

# Developing a New Process of Ensuring the Quality of Data Captured in Digital Images

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## ABSTRACT

It is a typical action for scientists in materials science, the consistent utilization of examined pictures produced by electron magnifying lens. While basically all hardware that produce these pictures (micrographs) can utilize a record type generally appropriate for catching picture information created (as TIFF or RAW documents if there should be an occurrence of metallography), numerous analysts decide to utilize a record design more normal as JPEG, for instance, maybe the explanation of the space accessible on compact stockpiling gadgets (USB, CD or DVD) that claims, or by the absence of information about the sorts of picture documents and their fitting use. The issue with the utilization of specific kinds of picture designs is predominantly the loss of the first information caught by an electron magnifying lens. As though that were insufficient, the use of channels and cycles in the first picture should likewise be deliberately created so as not to lose or change information caught or information pertinent to the examination. This article looks to feature the treatment of pictures in examination and distributions done by analysts with no information on this issue, since the utilization of filtered pictures is just an asset to proceed with the advancement of their own exploration. Moreover, this article means to advance a conversation on the most proficient method to treat the issue of computerized pictures distributed in logical papers so investigates can truly be duplicated in full.

**Keywords :** Image Processing, Digital Image Analysis, TIFF, JPEG, Metallography, Microscopy, Image Data

## I. INTRODUCTION

The dissemination of scientific research around the world has no other aim than to share with all the discoveries and innovations achieved in several areas. However, there is at least one problem in the images required for the replication of a complete and reliable work has documented: the images published in most cases are not the original images used in the research. An example of this problem can lighten their understanding. Based on the study presented in [1], theoretically, following step by step all the necessary requirements to replicate the image

processing to correct grain counting, the resulting image displayed in the study can be seen in Figure 1.

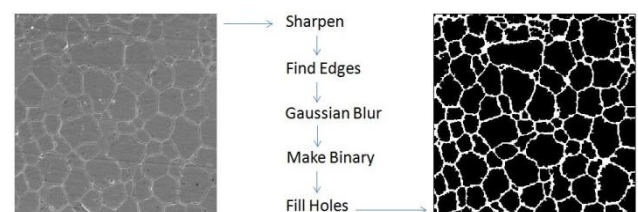


Figure 1 - Process binarization image of a microstructure of zirconia-based ceramics doped compound of yttrium and rare earths.

However, replicating this process to the images available in the published document, the result showed entirely different and undesirable, as shown in Figure 2.

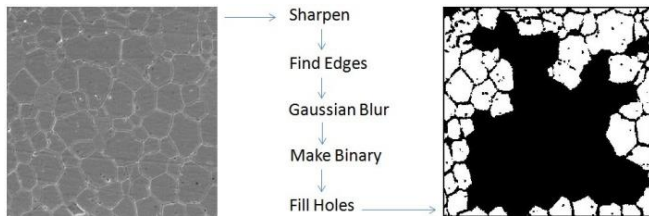


Figure 2 - Replication of binarization process shown in Figure 1 with images provided on the published document.

Regardless of certain activities that look to expand the goal of pictures in logical distributions, all things considered, these pictures are not unique pictures. The developing utilization of handling and examination of computerized pictures The advanced imaging started in the mid 20's of a century ago, when pictures were digitized and sent by a submarine link among London and New York to be distributed in American papers. This activity, decreased the vehicle season of pictures through the Atlantic Ocean from over seven days to under three hours.

Notwithstanding, just in 1964, during the beginning phases of room investigation that developed programmed examination of advanced pictures, with techniques to improve the visual data for human investigation and translation, quickly and with more noteworthy precision. As of now, a few different regions, for example, medication, geology, archaic exploration, material science, science, and so on., began the expanding utilization of preparing and examination of advanced pictures (PADI) [2].

In the territory of microscopy explicitly, the formation of electron magnifying instruments (optical, checking, transmission and others), PADI

has gotten basic since these magnifying lens catch test data being dissected and change this data into a computerized picture document. Besides, the innovation for this had been inserted in the hardware and not freely spread in ideas, techniques and practices for the correct treatment of advanced pictures [3].

Altering advanced pictures: an asset accessible to all With the far reaching utilization of PCs and admittance to picture altering programming for any clients (like Photoshop for instance [4]-[5]), an ever increasing number of individuals start to work with computerized pictures, including analysts from different zones that today are utilized to utilize PADI to quicken their examination measures. Be that as it may, utilize this asset for explicit purposes likewise requires something beyond thoughts of utilization some hardware and programming, requires insignificant information about picture types and documents, when and where to utilize them.

## II. DIGITAL IMAGES

There are two kinds of pictures: vector and bitmap. The vector picture (by numerical vectors) permits resizing picture at any scale without loss of value, notwithstanding, right now that must be printed for instance, it is changed over in a bitmap appropriate to the qualities of the gear. The cycle of change from vector to bitmap is called rasterization. The bitmap picture is - as the name recommends - planned pieces, where the picture is sorted out into a progression of lines and sections shaped by (pixels' framework), and every pixel (picture component) has just one tone (where each tone is referred to by numeric timespans, 4, 8, 16, 24 or 32 pieces), not having a fixed measurement since the size will be appointed to the pixel at the showcase time, in video or printer.

So the bitmap is the last sort of the whole picture showed. In this way, it is important to comprehend the significance of goal. Goal for this situation is the capacity of a catch or multiplication pictures framework needs to duplicate subtleties. The goal is given in specks per square inch (dpi), thus, how higher the goal is, better the subtleties replicated by a given framework (considering the "framework" as all gatherings required to catch picture: CCD, focal points, programming, and so forth.). It is imperative to clarify that the goal of the gear must be more prominent than the goal of the bitmap document wanted.

The improvement of gear and programming in the territory of catching and handling pictures made with different sorts of records that were made to help expanding requests of regular day to day existence. Today it isn't unexpected to anybody taking pictures or shooting with a cell phone or advanced camera. In spite of the fact that it doesn't appear to be something so intricate, however it was, on the grounds that this need was the restart of another picture insurgency concerning these documents types, to guarantee most noteworthy catch rate, with greater devotion of detail, with the least conceivable extra room. It was in this situation that developed the kind of bitmap record more utilized these days, JPEG [6]. Beneath, there are some picture document types:

JPEG (Joint Photographic Experts Group): The JPEG document type is a record type that permits the utilization of different pressure methods, while the majority of them, present misfortunes. For this situation the first picture won't be actually indistinguishable from the recuperated picture after decompression. Frequently such misfortunes are not seen by the unaided eye, making this kind of record a document appropriate for catching pictures to be seen thusly, for instance in logical articles this way.

- TIFF (Tag Image File Format): The TIFF record type is the document type generally reasonable for catching pictures. It is one of the document arranges that advanced backings more tones taking into account straightforwardness and obscurity information, and the utilization of layers. Albeit a few sorts of conceivable pressure doesn't lose any detail, however its size is entirely enormous.
- PNG (Portable Network Graphics): The PNG document type developed as an advancement of the GIF record type, supporting large number of shadings, straightforwardness and liveliness. This document type can be utilized instead of JPEG in certain circumstances in light of the fact that, regardless of having pressure, this doesn't create misfortunes.
- DICOM (Digital Imaging and Communications in Medicine): The clinical zone, for instance, has made a particular document type called DICOM [7]. At first made to normalize the organizing of symptomatic pictures, for example, CT filters, attractive resonances, x-beams, and so forth, this record type is changed into a lot of principles for therapy, stockpiling and transmission of clinical data in an electronic configuration, permitting clinical pictures and related data to be traded between analytic hardware imagers, PCs and clinics securely, rapidly and with the highest caliber.

### III. RISKS TO THE QUALITY OF CAPTURED DATA

Converting the file type TIFF to file type JPEG Figure 3 shows a generic image of a fish. The original image is a file type TIFF with a resolution of 300 dpi, 24-bit color and total size of 7.17 MB. This file is too large to compose a document like this article, then, this TIFF file is converted to a file type JPEG with the same resolution of 300 dpi, same 24-

bit color, and the file size resulting in almost a thousand times smaller than the original, only 856KB. The drastic reduction of the size of file confirms that many original image information were discarded and lost. Such information has great chance to be critical for automated PADI, despite the impression that gets nothing changed.



Figure 3 – Generic image of a fish (because the lack of images related to the area of materials science with public links to the original images).

#### IV. IMAGE FILES WITH COMPRESSION AND LOSS

The most aggravating factor for the PADI in an automated way is the loss of original image data, because if the file information has been changed, any processes running under this new information must submit results of processing different from the original file, which would not make sense for a particular study.

By the way, there is still one more aggravating when it comes specifically to the JPEG file type (the file type most used nowadays). Each time the file is saved, the calculation of image compression is performed again. If you have edited any pixel in the image, the calculation of its compression will significantly alter the pixels around it (see Figures 4, 5 and 6). If these pixels were originally a cell, a grain or a precipitate, which will have its size measured in an automated way, the sizes resulting would be

different, which could compromise a study requiring accurate and lower margins of possible error, as in the areas of precision mechanics and nuclear.



Figure 4 – JPEG file type original generic image detail. Here are the 3 (three) highlighted pixels to be edited: one in the left upper corner, two in the right upper side of image where shows a space (which could be a grain or a cell) limited by a range of pixels value.



Figure 5 – JPEG file type generic image detail after edited only 3 (three) pixels and saved 20 (twenty) times. It is clear that the areas around the edited pixels have changed because of file compression calculation. Therefore, the original image data has changed, which can result negatively in the application of PADI.



Figure 6 - Overlapping areas observed in figures 2 and 3. In the filled areas are presented the differences between them.

The desire to edit an image is too big when there seems to be perfect or it does not show what the researcher expected. Therefore, once the image is edited, there is a great risk of this change have a negative impact on the final results of study being

done [8], after all, “beautification” is a form of misrepresentation of the original image [9].

## V. GUIDELINES FOR BEST PRACTICES IN IMAGE PROCESSING

The journal Nature published a warning note in 2006 questioning the quality of the images that some authors would post them in your articles [9] and yet, within the policies of articles published in Nature describes the importance of access to the original images of any study that uses PADI [10]. The increasing use of PADI led to universities and research centers around the world publish some basic and relevant information for the use of this type of resource [11]-[12].

Here are some topics that should be used like guidelines for best practices in image processing [11]:

- In spite of certain activities that look to expand the goal of pictures in logical distributions, all things being equal, these pictures are not unique pictures. The developing utilization of handling and examination of computerized pictures The advanced imaging started in the mid 20's of a century ago, when pictures were digitized and sent by a submarine link among London and New York to be distributed in American papers. This activity, diminished the vehicle season of pictures through the Atlantic Ocean from over seven days to under three hours.
- Nonetheless, just in 1964, during the beginning phases of room investigation that rose programmed examination of computerized pictures, with strategies to improve the visual data for human examination and translation, quickly and with more noteworthy exactness. Right now, a few different zones, for example, medication, geology, archaic exploration, material science,

science, and so on., began the expanding utilization of handling and examination of advanced pictures (PADI) [2].

- In the zone of microscopy explicitly, the making of electron magnifying lens (optical, filtering, transmission and others), PADI has gotten basic since these magnifying instruments catch test data being dissected and change this data into a computerized picture record. Additionally, the innovation for this had been implanted in the hardware and not openly dispersed in ideas, strategies and practices for the correct treatment of advanced pictures [3].
- Altering advanced pictures: an asset accessible to all With the broad utilization of PCs and admittance to picture altering programming for any clients (like Photoshop for instance [4]-[5]), an ever increasing number of individuals start to work with computerized pictures, including specialists from different territories that today are utilized to utilize PADI to quicken their examination measures. Yet, utilize this asset for explicit purposes additionally requires something other than thoughts of utilization some gear and programming, requires negligible information about picture types and records, when and where to utilize them.

## VI. CONCLUSION

In spite of the fact that there is now a genuine worry about the negligible consideration required with respect to picture control arranged to PADI - handling and examination of computerized pictures - almost no has been done so essential data (and practices) goes to the specialist who just uses PADI as an asset to control your own exploration. The accepted procedures introduced are the underlying way: supplant where potential pictures of type JPEG

by PNG, know about what makes a channel before applying it to the picture, keeping the first picture securely. As distributors of logical distributions, could follow the case of Nature distributor, requesting that unique pictures are accessible in open archives, and his location distributed with the article. This demeanor has a more noteworthy reason than only distribution of value information, is to proceed with the logical examination on the grounds that, possessing the first information, specialists worldwide will have a more prominent possibility of reproducing the investigation distributed and offer coherence to it. Today, in the PADI region, numerous investigations experience the ill effects of an absence of admittance to unique information re-trying all the means of referred to explore, coming about - much of the time - in adjust, utilization of time and assets, change of center, and different components that hamper a characteristic advancement of logical works. We have to take activities that can advance change this situation.

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