Camera Detection and
Tracking Using Image Processing Technique

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Abstract: In this paper, we propose a new technique for detection of camera in photography prohibited areas. This technique will locate a camera. It uses image processing for detecting mobile camera. After detecting camera laser light will be directed towards that camera user also, security can be alerted about the same. The proposed work has applications such as preventing piracy in theatres. This work will serve beneficial at places such as museums, industries, historical monuments, exhibitions, changing rooms, shopping malls, jewellery stores where maintaining videography and photography is prohibited.

Keywords: Mobile Camera Capturing Detection, Camera Tracking, Arduino UNO, Flash Light

I. 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 theatres, 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 defence areas to identify possible attacks.

It is Supreme Court justices themselves who have been the most vocal opponents of allowing cameras into courtroom. 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, defence areas, jewellery stores etc. Eliminating use of cameras in such places improves visitor experience. 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 after violates copyright protection. Film industry also suffers 1/3 loss due to movie piracy. Hence, there arises a need to prevent this undesired photography, to avoid this heavy loss. This paper presents solution for this undesired photography to prevent security and privacy of the site. Our solution is based on detecting the camera's that are capturing pictures of the site. After detection of camera's a strong light is focused onto detected camera, which degrades the quality of the captured image, thus rendering the captured photograph useless.

Piracy is a wide spread menace in India these days. Illegal recording devices like mobile phones and hand held cameras are used for recording the film from movie theatres. Availability of low cost smart phones with decent camera quality has led to the inflow of theatre recordings at an unprecedented rate into the market. And due to availability of high speed internet on these hand held devices, such recordings are almost instantly uploaded on data sharing sites on the internet. This causes huge loss to production houses and the movie industry. Such losses are calculated by market researchers and are directly transferred onto the audience in form of increased ticket fare for the film. Thus, a system providing solution to the problem of piracy could revolutionize the tariff arrangements in the movie industry. Apart from the movie industry, various industrial organizations or companies suffer from industrial espionage. Many government agencies also suffer from leakage of secret confidential data, a part of which is illegally recorded from symposiums.

II. LITERATURE REVIEW

There has been tremendous increase in the population having access to smart phones.With rise in smartphone ownership globally,China will have highest number of smartphone users, 1.3 billion, in 2018, followed by India with 530 million users [3].With such increase there also use of cell phone cameras in illegal activities. Majorly these activities involve information stealing, illegal photography ,theft of designs, theft of data .All this illegal activities come under privacy law. The Indian privacy law states that "No person shall be deprived of his life or personal liberty except according to procedure established by law"[4]. But still such activities take place. So, it is necessary to develop a system which helps prevent such illegal activities. One of the approach is to install CCTV in the confined area ,Matthew P. J. Ashby has presented the value of CCTV in his paper[2]. A retro reflector (sometimes called a retro reflector or cataphote) is a device or surface that reflects light back to its source with a minimum of scattering. In a retroreflector an electromagnetic wavefront is reflected back along a vector that is parallel to but opposite in direction from the wave's source [6].This retro reflection property can be used ,P. A. Dhulekar used this to develop a technique to detect cameras in his technique he detects the camera and will neutralize it[5]. retro reflection is more useful to hamper the image quality. we should used another approach one such approach is object detection Panth Shah and TithiVyas ,they used Interfacing of MATLAB with Arduino for Object Detection Algorithm Implementation[1] they used the object detection algorithms.So we decided to detect a camera using various object detection algorithms .One of the examles of such algorithm - Viola Jones. It is the first object detection framework which provides competitive object detection rates in real-time. It was proposed by Paul Viola and Michael Jones in 2001[7] But another faster algorithm is SURF algorithm[8].The SURF algorithm was presented by Herbert Bay, Tinne Tuytelaars, and Luc Van GoolIn thier paper, they present a novel scale and rotation invariant interest point detector and descriptor, coined SURF (Speeded Up Robust Features). When it comes to repeatability, this perfroms better than the previous schemes. distinctiveness, and robustness are computed and compared faster than previous schemes. This is possible due to relying on integral images for image convolutions; building on the strengths of the leading existing detectors and descriptors. we are also using SURF algorithm in our paper as it is more advantageous.But once we detect the camera we need to measure its distance from the setup.

III. BLOCK DIAGRAM AND DESCRIPTION
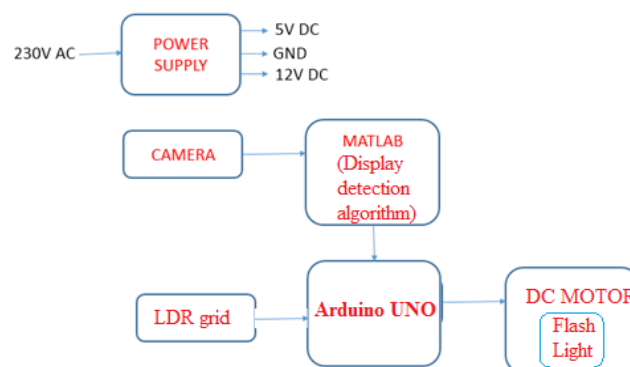
In our proposed system, a technique for detecting the recording in photography prohibited areas based on image processing is designed .Camera detection unit includes camera interfaced with PC. 5MP camera will be used to capture the images of prohibited area. Another Camera will also keep recording the audience. Then, using various algorithms, MATLAB will decide whether the camera is detected or not. Control signal from display detection part will be generated and sent through serial communication to Arduino. Flash light will be used as controlling action. Algorithm running in Matlab will be continuously looking for camera display. Once the display is found it will compare it with current live image. Depending on the location DC motor will move and flash light will be on.

IV. HARDWARE IMPLEMENTATION

A. Arduino UNO : The power needed for Arduino Uno can be taken via USB or external power. We need not provide any information for the same, selection of power is done automatically. Power can be taken externally via batteries o the AC supply. 6 to 20 Volts is the voltage range for external power source that can be provided to the Arduino Uno. Arduino Uno works as a controller in the circuit. It takes certain input from sensors or from the program and processes it. For the tracking model, programming Arduino is necessary. Arduino works only when it receives certain value from the computer setup and hence the tracking of the camera starts.

B. Camera : Model used is Logitec C170. It is a webcam and it is very easy to use. It comes with plug-and-play connectivity with USB 2.0. It supports video clear video calling at 640 x 480 resolution. C170 can be used to capture video at 1024 x 768 resolution. It has its own software and it can click pictures at 5MP. Its built in microphone has a noise reduction hence it gives better audio output. It also comes with a clip with which the webcam can be attached to the laptop monitor or phone. In this system, Two cameras are made to take pictures of audience and the prohibited object or the area.

C. DC Motor : DC Motors are electric motors that are continuous actuators. These actuators convert electrical energy into mechanical energy. DC motors rotate around its axis and can be used in pumps, fans, compressors, wheels, etc. There are three types of electric motors stated as AC type Motors, DC type Motors and Stepper Motors. A DC motor is of two parts. 1) "Stator" is the stationary part. 2) "Rotor" is the rotating part. With the help of this DC motor and the LDR, Tracking setup is manufactured.
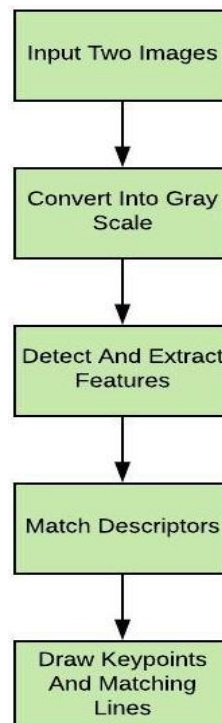
V. SPFTWARE IMPLEMENTATION

MATLAB:MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment. A proprietary programming language developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages including C, C++, C#, Java, Fortran and Python. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing abilities. An additional package, for dynamic and embedded systems. Installation of Arduino packages in Matlab is necessary also, Image processing toolbox must be there in the installed Matlab. The MATLAB application is built around the MATLAB scripting language. Common usage of the MATLAB application involves using the Command Window as an interactive mathematical shell or executing text files containing MATLAB code.

VI. ALGORITHMS USED

A. Normalized Correlation Function: computes normalized cross-correlation of matrices. One matrix must be larger than the matrix template or second matrix. Values in template must not all be the same. The output matrix or the resultant matrix contain coefficients called as correlation coefficients. Its values vary from -1.0 to 1.0. In this project, the same function is used to find the relationship between camera display image and the reference image or actual image of the restricted area or object. Basically both snaps are compared. If there is certain relation between both snaps we can say that the camera is used to capture video or photography and hence the camera is detected.

B. Surf Algorithm

```
Input Two Images
        ↓
Convert Into Gray
      Scale
        ↓
Detect And Extract
     Features
        ↓
 Match Descriptors
        ↓
 Draw Keypoints
 And Matching
     Lines
```

Surf Algorithm has wide applications in Image Processing such as object recognition, image registration, classification or 3D reconstruction. It is better, robust and faster than the Sift. Surf Descriptors can detect objects, can track objects and extract point of interest. Matching can be done with Surf Algorithm. By comparing descriptors obtained from different images matching pair can be found. Flow chart for this Surf algorithm is given as follows.

VII. FLOW CHART
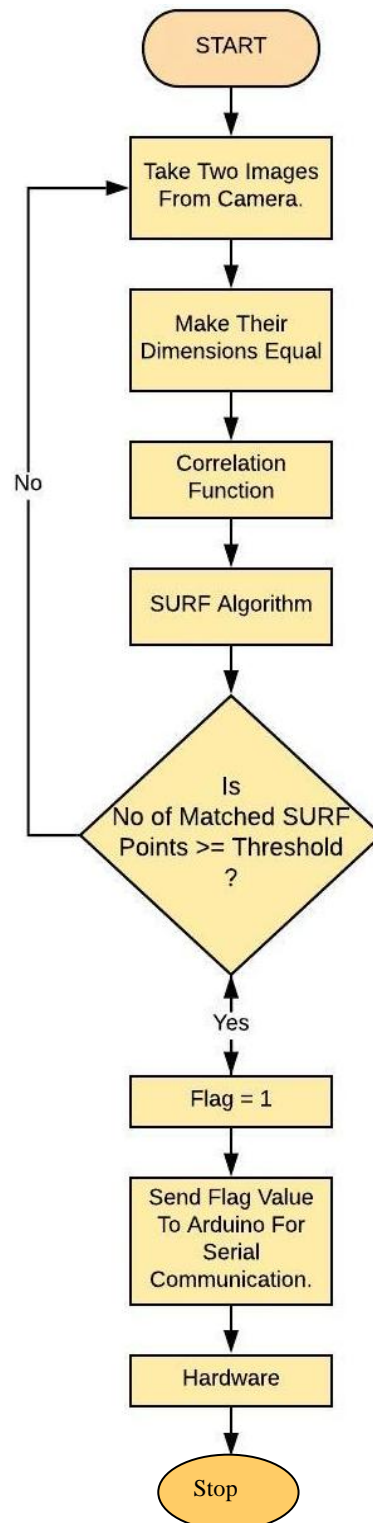
VIII. CONCLUSION

The main objective of this paper is to design image processing technique for mobile camera detection and tracking in photography prohibited area. With this Technique, the ca This work will serve beneficial in the areas such as theatres for prevention of piracy. It has many applications which include maintaining secrecy at defence areas, industries, research and development sections, historical monuments, religious places, jewellery stores, changing rooms at shopping malls.

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