Task 2.3D Answer sheet

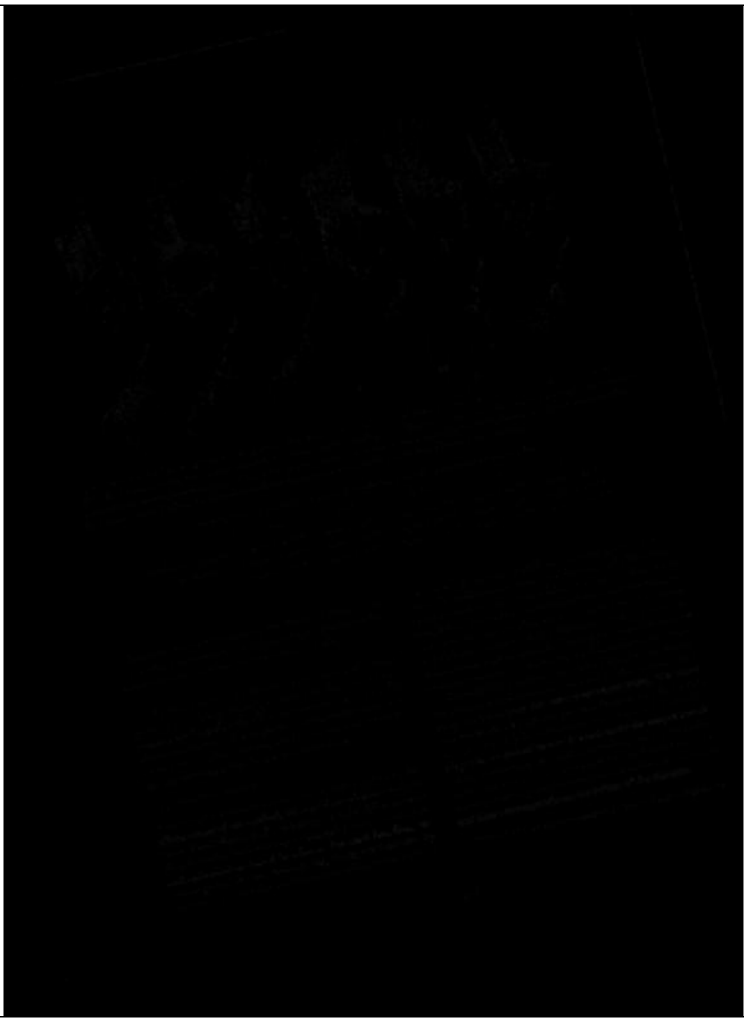
Fill in the "**Results**" column with relevant results

Notes:

- Examples are given for illustration purposes only and need to be replaced by your own results.
- Missing any required results will result in a re-submission.

1. Results of candidate point selection on doc.jpg

	Candidate points	**Computational speed (in calculating candidate points)**
Strategy a		0.0019991397857666016 seconds

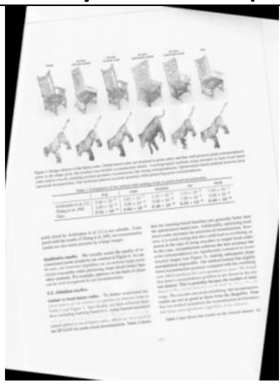
Strategy b			0.006463527679443359 seconds

Strategy c		148.18448686599731 seconds

2. Performance analysis

Note: For each setting (i.e., a combination of a point selection strategy and density threshold), you need to fill in the respective cell of the setting with the following information.

- Deskewing result of the setting (i.e., a deskewed image of doc.jpg).
- Computational speed of applying the Hough transform and the entire skew estimation process (from input to output).

	density threshold 1 (10)	**density threshold 2 (15)**	**density threshold 3 (20)**
Strategy a	 Hough time: 0.1670849323272705 seconds Total time: 0.2960667610168457 seconds	 Hough time: 0.18290948867797852 seconds Total time: 0.34273219108581543 seconds	 Hough time: 0.24344778060913086 seconds Total time: 0.37578439712524414 seconds
Strategy b	 Hough time: 0.016517162322998047 seconds Total time: 0.023608684539794922 seconds	 Hough time: 0.01272439956665039 seconds Total time: 0.026520252227783203 seconds	 Hough time: 0.02777266502380371 seconds Total time: 0.055969953536987305 seconds

Strategy c	 Hough time: 0.024947404861450195 seconds Total time: 0.05252861976623535 seconds	 Hough time: 0.015410184860229492 seconds Total time: 0.02565765380859375 seconds	 Hough time: 0.018285512924194336 seconds Total time: 0.03241539001464844 seconds

3. Other test cases

Based on the results in Section 2, choose ONE point selection strategy and ONE density threshold that you find best.

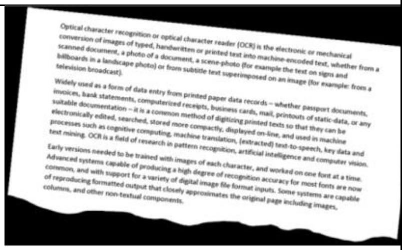
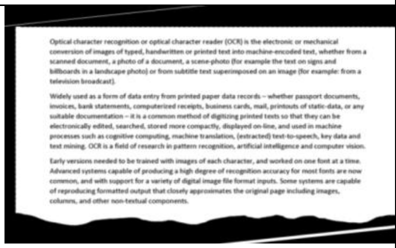
What is your chosen point selection strategy?

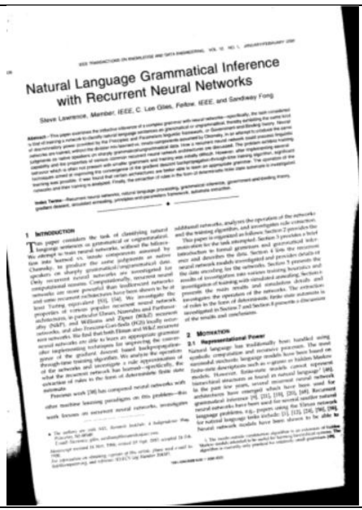
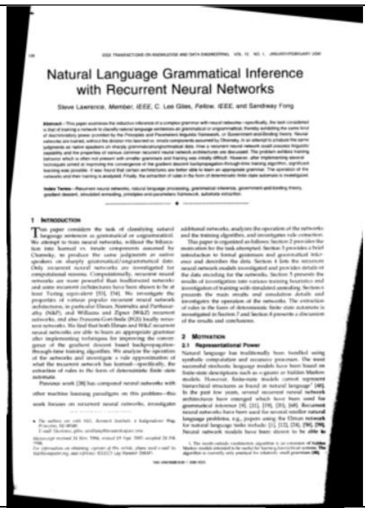
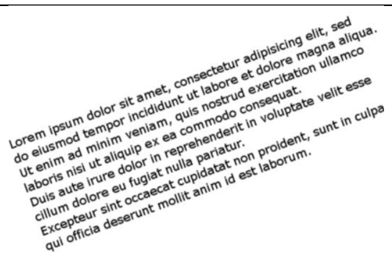
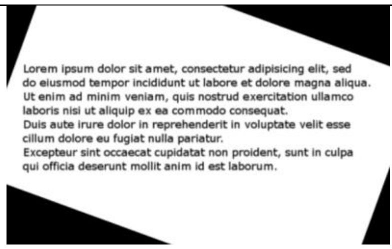
Strategy B

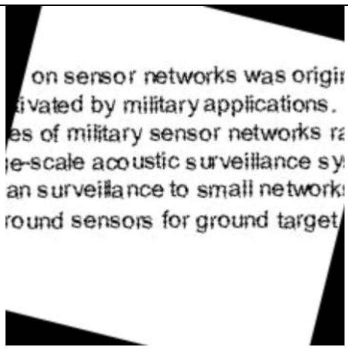
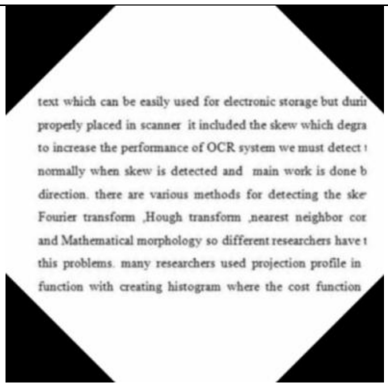
What is your chosen density threshold?

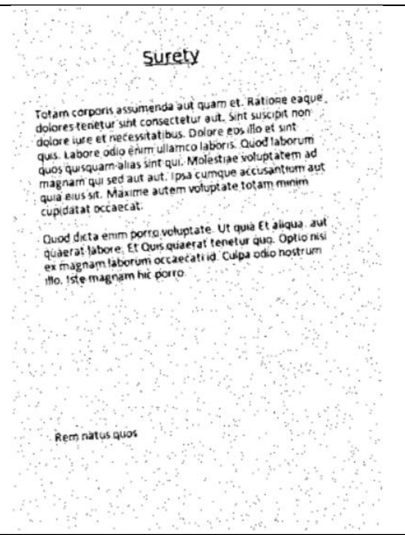
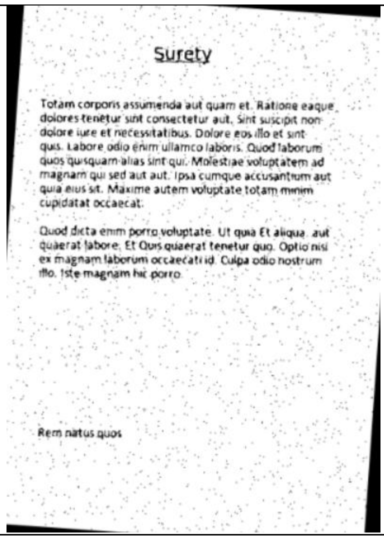
15

Results of other test cases

	Input image	**Output image (deskewed)**	**Computational speed (candidate point selection, Hough transform, entire process)**
Test case 1	 Optical character recognition or optical character reader (OCR) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example: from a television broadcast). Widely used as a form of data entry from printed paper data records – whether passport documents, invoices, bank statements, computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation – it is a common method of digitizing printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision. Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems capable of producing a high degree of recognition accuracy for most fonts are now common, and with support for a variety of digital image file format inputs. Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.	 Optical character recognition or optical character reader (OCR) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example: from a television broadcast). Widely used as a form of data entry from printed paper data records – whether passport documents, invoices, bank statements, computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation – it is a common method of digitizing printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining. OCR is a field of research in pattern recognition, artificial intelligence and computer vision. Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems capable of producing a high degree of recognition accuracy for most fonts are now common, and with support for a variety of digital image file format inputs. Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.	Computational speed of candidate points using strategy B: 0.0009984970092773438 seconds Hough time: 0.003997325897216797 seconds Total time: 0.004998207092285156 seconds

Test case 2			Computational speed of candidate points using strategy B: 0.000995635986328125 seconds Hough time: 0.0025866031646728516 seconds Total time: 0.0025866031646728516 seconds
Test case 3			Computational speed of candidate points using strategy B: 0.0029904842376708984 seconds Hough time: 0.024385452270507812 seconds Total time: 0.039115190505981445 seconds
Test case 4			Computational speed of candidate points using strategy B: 0.012007474899291992 seconds Hough time: 0.01402592658996582 seconds Total time: 0.022531986236572266 seconds
Test case 5			Computational speed of candidate points using strategy B: 0.0009982585906982422 seconds Hough time: 0.0020012855529785156 seconds Total time: 0.0020012855529785156 seconds

Test case 6			Computational speed of candidate points using strategy B: 0.0007431507110595703 seconds Hough time: 0.0012323856353759766 seconds Total time: 0.0027768611907958984 seconds
Test case 7			Computational speed of candidate points using strategy B: 0.0007674694061279297 seconds Hough time: 0.0009286403656005859 seconds Total time: 0.0015017986297607422 seconds
Test case 8			Computational speed of candidate points using strategy B: 0.0070035457611083984 seconds Hough time: 0.015010833740234375 seconds Total time: 0.022342205047607422 seconds
Test case 9			Computational speed of candidate points using strategy B: 0.0009949207305908203 seconds Hough time: 0.0010001659393310547 seconds Total time: 0.0015087127685546875 seconds

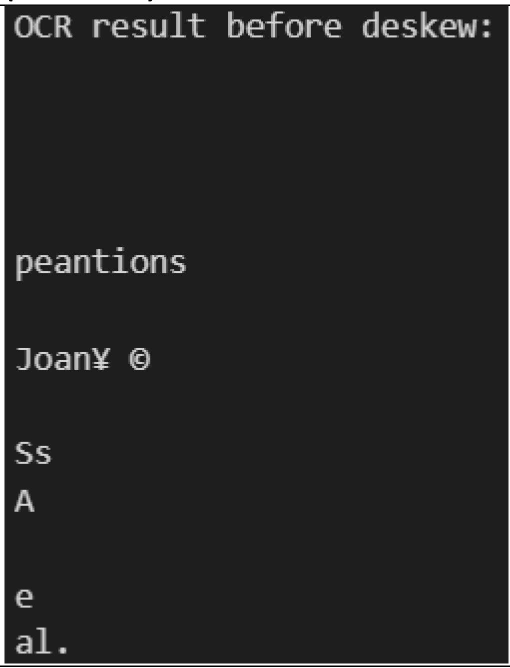
<table>
<tr>
<td>Test case 10</td>
<td>
</td>
<td>
</td>
<td>Computational speed of candidate points using strategy B: 0.001001119613647461 seconds
Hough time: 0.0013251304626464844 seconds
Total time: 0.0013251304626464844 seconds</td>
</tr>
</table>

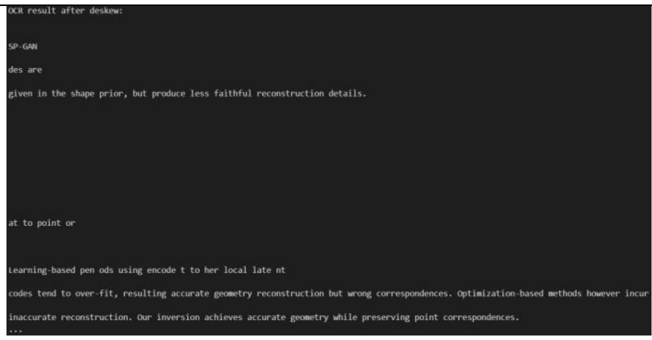
Observe and discuss the results. Does the Hough transform accurately work in every case? If not, what could be the reason and how to address it?

In my case, all of the Hough transform work accurately in every cases.

4. Text recognition using pytesseract

Provide screenshots with recognised text highlighted to showcase the effectiveness of skew correction to text recognition.

<table>
<tr>
<th></th>
<th>Text recognition without skew correction (screenshot)</th>
<th>Text recognition with skew correction (screenshot)</th>
</tr>
<tr>
<td>doc.jpg</td>
<td>

OCR result before deskew:
peantions
Joan¥ ©
Ss
A
e
al.</td>
<td>

OCR result after deskew:
SP-GAN
des are
given in the shape prior, but produce less faithful reconstruction details.
at to point or
Learning-based pen ods using encode t to her local late nt
codes tend to over-fit, resulting accurate geometry reconstruction but wrong correspondences. Optimization-based methods however incur
inaccurate reconstruction. Our inversion achieves accurate geometry while preserving point correspondences.
...</td>
</tr>
</table>

Test case 1	OCR result before deskew: Photo (for example the text on sig *t superimposed on an image (for es " from subtitle te; ! whether from a ns and xample: from a whether passport documents,	OCR result after deskew: Optical character recognition or optical character reader (OCR) is the electronic or mechanical conversion of images of typed, handwritten or printed text into machine-encoded text, whether from a scanned document, a photo of a document, a scene-photo (for example the text on signs and billboards in a landscape photo) or from subtitle text superimposed on an image (for example: from a television broadcast). Widely used as a form of data entry from printed paper data records – whether passport documents, invoices, bank statements, computerized receipts, business cards, mail, printouts of static-data, or any suitable documentation – it is a common method of digitizing printed texts so that they can be electronically edited, searched, stored more compactly, displayed on-line, and used in machine processes such as cognitive computing, machine translation, (extracted) text-to-speech, key data and text mining, OCR is a field of research in pattern recognition, artificial intelligence and computer vision Early versions needed to be trained with images of each character, and worked on one font at a time. Advanced systems capable of producing a high degree of recognition accuracy for most fonts are now common, and with support for a variety of digital image file format inputs. Some systems are capable of reproducing formatted output that closely approximates the original page including images, columns, and other non-textual components.
Test case 2	OCR result before deskew: 8 cer mre 90 nM nt NON SAAOEDRIATY 228 Natural Language Grammatical Inference with Recurrent Neural Networks Steve Lawrence, Member. IEEE, C. Lee Giles, Fellow. 1EEE, and Sandiway Fong: rads pe aT ea rnc car IE et seca, ve wsk consid earns ma ge er Te on rome anager Oe 7 rtf mn) pee ‘pene Fag varnont of GOFOTENS ying eon. Now oe rene we ee onroveared en org rece ne ST cere anne oak pavly great wee ne oT a cay ch OO femal eee ama 2k OTT connor tcl new wn renee ae sr rn wg aa can pacientes me haters gated. 4 fwTRODUETION vas paper corer: He cof classifying ature! ait ees a7 Ey eae sentences Mamata or ergs a gai ee aig ago aH ope gtes rae estar tame to ter neural Se Neithout the Bifste™ oe per engi 2 FOUN rion 2 provide We eyo. Hearned vs, nate so On ae te S ton egy to_preduce the ponents ae nate ree ornal pears Grammatical nie Speakers on sharply asl /unqrarsee ino deserves the a na an tnt the Feces speak great eM at ammigated for neural re models vestgned 238 provides details oF Crpatabonal rear’ oa nay CUE MEN rea oti ee See peor presents Ne compare ore more powertll may een networks cee of moet ito varies IN pears a8 neo pcurren reset "pee shown toe 2 ce igation of taining wit ar ek aealing SCHON	OCR result after deskew: TRANSACTIONS ON KNOWLEDOE ANG DATA ENGINEERING. VOL 12, NO. ere Natural Language Grammatical Inference with Recurrent Neural Networks Steve Lawrence, Member, IEEE, C. Lee Giles, Fellow, IEEE, and Sandiway Fong [Abstract—Ths pape examina te induclva nore of complex grammar wit eur natwons–epocticay, te tsk considered ‘Sitar of vaning« retwort to casi natr!angatesectnces as graratcal or ungrammatcal Drereby exting the same kind of acrmaatery power growed by the rotiee and Parameters ings tamewotk ot Goverment and ewsrg theory. Neu ‘etworks ar waned, winout he vison mo teamed vs nale components assumed by Chomsky, nb alert to produce he ame fuagmonte as nave apenas cn sharply grammmancatuegrarsmabcal daa. How a recur neva netecrk cus possess Mgusie Capabiy andthe properties of vavove common recurs ura ratwork archlectiven are dcusced. Te problem exis Waning tenavor whch 2 len not present wah emaber ramare a Waring wes may feu However, ater implementing several fecheiques med at ungrovng te convergence Otte graent descent backpropagatonthrcuvime vaning oigatty, riicant tearung was posse i was found that oeran erchaectures oe bse abo 1 lam an appropriate grammar. The Opera Of he senor and tev tracing analyzed. Fal, the eracton fr i he form determinate estgaied Icon Terme— Recurrent naurl networks, natal nguage process, grime! ference, goverment anébindng Meer. (raientdescere,smulated anneaing, prinopis-and-parameters IarhrwX.aulomata exFarPEn, 1 Irropuction ss paper considers the task of classifying natural language sentences as grammatical or ungratmanatical We attempt to train neural networks, without the bifurea
Test case 3	OCR result before deskew:	OCR result after deskew: entation viewed in terms of rows and columns. Tag = 274 (112.H) Type = SHORT Count = 1 Default = 1 1 = The Oth row is at the visual top of the image, and the Oth column is the visual left-hand side. 2 = The Oth row is at the visual top of the image, and the Oth column is the visual right-hand side. 3 = The Oth row is at the visual bottom of the image, and the Oth column is the visual right-hand side. 4 = The Oth row is at the visual bottom of the image, and the Oth column is the visual left-hand side. 5 = The Oth row is the visual left-hand side of the image, and the Oth column is the visual top. 6 = The Oth row is the visual right-hand side of the image, and the Oth column is the visual top. 7 = The Oth row is the visual right-hand side of the image, and the Oth column is the visual bottom. 8 = The Oth row is the visual left-hand side of the image, and the Oth column is the visual bottom. Other = reserved SamplesPerPixel The number of components per pixel. Since this standard applies to RGB and YCbCr images, the value set for this tag is 3. In JPEG compressed data a JPEG marker is used instead of this tag. Tag = 277 (115.H) Type = SHORT Count = 1 Default = 3 PlanarConfiguration Indicates whether pixel components are recorded in chunky or planar format. In JPEG compressed files a JPEG marker is used instead of this tag. If this field does not exist, the TIFF default of 1 (chunky) is assumed.

<table>
<tr><td>Test case 4</td><td>OCR result before deskew:</td><td>OCR result after deskew:
codes tend to over-fit, resulting accurate geometry reconstruction but wrong c
inaccurate reconstruction. Our inversion achieves accurate g
1ape prior, but produce less faithful reconstruction details. Learning-based methods using
hod with existir
encoders to learn local latent
orespondences. Optimization-based methods however incur</td></tr>
<tr><td>Test case 5</td><td>OCR result before deskew:</td><td>OCR result after deskew:
} Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed |
do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim ad minim veniam, quis nostrud exercitation ullamco
laboris nisi ut aliquip ex ea commodo consequat.
Duis aute irure dolor in reprehenderit in voluptate velit esse
cillum dolore eu fugiat nulla pariatur.
Excepteur sint occaecat cupidatat non proident, sunt in culpa
qui officia deserunt mollit anim id est laborum.</td></tr>
<tr><td>Test case 6</td><td>OCR result before deskew:</td><td>OCR result after deskew:</td></tr>
<tr><td>Test case 7</td><td>OCR result before deskew:</td><td>OCR result after deskew:
‘on sensor networks was origit
ivated by military applications.
s of military sensor networks Fz
je-scale acoustic surveillance sy
an surveiance to small network
round sensors for ground target
a</td></tr>
</table>

<table>
<tr>
<td>Test case 8</td>
<td>OCR result before deskew:

Paysage dans l'art
La notion de paysage dans art englobe la représentation des paysages par les différents arts :
peinture, le dessin, la photographie, etc,

fale important dans les arts graphiques. Elle peut, entre autres,
ée pour les symboliser (peinture
ture d'histoire, du portrait, de la

La représentation du paysage joue un
siopposer parfois a la représentation des étres, OU bien peut tre utilis
religieuse). En peinture, le paysage est un genre aux cétés de la pein
peinture de genre, de la nature morte ef de la peinture figurative.

Liimportance du paysage dans Ia Chine Traditionnelle
Le paysage a joué un rdle majeur dans Ihistoire et principalement dans la chine traditionnelle. En
Chine, la conception du paysage est différente quien occident.</td>
<td>OCR result after deskew:
Paysage dans l'art |

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peinture, le dessin, la photographie, etc.|

|
La représentation du paysage joue un {dle important dans les arts graphiques. Elle peut, entre autres,
s'opposer parfois G la représentation des étres, ou bien peut étre utilisée pour les symboliser (peinture
religieuse). En peinture, le paysage est un genre aux cétés de la peinture d'histoire, du portrait, de la
peinture de genre, de la nature morte et de la peinture figurative.

L'importance du paysage dans la Chine Traditionnelle

Le paysage a joué un réle majeur dans "histoire et principalement dans la chine traditionnelle. En
Chine, la conception du paysage est différente qu'en occident.

Les peintres chinois ont leurs propres langages : vide, vide médian, plein, souffle, (voir livre de Francois
Cheng).

|
Estampe chinoise peinte sur un éventail. On peut observer G gauche deux individus dont un 4 cheval.
Ces derniers se rendent probablement 4 leur maison familiale qui se situe tout 4 droite de l'estampe.

|
Si l'on observe attentivement une peinture, une estampe chinoise, on remarquera que souvent, un, OU
plusieurs personnages y figurent. Ces derniers sont peints trés petits, par rapport au paysage. lls sont
souvent peints au milieu de la toile (mais pas toujours). Ainsi, le spectateur qui observera la toile, aura
limpression d'étre a la place du persgnnage et de pouvoir bénéficier de la vue de celui-ci. Tel est effet

voulut par les peintres chinois. |

|
Histoire du paysage en peinture-Occident-De I'Antiquité au Moyen Age

Paysage de I'Odyssée dans la Maisdn de !a via Graziosa, I*" siécle av. J.-C.

Dans l'antiquité grecque et romaine, le paysage n'est peint que comme fond ou environnement pour</td>
</tr>
<tr>
<td>Test case 9</td>
<td>OCR result before deskew:</td>
<td>OCR result after deskew:

text which can be easily used for electronic storage but durin

properly placed in scanner it included the skew which degra

to increase the performance of OCR system we must detect!
nommally when skew is detected and main work is done b
direction. there are various methods for detecting the ske
Fourier transform Hough transform nearest neighbor cor
and Mathematical morphology so different researchers have |

this problems. many researchers used proje

n profile in

function

swith creating histogram where the cost function</td>
</tr>
<tr>
<td>Test case 10</td>
<td>OCR result before deskew:

‘Yotam corporis assumenda ‘gut quam et. Rations eaque.
Fear tenetuy aint consectetur aut Sint sukePA 108
dolore iure et receysitatibus. Dolore £05 io et sint

quis. Labore dio efi ullarnco labor Quod laborur
quos quisquarnaias Sint qui-Miolestiae ‘voluptatem ad
magoarh qui sed aut aut, 1ps8 Cumave aécusantiom aut
uta avs'st. Maxime autem voluptate tot rye
cupidatat occaecat:

quod dicta én porravoluptaté, Ut gue EC abah2, 2
quaerat labore: er Qus.quaerat tenetur quo. Optio nish
da inagnamtaboram occaceatt (a Culpa odio nostrum
Ho, 1ste magne Hie Bor:

Rem natys Quos</td>
<td>OCR result after deskew:

Totam corporis assumenda aut quam et Ratione eaque’,
dolorestenietur sint consactetur gut, Sint suscipit non:
dolore iure et necessitatibus. Dolore e0s flo et sint

quis. Labore odio eur ullamico labor's, Quod laborum
u05 quisquam alias sint-qui. Mofestiae woluptatem ad
‘magnart qui sed aut aut. Ipsa cumque accusanteum aut
quia ewus it. Maxime autem voluptate totam minim
cupidatat occaecat:

Quod dieta emm porravoluptaté. Ut quia Et aliqua. aut
Quserat labore; Et Quis quzerat tenetur quo. Optio nisi
ex magnamlaborum occaecatiid. Culpa odio nostrum
Mo, Iste magnam hit gorro.

Rem natus quos</td>
</tr>
</table>