Impact Study of the Fig and Olive Juices on the Pathogen Bacteria using Digital Image Processing Methods

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ABSTRACT

There is a very little research using combined image processing with biological methods, and in this paper digital image processing methods, segmentation, image enhancement, Framelet transform, extraction features by SURF and classifications by Google net were used on various pathological bacterial samples where five specimens were collected from bacteriological culture from the educational laboratories of the city of medicine – Baghdad, Iraq by the transport media, which were used for 72 hours the samples include *Pseudomonas aeruginosa*, *Escherichia coli* isolate from Urine, *Entero klebsiella* isolate from sputum, *Staphylococcus aureus* isolate from wound and *S. aureus* isolate from sputum Nutrient Agar (NA) are prepared and then inoculated the samples obtained from the transport medium on NA medium and gestated for 24 hours at a rate of two plates for each isolate. The effect of olive and fig juices at different concentrations on these bacteria was studied to inhibit them and the inhibition zone was determined using digital image processing and biological methods.

In biological methods, the biologists cultivate bacteria in blood agar plates to determine the resident of becteria were examined in the electron microscope by using the eyes and often they need to re-implant the sample in other mediums to know the affects of plants or drugs on these bacteria.

This requires the cost of media and chemical materials and time, while the proposed image processing method used in this paper helps biologists to be able to diagnose the resident of bacteria with less effort, cost, and time.

Keywords: Features detection, Google Net, Image Enhancement, Image Segmentation, Pathogen Bacteria.

International Journal of Drug Delivery Technology (2022); DOI: 10.25258/ijddt.12.1.28

How to cite this article: Abbas HF, Abbas RF. Impact Study of the Fig and Olive Juices on the Pathogen Bacteria using Digital Image Processing Methods. International Journal of Drug Delivery Technology. 2022;12(1):157-161.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

General Introduction to Digital Image Processing Methods

Image process could be a taxon of signal process involved specifically with photos. Improve image quality for human perception and/or pc interpretation. Hence image process is that the sweetening or changed manipulation of the image–the results of that is sometimes another pictures.[1]

Image analysis ways extract data from a picture by mistreatment programmed or semiautomatic strategies named: scene examination, picture portrayal, picture understanding, beautification acknowledgment, computer vision etc.). Image analysis be unlike from alternative kinds of image process ways, like improvement or restoration therein the ultimate results of image analysis procedures could be a numerical output instead of an image,[2] Image analysis has been pragmatic to several totally distinctive areas of science and innovation.

As an illustration, it's been usual evaluate or evaluate the outside features (i.e., color, estimate, shape and surface) and inner constructions (design and/or property of the texture constituents) of nourishment item.[3] Image process actions are often sorted into four sub-areas:

(a) *Image preprocessing*, that comprises of up the visual quality of the picture by decreasing clamor, component standardization and standardization, upgrading the sting discovery,[4] and making the picture investigation step a parcel of solid upheld impartial and well set up norms. The term picture preprocessing, in common, is watched all controls on a picture, each of that yields latest picture.[5,6]

(b) *Image compression* that diminishes the memory necessities according to eliminating the joblessness gift within the image, where the image data isn't perceptible to the human eye.[7]

(c) *Image Segmentation*: image segmentation could be a fundamental strategy for numerous picture examination

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future assignments.[8] Over all, a few of the show strategies for picture depiction and acknowledgment depend greatly on the division comes about.[9] Division boundaries the picture into its fundamental districts or objects. Division of therapeutic pictures in moment, cut by cut has a few accommodating applications for the therapeutic gifted such as: picture and volume estimation of objects of intrigued, revelation of anomalies (e.g. tumors, developments, etc.), tissue measurement and classification.[10] The objective of division is to change and/or revision the outline of the picture into one thing that's a part of substantive and less demanding to investigations. Picture division is frequently usual discover objects and bounds (lines, bends, etc.) in pictures. A parcel of absolutely, picture division is that the strategy of dissemination a name to each component in a picture indicated pixels with steady name share bound visual characteristics.[11]

(d) *Image analysis*, that archetypally which yields numeric values with/or the graphical data regarding the image features that area unit matched to arrangement, fault detection,[12] or prediction of a number of the standard assets of the imaged item so the word image analysis is employed once the production may be a range or call, not a picture.[3]

This paper used methods of image processing, including segmentation, image enhancement and features detection and extraction on images of various pathological bacterial testers from the educational laboratories of the city of medicine-Baghdad, Iraq. Where the inhibition area was determined using digital image processing methods and biological methods, through the field of image processing will reduce the time and growth the adeptness of isolating areas of bacterial inhibition.

General introduction to Pathogen Bacteria

The indiscriminate use of antibiotics has LED to the proliferation of strains immune to these antibiotics, that have LED to the interest in meditative plants and therefore the jeopardy of getting medicines made up of plants that are used as different therapies with advantages to the mankind. It's additionally wide believed that inexperienced drugs is best and additional reliable than overpriced, have vital aspect effects moreover because the effectiveness of those plant foundations for its compounds of compounds with antimicrobial properties that may be used as different treatments for the treatment of illness,[13] where the plants manufacture several compounds, a number of that have advanced molecular structures and their antibodies against microorganisms throughout secondary metabolism, as well as alkali, phenoplast and different compounds.[14] For instance, onions area unit of nice profit for having several smart properties, principally antimicrobial effectiveness and inhibitor effectiveness,[15] whereas victimization grapes to treat burns, bleeding, anemia and respiratory illness.[16] Studies have shown the effectiveness of castor plant as an antimicrobial agent. As for our analysis, that dealt within the biology kind with the employment of figs and olives and knowledge its effectiveness as an antimicrobial agent

wherever studies have well-tried the effectiveness of olives as vital sources for treating numerous diseases. Olive Europe is employed historically as water pill, hypotensive, emollient, laxative, febrifuge, skin formulation, and conjointly used for the treatment of urinary infections, gallstones, respiratory disease,[17] either fig the health advantages of figs or a jeer area unit several and embrace its use within the treatment of sexual pathology, constipation, upset stomach, piles, diabetes, cough, bronchitis, and asthma. Figs are used as a fast and healthy thanks to gain weight when stricken by an illness.[18] The isolate choice as a result of manifestation well-liked that cause these bacterium once Escherichia (abbreviated as *Escherichia coli*) area unit bacterium originate inside the setting, foods, and intestines of personalities and animals. *E. coli* area unit a huge and many gathering of bacterium. However, maximum strains of *E. coli* area unit innocuous and others will cause disease. Several styles of *E. coli* will reason symptom, whereas others reason area contagions, breathing disease and respiratory disorder, and different sicknesses.[19] The bacteria genus {pseudomonas bacteria genus} aeruginosa is one among the most causes of infections and infection in individuals stricken by severe burns *Pseudomonas aeruginosa* has recently been classified by the globe Health Organization collectively of the priority pathogens to be targeted for the event of latest treatments. This dangerous bacteria is answerable for numerous styles of doubtless deadly acute or chronic infections. Patients stricken by severe burns represent a risky cluster, as this agent develops in wounds and adapts to its setting to proliferate and colonize the host.[20] The overwhelming majority of enter bacterial infections, however, area unit as- related to hospitalization. As opportunist pathogens, Kleb-siella spp. chiefly bout in compromised people United Nations agency area unit hospitalized are hurt from numerous underlying illnesses like diabetes or chronic pulmonic obstruction.[21] *Staphylococcus aureus* might reason form of indicators like Minor skin infection it's the motivation for burned skin condition and boils it should cause respiratory organ infections or respiratory disorder Brain contagions or infectious disease Bone contagions or otitis Heart contagions or caritas Generalized life threatening blood infections or syndrome syndrome (TSS), bacteremia and septicemia.[22-25]

RESEARCH METHOD

Material and Method for Image Processing

This part demonstrates the of development process of digital image processing methods to impact study the Fig and Olive juices on the Pathogen Bacteria, Five specimens were collected from bacteriological culture from the educational laboratories of the city of medicine-Baghdad-Iraq by the transport media, which were used for 72 hours the samples include *P. aeroginosa*, *E. coli* isolate from Urine, *Entero klebsila* isolated from sputum, *S. aureus* isolate from wound and staphylococcus auras isolate from sputum.

In this investigate, to secure more idealize comes about we isolated our work into the taking after four stages:

Image Enhancement Stage

Image enhancement procedures are castoff to advance a picture, where "progress" can be characterized impartially or subjectively. Picture upgrade operations archetypally return a changed adaptation of the initial picture and are as often as possible utilized as a preprocessing step to move forward the comes about of picture examination. The next two approaches are cast-off for this resolution: Edge-preserving Filtering (to preserve the edges), and two dimensional Framelet transform (The framelet transform has an capacity to eradicate some of the boundaries of wavelet transform which realized on discrete-time signals consuming the oversampled breakdown and synthesis filter section. The filter panel entails of three breakdown filters: one low-pass filter signified by h0 (n) and two different high-pass filters represented by h1 (n) and h2 (n). In place of the feedback signal X (N) explorations through the scheme, the analysis filter set crumbles it into three sub bands, every of which is then down-sampled by 2. From this progression, XL (N/2), XH1 (N/2) and XH2 (N/2) are spawned which characterize the small frequency (or coarse) sub band, and the two great frequency (or detail) sub bands, singly.

Image Segmentation Stage

Image segmentation is the manner of part and picture into districts or parts. This separation into parts is frequently made on the physiognomies of the pixels within the picture. For case, one way to revelation locales in a picture is to pretense for rushed discontinuities in pixel values, which characteristically show edges. These edges can depict districts. Supplementary methods split the image into regions based on color values or texture by detect regions of texture images.

Local Features Detection and Extraction Stage

Talk about to a design or particular structure found in a picture, such as a point, edge, or little picture fix. They are generally related with a picture fix that changes from its quick environment by surface, color, or escalated. What the highlight really epitomizes does not matter, fair that it is unmistakable from its environment. Cases of neighborhood highlights are sprinkles, corners, and edge pixels utilizing SURF methods. The SURF algorithmic program has 3 highest parts (a) curiosity purpose detection (b) inherent neighborhood description (c) matching. SURF uses blob detector supported boot matrix to seek out purpose of interest. The determinant of the boot matrix is employed as a degree of native amendment near the purpose and points square measure chosen wherever this determinant is highest.

Image Category Classification using Google Net

Google Net will be charity to classify bacterial isolates. After adding the various figs and olive juices added in the drilling sites (after extracting the bacteria, juices with different concentrations are placed in the pits i.e. each hole contains one or two different concentrations) and these areas will be classified as a group of pixels. Represents categories.

Categories1 = {'*Pseudomonas Aeroginosa', 'Escheichia coli', 'Staphlococcus aureus', 'Entero klebsila', 'Staphlococcus aureus'* }.

Categories2 = {' F only', ' O only ', ' F: O 75 : 25',' O:F 75:25', ' F:O 1:1', ' O:F 1:7' }.will be compared and seen if the bacteria are inhibited (since the bacterial inhibition zone appears in the perimeter of the pit) if the pixels in the perimeter of the hole are pixels of categories 1, it means that the juice did not eliminate the bacteria, However, if the perimeter of the hole is not one of the pixels of categories 1, this means that the bacteria did not grow any got the region got installed and proved the juice as effective as this area is within the categories 2.

RESULTS AND ANALYSIS

This paper aim to study the effect of the Fig and Olive juices on the Pathogen Bacteria, there is many types of pathogen bacteria, in table (1) five types of pathogen bacteria are taken with different sources such that Sputum, Urine and Wound and the effect of Fig and Olive jucies are studied on these types of five bacteria, there is inhabation zone with + and non inhabation zone with the blood agar for these five bacteria are taken and Fig and Olive jucies are put with circully area to these blood agars with different percent, from table (1), at the first column the Fig juices is put with circully area and with 100 microns with it, the second column the Olive juices is put with also circully with 100 microns, in the third column the mix of Fig and Olive jucies are put also circully with percent 75:25, in the forth column the mix Olive and Fig juices are put with 75:25, in the six column the mix of Fig and Olive jucies with equall percent (1:1) are putting, funally the mix of Olive and Fig with 1:7 is putting.

As we can see in table(1) the minus (-) cells mean that the becteria is resident (not die), the positive cells (+) mean that the becteria is not resident (die), so the good results when O:F (1:7) which all positive which mean die becteria.

Results of digital image processing modified methods

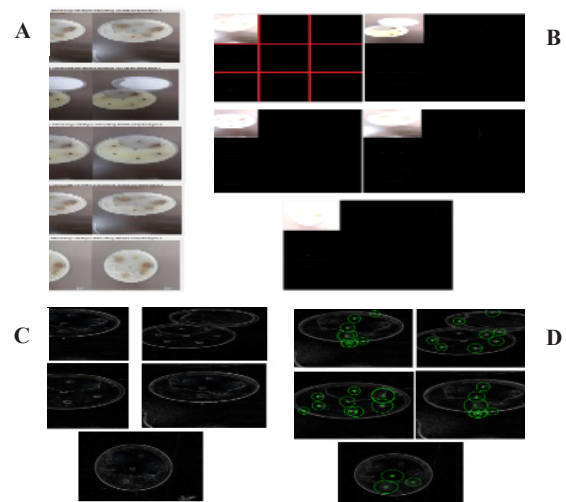The result of digital image processing methods are shown in Figure 1.

Figure 1: Digital image processing methods (A): Bacterial images with edge-preserving filtering, (B): Framelet decomposition with edge-preserving filtering, (C): Bacterial images segmentation, (D): Bacterial images local features.

Table 1: Isolate, source and ratio of the juice with results

Isolate	Source	F only 100 micron	O only 100 micron	F: O 75 : 25	O:F 75:25	F: O 1:1	O:F 1:7
P. aeroginosa	Sputum	-	-	-	-	-	+
E. coli	Urine	+	+	+	+	+	+
S. aurus	Sputum	+	+	+	+	+	+
E. klebsiella	Sputum	-	-	+	+	+	+
S. aurus	wound	-	+	-	+	-	+

+ Inhibition zone (sensitive)
- No inhibition zone (resistance)

Table 2: Classification bacterial images using modified image processing method.

Categories 1	Categories 2					
	F only	O only	F: O 75 : 25	O:F 75:25	F: O 1:1	O:F 1:7
P. Aeroginosa	B cell	B cell	B cell	B cell	B cell	Juice cell
E. coli	Juice cell	Juice cell	Juice cell	Juice cell	Juice cell	Juice cell
S. aureus	Juice cell	Juice cell	Juice cell	Juice cell	Juice cell	Juice cell
E. klebsiella	B cell	Juice cell+ B cell	Juice cell	Juice cell	Juice cell	Juice cell
S. aureus	B cell	Juice cell	B cell	Juice cell	B cell	Juice cell

Juice cell (sensitive)
B cell (becteria resistance)

Below the result of objective test of classification, bacterial images using Google Net

When Tables 1 and 2 were be compared the results found that the two tables are identical in the results except in the bacterial image *E. klebsiella* and in the hole with content O only juice, there is a small growth with a little inhibition and this indicates that there is little effect of olive juice on these bacteria.

CONCLUSION

Impact study the Fig and Olive juices on the Pathogen bacteria using digital image processing methods is proposed. The diagnosing methodology uses segmentation, image enhancement, Framelet transform, extraction features using SURF and classifications using Google net were used on various pathological bacterial samples. The areas of bacterial inhibition were determined using biological and image processing methods.

All tests and progressive method were implemented on different pathogen bacteria and the results of digital image processing method were found to be parallel to biological tests. Over the projected image processing method, it was institute to be easy, efficient and accurate to identify areas of bacterial inhibition.

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