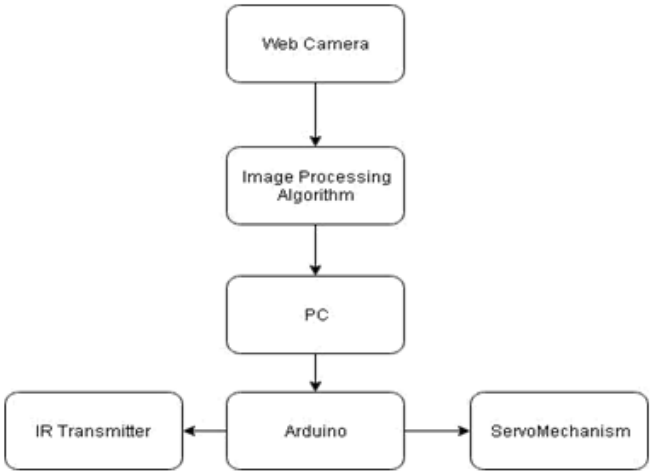

Fig. 1. Block Diagram

Web Camera

The first stage of any vision system is an image acquisition device. Web camera will be used as an image acquisition device for capturing images in photography prohibited areas. This web camera will be interfaced with computer via image acquisition toolbox in Python. The image acquisition toolbox enables modes such as processing in loops, hardware triggering, background acquisition ,etc. The obtained data will be in the form of video. The video will be divided into frames for further processing.

Image Processing Algorithm

After acquisition of images from the web cam, position of lens and be detected by identifying the distinct features of the camera lens. This can be done by using different image processing algorithms using Python -OpenCV software.

PC

Image processing software identifies the camera lens and generates control signal. The control signal will be sent to the PC to send coordinate of camera lens to arduino to control the servomechanism movement.

ARDUINO

Arduino is used to control the servomechanism to position IR Transmitter to correct position. It also control the IR Transmitter.

A. SERVO MECHANISM

It consist of a servo motor and a stepper motor. Servo motor is used to control the x-axis co-ordinates and stepper motor is used to control the y-axis co-ordinate

B. IR TRANSMITTER

IR transmitter or IR LED plays an important role in the camera disabling part. With the control of servomechanism IR transmitter point to the direction of camera and it will reduce the quality of captured image.

METHODOLOGY

We propose a new method for the problem of digital camera identification from its images based on the sensor's pattern noise. The process of camera tracking is based on image processing algorithms Camera is used an image acquisition tool. This camera can be a USB camera or built in camera of laptop. Command Video Capture in OpenCv can be used to get the details of the Camera hardware interfaced with it [5]. It is possible to track multiple cameras by tracking camera lens. For circular lens detection algorithm based on Helmholtz perception principle can be used. Using this algorithm multiple circular camera lenses can be tracked [6]. This process can be divided in following parts:

A. Image acquisition

The first step is to get a video feed from the camera connected. This video is then converted into sequence of frames. These frames will undergo further image processing algorithms [5].

B. Detection of Camera

Detection of objects having circular shapes in digital images is important for image analysis in various computer vision applications. This circular object detection method can be used for detection of circular camera lens. An algorithm for detection of camera lens will be written in any image processing software. Algorithm will include identifying circular lens from the images and the locating position of the lens.

C. Locating Camera

Position of the lens of camera in the area can be tracked by referring its axis values. Depending on axis values a control signal will be generated and sent to Arduino Mega 250.

Neutralizing Camera

Servomechanism will be interfaced with Raspberry pi 3. An IR- transmitter or IR-LED will be mounted on to servomechanism. Servomechanism and IR-transmitters will operate as per signals from Raspberry pi . IR-transmitters can also be replaced with strong light source. Use of Strong light source or IR is to reduce the quality of image by over exposure to light.

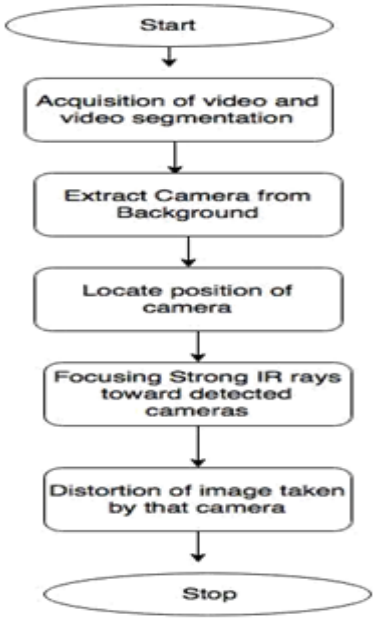

Fig. 2. Flow Chart

EFFECT OF OVER-EXPOSURE ON IMAGES

When camera lens will be located it has to be neutralized by using infrared transmitters or strong light source. Since the infrared beam is of high intensity as compared to the other light incident on the lens from the image, the camera tends to be overexposed. After this effect the photograph will be distorted. This will contribute in loss of fine details of image rendering it useless.

Example of overexposure on image by infrared rays:

CONCLUSION

The main objective of this paper is to design IR based image processing technique for digital camera deactivation in photography prohibited area. This system will locate the maximum number of cameras by using image processing algorithms. The detected cameras will be deactivated using IR transmitters. This work will serve beneficial in the areas such as theaters for prevention of piracy. It has many applications which include maintaining secrecy at defense areas, industries, research and development sections, historical monuments, religious places, jewelry stores, changing rooms at shopping malls.

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