Document Layout Analysis

By: Garrett Hoch

Document Layout Analysis Overview

- What is Document Layout Analysis
 - Geometric layout analysis
 - Logical layout analysis
- Why is it useful?
 - Done before OCR
 - · Gives meaning to text
 - Databases
- Algorithm: Docstrum

| | H[f(x,y) + f(x,y)] = H[f(x,y)] + H[f(x,y)] | 155.3 | |
|--|---|----------------------------|--|
| | $m_{[j](x, j)} + j_{2(x, j)]} = m_{[j](x, j)]} + m_{[j_{2}(x, j)]}$ | (0.0-0 | |
| | which is called the property of <i>additivity</i> . This property simply says t a linear operator, the response to a sum of two inputs is equal to the two responses. With $(a, y) = 0$, Eq. (5.5.2) becomes | hat, if H is sum of the | |
| | H[af(x,y)] = aH[f(x,y)] | 1554 | |
| | $m[u_{j}(x, y)] = u_{j}(x, y)$ | (5.54) | |
| | which is called the property of <i>homogeneity</i> . It says that the response to a constant multiple of any input is equal to the response to that input multipled by the same constant. Thus a linear operator possesses both the property of additivity and the property of additivity and the property of addition of property in the input-output relationship $g(x, y) = H[f(x, y)]$ is add to be profined (or same) invariant if | | |
| | $H[f(x-\alpha,y-\beta)] = g(x-\alpha,y-\beta)$ | (5.5-5) | |
| | for any $f(x, y)$ and any α and β . This definition indicates that the re any point in the image depends only on the value of the input at that on its position. | sponse at point, not | |
| et the footnote in page NI repeding continuous nel discute variables | With a slight (but equivalent) change in notation in the definition pulse in Eq. (4.5-3), $f(x, y)$ can be expressed as: | of the im- | |
| | $f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) \delta(x - \alpha, y - \beta) d\alpha d\beta$ | (5.5-6) | |
| | Assume again for a moment that $\eta(x, y) = 0$. Then, substitution of linto Eq. (5.5-1) results in the expression | Eq. (5.5-6) | |
| | $g(x,y) = H[f(x,y)] = H\left[\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}f(\alpha,\beta)\delta(x-\alpha,y-\beta)d\alphad\beta\right]$ | (5.5.7) | |
| | If H is a linear operator and we extend the additivity property to inte | grais, then | |
| | $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} H[f(\alpha, \beta)\delta(x - \alpha, y - \beta)] d\alpha d\beta$ | (5.5-8) | |
| | Because $f(\alpha, \beta)$ is independent of x and y, and using the homogeneity it follows that | property. | |
| | $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H[\delta(x - \alpha, y - \beta)] d\alpha d\beta$ | (5.5-9) | |
| | The term | | |
| | $h(x, \alpha, y, \beta) = H[\delta(x - \alpha, y - \beta)]$ | (5.5-10) | |
| | is called the <i>impulse response</i> of H. In other words, if $\eta(x, y) = 0$ in E then $h(x, a, y, \beta)$ is the response of H to an impulse at coordinates | q. (5.5-1). (x, y). In | |
| | | | |



North Antistic at page Ni repairing continues (we reported. with f(x/y) = 0. Eq. (5.52) becomes with f(x/y) = 0. Eq. (5.52) becomes with f(x/y) = 0. Eq. (5.52) becomes intermediated of the reported of the reported in the reported in the format multiple of any input is equal to the reported to that input multipled the same constant. Thus a incore operator possesses both the property of add trivity and the property of homogenesity. An operator homogene the input output relationship (x, y) = #(f(x, y)) and operator homogenesity.

E<mark>gr(r - a.y - 3)] = s(r - a.y - 3)</mark> ugs

for $\bigcup_{i=1}^{n} y_i(x, y)$ and any α and β . This definition indicates that the response and any point in the image depends only on the value of the input at that point, not on its *position*. With a slight (but equivalent) change in notation in the definition of the impute in Eq. (4.53), f(x, y) can be expressed as:

 $(t, 5) = \int_{-\infty} \int_{-\infty}^{\infty} f(a, \beta)b(x - a, y - \beta) da d\beta$ where again for a moment that $\eta(x, y) = 0$. Then, substitution of Eq. (5.50) where f(5, 5) results in the expression $1, 5_{0} = H(t, y) = H\left[\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} (ta, \beta)b(x - a, y - \beta) da d\beta\right]$ (5.57)

Loo Loo

 $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H(\delta(x - \alpha, y - \beta)) d\alpha d\beta \qquad (5.5)$ (22)

In the impulse response of *H*. In other words, if $\eta(x, y) = 0$ in Eq. (5.5) and $h(x, \alpha, y, \beta)$ is the response of *H* to an impulse at coordinates (x, y)

Algorithm - Docstrum

- 1. Preprocessing
- 2. Detect centroids
- 3. Determine k nearest neighbors
- 4. Estimate skew of image
- 5. Estimate in line and between line spacing
- 6. Find lines of text
- 7. Find blocks of text
- 8. Bounding box calculation

1. Preprocessing

- Convert image to gray scale
- Threshold
- Salt and pepper noise Median Filter
- Morphological opening

366 Chapter 5 B Image Restoration and Reconstruction $H[f_1(x, y) + f_2(x, y)] = H[f_1(x, y)] + H[f_2(x, y)]$ (5.5-3) which is called the property of *additivity*. This property simply says that, if H is a linear operator, the response to a sum of two inputs is equal to the sum of the two responses. With $f_2(x, y) = 0$, Eq. (5.5-2) becomes $H[af_i(x, y)] = aH[f_i(x, y)]$ (5.5-4) $\begin{array}{c} \alpha_{(0)}(x,y) = \alpha_{(1)}(x,y), \\ \alpha_{(2)}(x,y) = \alpha_{(1)}(x,y), \\ \alpha_{(2)}(x,y) = \alpha_{(2)}(x,y), \\ \alpha_{(2)}(x,y) = \alpha_{(2)}(x$ $rr[j(x - \alpha, y - \beta)] = g(x - \alpha, y - \beta) \qquad (5.55)$ for any (x, y) and any a an dβ. This definition indicates that the response at any point in the image depends only on the where of the respit that the print, not with a signal (but equivalent) change in notation in the definition of the im-pather in Eq. (4.5-5), f(x, y) can the expressed as. $H[f(x - \alpha, y - \beta)] = g(x - \alpha, y - \beta)$ (5.5-5) $f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) \delta(x - \alpha, y - \beta) \, d\alpha \, d\beta \qquad (5.5-6)$ Assume again for a moment that $\eta(x, y) = 0$. Then, substitution of Eq. (5.5-6) into Eq. (5.5-1) results in the expression $g(x, y) = H[f(x, y)] = H\left[\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}f(a, \beta)\delta(x - a, y - \beta) da d\beta\right]$ (5.5.7) If H is a linear operator and we extend the additivity property to integrals, then $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} H[f(\alpha, \beta)\delta(x - \alpha, y - \beta)] d\alpha d\beta$ (5.5-8) Because $f(\alpha, \beta)$ is independent of x and y, and using the homogeneity property, it follows that $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H[\delta(x - \alpha, y - \beta)] d\alpha d\beta \qquad (5.5.9)$ The term $h(x,\alpha,y,\beta)=H[\delta(x-\alpha,y-\beta)]$ (5.5-10) is called the *inpulse response* of *H*. In other words, if $\eta(x, y) = 0$ in Eq. (5.5-1), then $h(x, \alpha, y, \beta)$ is the response of *H* to an impulse at coordinates (x, y). In

365 Chapter 5 II Jonage Rest

 $H\{f_i(x, y) + f_i(x, y)\} = H[f_i(x, y)] + H[f_i(x, y)]$ (5.5-3) ed the property of additivity. This property simply s.if H is molthe

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· 0, Eq. (5.5-2) becomes

 $H[af_i(x, y)] = aH_i^i f_i(x, y)$ the It say a con- $(\mathbf{x}) = H[f(\mathbf{x}, \mathbf{y})]$ is

 $H[f(x = \alpha, y = \beta)] = g(x = \alpha,$ γ) and any α and β . This definition indicates that the

(has equivalent) change in notation in the defaution of the im-state of the subressed as: See the Australia in page Will regarding participations

 $f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) \delta(x - \alpha, y - \beta) dx d\beta \qquad (5.5.6)$ Assume again for a moment that $\eta(t, t) = 0$. Then, substitution of Eq. (55.6) into Eq. (55.7) results in the gametsion

 $g(x,y) \in H(f(x,y)) = H\left[\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha,\beta)\delta(x-\alpha,\gamma-\beta)\,d\alpha\,d\beta\right] (5.5^{29})$

If H is a linear operator and we extend the additionty property to integrals, then

 $g(\mathbf{x}, \mathbf{y}) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} H(f(\alpha, \beta)\delta(x - \alpha, \mathbf{y} - \beta)) \, d\alpha \, d\beta = (5.5 \text{ N})$ Because $f(\alpha, \beta)$ is independent of x and y, and using the homospherity projectly, it follows that

 $(y, x, x) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H[\theta(x - \alpha, x - \beta)] d\omega d\beta$ (5.5.9) The usin

 $h(x, \alpha, \gamma, \beta) = H[\delta(x - \alpha, \gamma - \beta)]$ is called the *singular exponse* of *H*, in other words if $\eta(x,y) = 0$ in $\Gamma_{\eta}(x,y)$ then $\delta(x,y) \sim \eta(x,y)$ the response of *H* to an insulae it coordinates (x, x). In

2. Detect Centroids

- 8-connected components
 - bwlabel
- Calculate area and position of centroids
- Filter out large and small centroids



3. K-Nearest Neighbors

- 5 Nearest Neighbor
 - knnsearch
- Calculate Phase
- Calculate Distance
- Longest Part of Computation



4. Estimate Phase



5.Estimate inline and between line distance

- Based on the phase
 - · Nearest neighbors that have phase around 0 degrees are inline
 - · Nearest neighbors that have phase around 90 degrees are between line



6. Find text lines

- Threshold centroids based on phase
- Transitive Closure
- Linear regression

| | $H[f(x,y) - f_{0}(x,y)] = H[f(x,y)] = H[f_{0}(x,y)]$ | (55.3) |
|------------------------|--|--|
| | which is called the property of adduivity. This property simply says that | if H is |
| | a linear operator, the response to a sum of two inputs is equal to the sur | n uf the |
| | With $f_2(x,y) = 0$, Eq. (5.5.2) becomes | |
| | $H[af_i(x,y)] = aH[f_i(x,y)]$ | (محکر) |
| | which is called the property of homogeneity. It says that the response to stant multiple of any input is equal to the response to that liquit multiple to the same constant. Thus, a linear coperator protections both the property of twist and the property of homogeneity. An operator having the implementation of the property of the same constant is substantiant of the property of the property of the same transmission of the property of the same constant of the property of the same transmission of the property of the property of the same transmission of the property of t | a con- thert by of adrit- r. y)} is |
| San its for any state | $H^{*}_{f(x)}(\alpha, y) = \beta^{*}_{f(x)}(\alpha, y) = \beta^{*}_{f(x)}(\alpha, y)$ | (5.5.5) |
| | for any $f(x, v)$ and any r_0 and g . This definition indicates that the zero any point in the manyadopanals around the solution of the apput at that pur- on list postface. With estight (but equivalent) changes in metatomic head-fairting of outer in Fort 5.1. If (x_{1-1}) is no become and as | once at <u>or not</u> rho im- |
| and forcerin on schies | $f_{1,1} = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f_{1,0} \frac{\partial h}{\partial h} \frac{\partial h}{\partial h} dh dh$ | (5.5.6) |
| | J vJ | |
| | Assume space for a moment that $q_i r_i x_i = 0$. Then substitution of his into Eq. (5.5.1) results in the expression. | <u>(\$ 5 6)</u> |
| | $g(\underline{r},\underline{y}) = H[\underline{f(\underline{r},\underline{y})}] = H[\underline{f}] = \frac{1}{2} \int \sum_{i=1}^{n} f(\underline{\sigma},\underline{\beta};\underline{\beta};\underline{r}, -\underline{\sigma}, -\underline{\beta}) d\sigma d\beta$ | (<u>\$ \$ 71</u> |
| | If H is a lower operator and we extend the additivity projectly to unitate | le rhon |
| | $g(x,y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{H^{2}(f(x,\beta))\delta(x-\alpha,y-\beta)}{2} d\alpha d\beta$ | 1 <u>5.5-81</u> |
| | Because for B) windopendent of r and y, and using the home sense is not judge that | u <u>serts</u> |
| | $\frac{r(x,y)}{\int_{-\infty}^{\infty}} \frac{\int_{-\infty}^{\infty} \frac{\rho(x,y)}{\rho(x,y)} \frac{dy}{dx} \frac$ | (<u>4 5 9)</u> |
| | The-team | |
| | $h(x,\alpha,y,B) = H[S(x,\alpha,y,B)]^{-1}$ is | 5 100 |
| | receiled the ansatic response of 11 to other words it of yet = 94845.5 (here \$12, 25, 3, 9) is the response of the one investigation of the second state of the second | > : L |
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7. Find text blocks

- Each line is compared to each other
 - If it meets the criteria to be in block then add it to the block
 - Else start a new block
- Sort text lines by:
 - Approximately parallel
 - based on estimated phase
 - Perpendicular distance
 - Based on between lines distance
 - Overlap or parallel distance
 - Based on inline distance
- · Customized based on a document to document basis

8. Bounding box

- From the Previous step bounding boxes are drawn for each text block.
- Based on the position and size of a box each box can be labeled as text, equation, equation number, section heading, and etc.

| | a linear operator, the response to a sum of two inputs is equal to the s two responses. | um of the |
|--|---|--|
| | With $f_2(x, y) = 0$, Eq. (5.5-2) becomes | |
| | $H[af_{x}(x, y)] = aH[f_{x}(x, y)]$ | (12.2.4) |
| | which is called the property of <i>homogenety</i> . If any final the response start multiple of any input is equal to the response to that input mul- the same constant. Thus a linear operator possesses both the propert vivity and the property of <i>homogenety</i> . An operator having the input-output relationship $g(x, y) = H[j]$ said to be possible for <i>symptochysical property</i> . | to a con- tiplied by y of addi- f(x, y)] is |
| | $H[f(x - \alpha, y - \beta)] = g(x - \alpha, y - \beta)$ | (55.5) |
| | for any $f(x, y)$ and any σ and β . This definition indicates that the re- any point in the image depends only on the value of the input at that on its position. With a slight (but equivalent) change in notation in the definition quite in Eq. (4-5), $f(x, x)$ can be expressed as: | sponse at point, not of the im- |
| | $f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) \delta(x - \alpha, y - \beta) d\alpha d\beta$ | (55-6) |
| | Assume again for a moment that $\eta(x, y) = 0$. Then, substitution of E into Eq. (5.5.1) results in the expression | a. (5.5-6) |
| | $g(x, y) = H[f(x, y)] = H\left[\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}f(\alpha, \beta)\delta(x - \alpha, y - \beta) d\alpha d\beta\right]$ | (5.5-7) |
| | ULW is a linear operator and we extend the additivity property to integ | 1001000000000 |
| | $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} H[f(\alpha, \beta)\delta(x - \alpha, y - \beta)] d\alpha d\beta$ | (5.5-8) |
| | Because $f(\alpha, \beta)$ is independent of x and y, and using the homogeneity it follows that | property. |
| | $g(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H[\delta(x - \alpha, y - \beta)] d\alpha d\beta$ | (5.5-9) |
| | The term $W_{(x, \alpha, y, \beta)} = H[\delta(x - \alpha, y - \beta)]$ | |
| | is called the <i>impulse response</i> of <i>H</i> . In other words, if $\eta(x, y) = 0$ in Eq. then $h(x, \alpha, y, \beta)$ is the response of <i>H</i> to an impulse at coordinates | {. (5.5−1) (x, y). Ir |
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Similar and Dissimilar Document Structure

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| or, with respect to the center of the frequency rectangle, using the rister | which is called the property of <i>additivity</i> . This property simply says that, if <i>H</i> is | 6.5.4 Tone and Color Contections 455 |
| $W(u,v) = -4\pi^2 \left[(u - P/2)^2 + (v - Q/2)^2 \right]$ | two responses. | 6.6 Smoothing and Sharpening 461 6.6.1 Color Image Smoothing 461 |
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| where $D(u, v)$ is the distance function given in Eq. (4.8-2). Then, the Laplacian | $\frac{11071(X,Y)}{1000} = 0.0171(X,Y)$ | 6.7.1 Segmentation in HSI Color Space 465 |
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| $\mathcal{O}^{*}f(x,y) = \mathcal{J}^{*}(H(u,y)F(u,y)) \qquad (13.3.3)$ | the same constant. Thus a linear operator poisesses both the property of addi- tivity and the property of homogeneity. | 6.8 Noise in Color Images 473 6.9 Color Image Compression 476 |
| where $F(u, v)$ is the DFT of $f(x, y)$. As explained in Section 3.6.2, enhance | An operator having the input-output relationship $g(x, y) = H[f(x, y)]$ is usid to be notifien (or space) invariant if | Summary 477 |
| inent is achieved using the equation: | | References and Further Reading 4/8 Problems 478 |
| $\mathbb{C}[x,y] = f(x,y) + \mathbb{C}^{\nabla}f(x,y) \qquad \text{(2.3.2)}$ | for any $f(x, y)$ and any or and B. This definition indicates that the response up | 7 |
| Here, $c = -1$ because $H(u, v)$ is begative. In Chapter 3, $f(x, y)$ and $\nabla f(x, y)$ | any point in the image depends only on the value of the input at that point, not | Wavelets and Multiresolution Proc |
| had comparable values. However, computing $v^{-}(x, y)$ with Eq. (4.9-7) intro- duces DFT scaling factors that can be several orders of magnitude larger than | With a slight (but equivalent) change in notation in the definition of the im- | 7.1 Background 484 |
| the maximum value of f. Thus, the differences between f and its Laplacian must be brought into comparable ranges. The easiest way to handle this prob- | We repair generation the public in Eq. (4.5-3), $f(x, y)$ can be expressed as: | 7.1.2 Subband Coding 488 |
| lem is to normalize the values of $f(x, y)$ to the range [0, 1] (before computing its DED and divide $\nabla^2 f(x, y)$ by its maximum value which will bring it to the | $f(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) \delta(x - \alpha, y - \beta) d\alpha d\beta \qquad (55.55)$ | 7.1.3 The read Transform 499 7.2 Multiresolution Expansions 499 |
| approximate range [-1,1] (recall that the Laplacian has negative values). | Remove assis for a moment that wir vi = 0. Then subsitiution of Par (5.5-9) | 7.2.1 Series Expansions 499 7.2.2 Scaling Functions 501 |
| Equation (4.9-8) can then be applied. In the frequency domain, Eq. (4.9-8) is written as | Into Eq. (5.5.1) results in the expression | 72.3 Wavelet Functions \$03 |
| $\mathbb{P}(x,y) = \mathbb{P}\left(F(x,y) - H(x,y)F(x,y)\right)$ | $\int dx = \frac{1}{2} \int dx$ | 7.3.1 The Wavelet Series Expansions 308 |
| HIL WIRLE W | $g(x, y) = H[f(x, y)] = H \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(a, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) a a a p \int_{-\infty}^{\infty} f(x, p) \phi(x - a, y - p) \phi$ | 7.3.2 The Discrete waveer transform 510 7.3.3 The Continuous Wavelet Transform 513 |
| | WHIGS a larger operator and we extend the additionly property to integrals, then | 7. The Fast Wavelet Transform 515 7. Wavelet Transforms in Two Dimensions 523 |
| E - (() or (a, c))o(a, c) | $\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \frac{1}{16} \int_{-\infty}^{\infty} $ | Z.6 Wavelet Packets 532 |
| Although this result is cregant, it has the same scaling issues just mentioned compounded by the fact that the normalizing factor is not as easily computed | $p(\mathbf{x}, \mathbf{y}) = \int_{-\infty} \int_{-\infty} \frac{n}{2\pi} \prod_{i=1}^{n} \frac{n}{2\pi} \left[\frac{(u, p)o(x - u, \mathbf{y} - p)}{2\pi} \right] du dp (2\pi^{n})$ | References and Further Reading 542 |
| For this reason, Eq. (49-8) is the preferred implementation in the frequency domain with $\nabla^2 f(r, s)$ computed using Eq. (4.9-7) and scaled using the an | Because $f(n, \beta)$ is independent of x and y, and using the bomogeneity property, it follows that | Probleme Sta |
| proach mentioned in the previous paragraph | | 8 Incore Commercian 547 |
| | $\varrho(x, y) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} f(\alpha, \beta) H[\delta(x - \alpha, y - \beta)] d\alpha d\beta$ (5.5.9) | 8.1 Fundamentals 548 |
| Figure 4.56(a) is the same as rig. 3.56(a), and rig. 4.56(b) shows the result of the same same same same same same same sam | (Instants) | 8.1.1 Coding Redundancy 550 8.1.2 Spatial and Temporal Redundancy 55 |
| main using Eq. (4.5-7). Scaling was such as described in connection with that equation. We see by comparing Figs. 4.58(b) and 3.38(e) that the frequency do- Listerion | $u_{(x,\alpha,\gamma,\beta)} = 2d_{2}(x-\alpha,\gamma-\beta)$ (5.5.00) | 8.1.3 irrelevant Information 552 |
| main and spatial results are identical visually. Observe that the results in these two figures correspond to the Laplacian mask in Fig. 3.37(b), which has a - 8 in | is called the impulse response of H. In other words, if $\eta(x, y) = 0$ in Eq. (3.3-1) | 8.1.4 Measuring integration 333 8.1.5 Fidelity Criteria 556 |
| the center (Problem 4.26) | then $h(x, a, y, B)$ is the response of H to an impulse at coordinates (x, y) . If | |
| | | |
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Discussion

- Pros
 - · Can separate analysis into subsection for more accurate results
 - Analysis independent of skew
- Cons
 - The algorithm needs to be customized based on the document
 - Current area of research
 - Nearest neighbor computation is computational heavy
- Future work
 - Need to implement skew estimation
 - Explore more advanced techniques
 - Use in conjunction with OCR

References

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Questions?