

**TAMPERED PHOTO DETECTION UTILITY USING SPLICING  
DETECTION**



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# **TAMPERED PHOTO DETECTION UTILITY USING SPLICING DETECTION**

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## Recommendation for Oral Defense

*In partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**, this **UNDERGRADUATE SENIOR PROJECT** entitled:*

### **TAMPERED PHOTO DETECTION UTILITY USING SPLICING DETECTION**

*has been prepared and submitted by* **JAMES ANGUB, ALEXIS BANAAG JR., and JOHN RUSSEL TINGZON** and is recommended for **ORAL PROPOSAL DEFENSE**.

  
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## ABSTRACT

Nowadays altering of images is rampant with the advent of technology that sometimes leads to malicious use. With this threat to copyright work, and the pressing need to determine a digital image's authenticity, splicing detection has been the subject of numerous studies and research in the field of digital image processing.

Splicing is the act of copying a portion of an image then pasting it into another image to form meaning or a new image. This process may be done seamlessly that the spliced image or portion will less likely be seen by the human eye. There will be two kinds of splicing and it is High-level splicing and Low-level splicing. High-level splicing requires post-process smoothing which is blurring. It is evident that blurring will help smoothen out image and that it can hide unwanted discontinuity in the image. While low-level splicing is pasting spliced image that it visible to the human eye. With the advent of technology all of this process is possible only that detection of this kind of images is quite impossible as no utility was made to detect such images. It is quite difficult to detect such images because not all images have the same characteristics in terms of color and background also that it is hard to come up with a dynamic approach or a dynamic algorithm that will work on all images. A utility is made to somehow detect spliced images.

### ***Keywords:***

Fake photo detection, Digital Image Processing, Splicing Detection

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the Study

The digital age is creating a world where manipulating digital image is easy as doing a plain document. Companies such as Adobe created their application called Photoshop and this is one of the applications that are widely used today. However, some people use this technology to do something wrong. Tampered images emerge in news coverage, scientific experiments and even legal evidences. Today having the authenticity of an image is not that easy. So we have come up with the idea of creating a utility that will detect inconsistencies within an image. One of the most essential part of photo manipulation is the image splicing. It is a copy-and paste operation of image regions from one image onto the same or another image without performing post-processing such as smoothing. Even without the post-processing of photo manipulation, it is still almost imperceptible to see the alterations done in the image. The naked eye can readily detect spliced image without post-processing done. Today automating detecting of spliced image is not that easy and can pave the way for higher forms of photo-tampering detection applicable in many different areas in society. But there is a need to automate this process in an easy way without having the original image at hand.

### 1.2 Technology Application Context

Detecting spliced image is difficult in a way that not all images have the same characteristics such as color and background. As of today there is no standard algorithm on how to detect such images.

Splicing detection is the process of detecting spliced images. Currently there is no standard approach in detecting such so the proponents resulted to using image processing libraries such as [aforge.net](http://aforge.net) and [emgucv](http://emgucv.com).

The utility will be detecting spliced images without requiring or acquiring the original image.

### 1.3 Objectives of the Study

The main objective is to be able to create an application that will be detecting tampered images. Also another objective is to address splicing problem in the field of digital image processing. Splicing in this study has no advance post-processing done to the image. The level of complexity of this study has increased since it is done without a priori information from the original image.

## 1.4 Significance of the study

This study is significant for all people in the field of Digital Image Processing. Through our application it will somehow help people in creating / developing a standard approach that will detect all tampered images successfully in almost all kinds of images. This will help copyright laws, though it can't mitigate the violations. It will help in detecting tampered images.

## 1.5 Scope and Limitations of the Study

The study will generally focus on detecting tampered images using Splicing. The proponents will focus on photos that have a copy-paste image in it with no post-processing done. Photos that do not have spliced artifacts will be automatically detected as an original photo including effects just like greyscaling.

It shall be implemented on a Windows Based operating system. A utility application shall be created to test whether user's images are tampered or not.

This study covers detection of image splicing to address image forgery and establish image authenticity. However, because image tampering can take on numerous forms, only splicing of spliced images will be included in this study. Other forms of image forgery will not be part of the scope. Other approaches and technologies like digital watermarking will not be included, as well.

## 1.6 Definition of terms

**Hue** is one of the main properties of a color, defined technically (in the CIECAM02 model), as "the degree to which a stimulus can be described as similar to or different from stimuli that are described as red, green, blue, and yellow,".

**RGB** is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors.

**Thresholding** is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images.

**Otsu Thresholding** is the reduction of a graylevel image to a binary image. This algorithm assumes that the image to be thresholded contains two classes of pixels is minimal.

**Blob extraction** is generally performed on the resulting binary image from a thresholding step. Blobs may be counted, filtered, and tracked.

**Digital Photomontage** is the result / process of sticking two images together to create a new image.

YCbCr or Y'CbCr, sometimes written  $Y_{CB}C_R$  or  $Y'_{CB}C_R$ , is a family of color spaces used as a part of the color image pipeline in video and digital photography systems. Y' is the luma component and  $C_B$  and  $C_R$  are the blue-difference and red-difference chroma components. Y' (with prime) is distinguished from Y which is luminance, meaning that light intensity is non-linearly encoded using gamma correction.

## CHAPTER 2

### REVIEW OF RELATED LITERATURE AND WORKS

#### Review Sections 2.1

##### 2.1.1 Edge-based Blur Metric for Tamper Detection

According to Cao, Zhao and Ni (2009), In order to check the aboriginality and integrity of a digital photograph, a blind forensics scheme for detecting blur manipulation is proposed in this paper. A cost effective local blur estimator is designed to measure the blurriness of each pixel along a doubted edge. Consistency metric of such a blurriness sequence is constructed based on the deviation from its linear fitting then the metric is used as evidence for identifying blur operation.

##### 2.1.2 A Natural Image Model Approach to Splicing Detection

Another study in response to the problem of image forgery/alteration has been performed by Shi, Chen and Chen. They formulated a model that they called "Natural Image Model" to detect image splicing. Adhering to the very simple method that splicing is, they used the limitations of splicing to formulate their model. Expectedly, their model extracted the features of the image and looked for inconsistencies like lighting, sharpness, lines and edges. They also mathematically solved for the correlation between the image pixels.

One advantage of this study is their concept of "blind splicing detection". This involves the capability of detecting splicing without any "a priori" information, even without the original image or any knowledge of the characteristics and properties of the original image, alteration or in this case splicing will still be detected.

##### 2.1.3 Image Splicing Detection using 2-D phase Congruency and Statistical Moments of Characteristic Function

Chen, Shi, and Su proposed a solution to image splicing detection using statistical tools that they identified in their paper. Realizing the importance of image splicing detection, they were among the many researchers who studied an appropriate algorithm to achieve their objective of image splicing detection. Their paper, however, only focused on basic