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Digital Camera Authorization

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ABSTRACT

In the modern world there are many situation where photography and videography are to be banned at certain places for various reasons. In places such as museums, court rooms, shopping malls, industries, defense areas, jeweler's stores, theater etc. where maintaining secrecy is big issue, a new technique is required that could differentiate authorized and unauthorized camera and deactivate the fraud one. This paper proposes a technique for authorization of digital camera. Here a system that can be used to detect multiple unauthorized camera and deactivate them is used. This system can be used to authorize camera by assigning special symbol on device using glyph marks and use them at places. The system learns to differentiate unauthorized device by deep learning technology and detect them from real-time video feed using computer vision to locate its position and deactivate the camera by directing laser or IR light to the lens which will distort the image due to overexposure. The light does not interfere with camera's operation and is harmless to camera user.

Keywords : Image Processing, Deep Learning, Neural Network.

I. INTRODUCTION

The no-photography policy is not limited just to India. But it is a worldwide phenomenon. Photography is banned at places such as museums, court rooms, shopping malls, industries, defense areas, etc. Eliminating use of cameras in such places improves visitor experience. Preventing photography ensures the gift shop maintains a monopoly on selling images. Banning photography is believes to boost security by preventing thieves or terrorists from visually capturing and pinpointing weakness in alarm systems and surveillance. Also, taking photographs in restricted areas violates copyright protection. Film industry also suffers loss due to movie piracy. Hence, there arises a need to prevent this undesired photography, to avoid this heavy loss. This projects presents solution for this undesired photography to prevent security and privacy of the site. Our solution is based on detecting the camera's which are unauthorized and are capturing pictures of the site. After detection of unauthorized camera's a strong light is focused onto detected camera, which degrades the quality of the captured image, thus rendering the captured photograph useless. By implementing this project only desired cameras could be authorized into the place for capturing.

II. LITERATURE REVIEW

The detection of digital cameras or other optical device in the background could help military forces to detect possible attacks. By scanning the surroundings with a laser beam, a relatively strong retro reflection signal is created by an optical sight that is pointed the direction of the laser source. In 2005, a group of four people Khai N. Truong, Shwetak N. Patel, Jay W. Summet, Gregory D. Abowd published their results in Springerverlag Berlin, Heidelberg of 7th International Conference on Ubiquitous Computing [1]. System implementation includes use of Sony digital handy-cam video camera. This camera was held in night shot

mode. The lens of this handy-cam was surrounded by IR-transmitter and narrow band pass IR filter. This arrangement projects IR radiations in field of view, due to retro-reflection lens appears as a bright white circular sparkle through the handy (capturing device). The detected reflection in located by tracking the bright regions in handy cam above some luminance threshold. For neutralizing camera, 1500 lumens projector which emits localized light beam at each detected camera. In 2014, Virendra Kumar Yadav, Saumya Batham, Anuja Kumar Acharya published their results in Electronics and Communication Systems [2]. They used Circular Hough Transform and Local Maxima concept for detecting multiple circles. These results can be used to track circular lens of a camera. In 2014, Panth Shah, Tithi Vyas published their results in International Journal of Engineering Research & Technology (IJERT)[3], which are based on interfacing between Arduino for Object Detection Algorithm. These results can be used to locate the axis value of camera's lens and passing those values by serial communication to Arduino. In 2016 PA dhulekar[4] published a paper with new technique to deactivate all camera in the area by directing IR rays to the lens detecting it by image processing.

III. MODULE DESCRIPTION

The procedure is based on Image Processing and Deep Learning Algorithm [5]. Here, web camera is used as an image acquisition tool. The web camera can be inbuilt camera or any other USB camera. The whole procedure can be divided into several parts:

A. Image acquisition

The initial step is to feed the video from the web camera. The video is captured by the web camera having resolution 1280*720 pixels continuously. The video is then converted into sequence of frames. The converted sequence of frames will undergo further image processing algorithm. Here, web camera performs role of image acquisition toolbox. The video streaming from web cam is used for detection.
Figure 1 shows data flow diagram of the project.

B. Detection of camera

The acquired video is used to compare with the trained weight using deep learning and image processing algorithm using computer vision to compare the input data and locate the unauthorized camera in the frame.

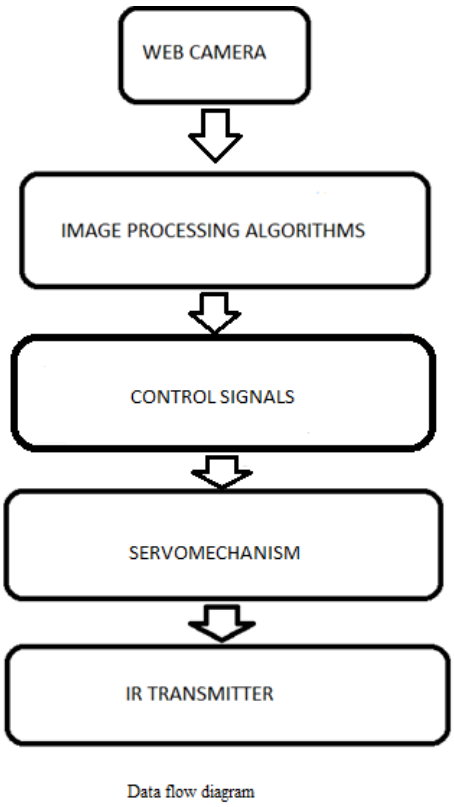

Figure 1. Data flow diagram

C. Locating camera

After detecting the camera's lens from the background the exact position of the lens can be detected by calculating the centroid of the lens. The X-Y axis values are calculated for locating the centroid of the detected camera lens then according to the axis value the control signal is given to the Arduino to operate the servomechanism.

D. Authorizing camera

Authorization of detected camera is done by analysing the details from image processing algorithm. Cameras

are authorized by sticking glyph sticker close to lens of camera. If this mark is not present in near the lens the camera is marked as unauthorized and reserved for neutralizing.

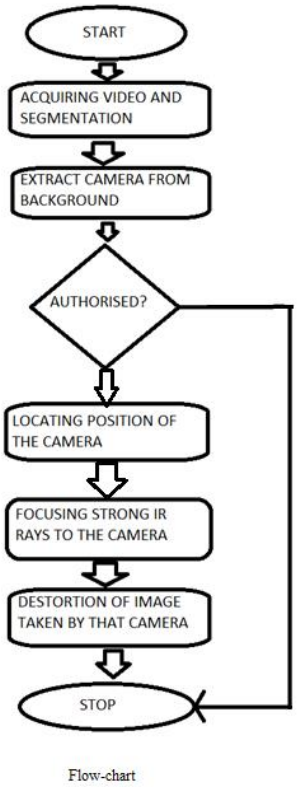

Figure 2. flow chart

E. Neutralizing camera

Servomechanism plays vital role in neutralizing the detected camera. Servomechanism is interfaced with the controller board. On the servomechanism a strong point laser is mounted to operate as per the control signal sent from controller. The laser have alternatives such as IR transmitters or any other strong light source. The only duty of laser is to degrade the quality or fine details of the image by using over- exposure property of light. And the requirement of the strong laser of any other strong light source is that the intensity of strong light source must be greater than background light.

The camera is deactivated by exposing it to IR rays. When camera lens will be located it has to be neutralized by using infrared transmitters or strong light source. Since this 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.

IV. IMPLEMENTATION

This paper aims at designing a technique for authorization, detecting and deactivating digital cameras in photography prohibited areas based on image processing .The system will consist of two parts: Camera detection & authorization unit and camera deactivating unit.

Hardware requirement for implementing this project are web camera, controller, glyph sticker, servomechanism and light source. Webcam connected to pc for feeding the surveillance video to algorithm. Controller is any board like arduino or raspberry pi for controlling servo mechanism. Glyph sticker is Sticker with any special symbol. Servomechanism is Servomotor to direct light source to the desired location. Light source may be IR or laser led Software requirement are OpenCV and python. OpenCV is a Library of programing functions for real time computer vision. Python programming language is used to implemented algorithm.

Camera detection & authorization unit includes web cam interfaced with PC .Web cam will be used for surveillance of the prohibited area. This video is then converted into sequence of frames. These converted frames will undergo further image processing. First step is to get video feed from web cam which is connected to the laptop. An algorithm named YOLO(you only look once)[6] which is used for the detection of camera device and lens will be written in using python and any image processing software like OpenCV[7]. Yolo processes each frame of the surveillance video and divides each frame into $S \times S$ grid. If the centre of an object falls into a grid cell that

grid cell is responsible for detecting that object. This algorithm comes with customized deep learning model built using neural network which is responsible for object detection [8]. The model is trained using dataset of images that has glyph sticker with symbol. This sticker symbolizes that device is an authorized camera. Else the device without this symbol are marked unauthorized by the algorithm. The position of the unauthorized camera lens will be monitored by identifying and tracking distinct features of the lens [9]. Position of the lens of camera will be tracked by referring its axis value as defined in image processing software.

Figure 3. Screenshot of camera device detected by detection algorithm

Camera deactivating unit consists of IR- Transmitter or Strong Light Source, servomechanism and a controller. Control signal from camera detection unit will be generated and sent through serial communication to controller. IR transmitter will be fitted on to the servomechanism. Servomechanism will be interfaced with controller. After detection of camera lens and its position a signal will be sent to controller 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[10]. The number of lenses can be counted by algorithm on real time basis.

V. CONCLUSION

The main objective of project is to detect and disable unauthorized digital cameras in photography prohibited area using image processing algorithms and servomechanism. The image processing techniques are used to locate the position of multiple unauthorized cameras in prohibited area. It locates the lens of multiple cameras but it neutralizes the only one camera lens. The axis values of camera lens received by controller. The servomechanism rotates according to control signal which are received from controller. Because of the strong light source or LASER focused on centroid of camera, the user gets the distorted image. This work will beneficial in the areas such as theatres for prevention of piracy. It has many application which includes maintaining secrecy at defence areas, courts, industries, government offices, research and development sectors, museums, historical monuments, religious places etc.

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