University Of Karachi Department Of Computer Science

DOCUMENT LAYOUT ANALYSIS

GROUP MEMBERS:

SANIA IRFAN | B12101110 | saniairfan4@gmail.com

TOOBA AZIZ | B12101134 | toobi_94@hotmail.com

COURSE SUPERVISOR: DR. HUMERA TARIQ

Contents

- Problem Statement
- Why It is important to Solve the Chosen Problem?
- Data Acquisition (Input Images)
- Block Diagram
- GUI
- intermediate and output images (Important Results)
- Preprocessing Details
- Algorithm Description
 - Image Segmentation

- Feature Extraction
- Matching Criteria
- Challenges/ Difficulties
- Learning and Achievements
- Improvements and Future Work
- Demo and Queries

Problem Statement

- ➤ The process of document structure and layout analysis tries to decompose a given document image into its component regions and understand their functional roles and relationships.
- The process of Document Layout Analysis aims to decompose a document image into a hierarchy of homogenous regions, such as figures, background, text blocks, text lines, words, characters, etc.
- > We assign functional or logical labels to some of these regions.

Importance

To Solve the given Problem is important because automatic analysis of an arbitrary document with complex layout is an extremely difficult task and is beyond the capabilities of layout analysis systems these days. This is interesting since documents are designed to be effective and clear to human interpretation.

Data Acquisition

IN THIS SECTION WE DESCRIBE THAT HOW WE ACQUIRE INPUT IMAGES / VIDEO FOR PROCESSING. INPUT IMAGES ARE ALSO SHOWN TO UNDERSTAND THE ADDRESSED PROBLEM.

Newspaper images are a good way to start document structure analysis. We gathered the images from **epaper.dawn.com**.

India finds no role of Pakistan govt in Pathankot attack

By Our Correspondent

NEW DELHI: There is no evidence so far to indicate direct complicity of Pakistan government or its agencies in the Pathankot attack, India's probe chief has said.

"No evidence to show that Pakistan government or Pakistani government agency was helping Jaish-e-Mohammad or Masood Azhar or his aides carry out the Pathankot attack," Director General of the National Investigation Agency (NIA) Sharad Kumar said in a TV interview broadcast on Thursday.

Mr Kumar's remarks coincided with preparations for Prime Minister Narendra Modi's visit to Washington next week, which has been urging improved relations between India and Pakistan. Moreover, Indian officials were sharing their findings with the FBI, which could perhaps be a factor in Mr Kumar's professional comments bereft of finger pointing at Pakistan.

Reports surfaced in April that to bolster its case against the Jaish-e-Mohammad and its chief Maulana Masood Azhar over the Pathankot terror attack, the NIA had approached several foreign investigating agencies, including the FBI, for assistance. The NIA wanted the FBI's help in mapping cyber footprints of Azhar's brother, Abdul Rauf. It also got in touch with agencies of a few other countries to map the financial trail in the terror attack case.

The NIA's reputation at home remains mired in controversy, how-

ever, fuelling fears that it was pliable to political pressure. It was responsible for investigating major attacks by alleged Hindutva terror groups in Malegaon and Samjhauta Express among other outrages.

However, reports have quoted the agency as claiming that the slain antiterror police chief Hemant Karkare planted evidence implicating some Hindutva sympathisers. Karkare was mysteriously killed in the terror chaos by a sniper, who the government says was one of the terrorists from Pakistan.

Mr Kumar told News18 TV channel that his agency had completed its India leg of investigation and was waiting for Pakistan to allow its team to visit there to complete the investigations. "We are hopeful," he said when asked if Pakistan

would allow NIA to visit on the basis of reciprocity.

He was sure, however, that the charge-sheet in the terror case would be filed even if Pakistan did not give NIA access. "We have sufficient and stringent evidence against Maulana Masood Azhar and his brother Rauf Azhar and we will include those in our charge-sheet." he said.

When asked if he had found any evidence that Pakistani government agencies were aiding the terrorists to enter India and attack Pathankot, he said: "No. So far no evidence to show that Pakistan government or Pakistani government agency was helping Jaish or Masood Azhar or his aides carry out Pathankot attack."

In reply to a question, Mr Kumar said

so far his probe did not point to any inside help to terrorists in Pathankot. "If there were security lapses it was the government's concern. We are an investigating agency. We are investigating the case as a crime. We will not recommend any action for lapses or security breach."

Mr Kumar refused to comment on the role of Salwinder Singh, the Punjab Police SP, as accused or witness.

"At the time of filing charge-sheet we shall reveal what his status is. But at this point I don't want to give him a clean chit," he said.

The NIA probe had not found any narcotics angle to Salwinder Singh. "We searched his house. Sent sniffer dogs, but did not find any evidence to support these claims."

Waterfalls add to beauty of Shangla, Kohistan tourist sites

By Umar Bacha

SHANGLA: The northern areas of Pakistan are famous for their beautiful waterfalls, mostly located in Kohistan and Shangla districts.

About 100 waterfalls are located in Bisham, Shangla and upper Kohistan districts and most of them could be seen stretching along Indus River while travelling through the Karakoram Highway.

The large and charming waterfalls originating at 1,000 to 5,000 meters height and falling with a great speed attract large crowds. These are regarded as tourist spots and a large number of domestic and foreign tourists visit them. The tourists also enjoy seeing scenic waterfalls wherever they travel in Giligt-Baltistan and Hunza.

"The waterfall is really amazing to see besides enjoying cool winds and humming sounds," said Aksa Nauman, a member of a tourist family making snaps with a waterfall at Dassu.

She said that from Bisham to Chilas they had seen many beautiful waterfalls from their vehicle. She said that the Indus River flowing along Karakoram Highway also presents another scenic view.

Ashfaq Ahmed, a tourist from Lahore, said that he had only seen such beautiful waterfalls in movies, but today he enjoyed the panoramic view of the waterfall from atop and its roaring noise punctuated by chirping of birds.

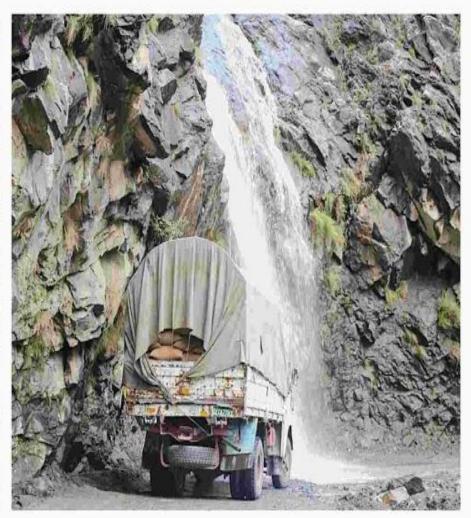
"The government could generate big revenue by developing these waterfalls into proper tourist spots in Shangla and Kohistan districts. There are no such facilities for tourists like hotels here," he said.

A foreign tourist, Adeen Kalam, told this correspondent that he enjoyed seeing natural scenery and the queue of waterfalls along the Karakoram Highway and Indus River besides the lush green mountains. However, he complained that the road from Dassu to Chilas was in a dilapidated condition and created difficulties for tourists.

"The government should take steps for providing facilities to tourists along the Karakoram Highway and ensure installing signboards to guide them about the tourist spots in Kohistan," he said.

When contacted, MPA Abdul Sattar Khan said that Kohistan was full of natural beauty; there are numerous waterfalls, springs, rare birds and many picturesque scenes in the valley.

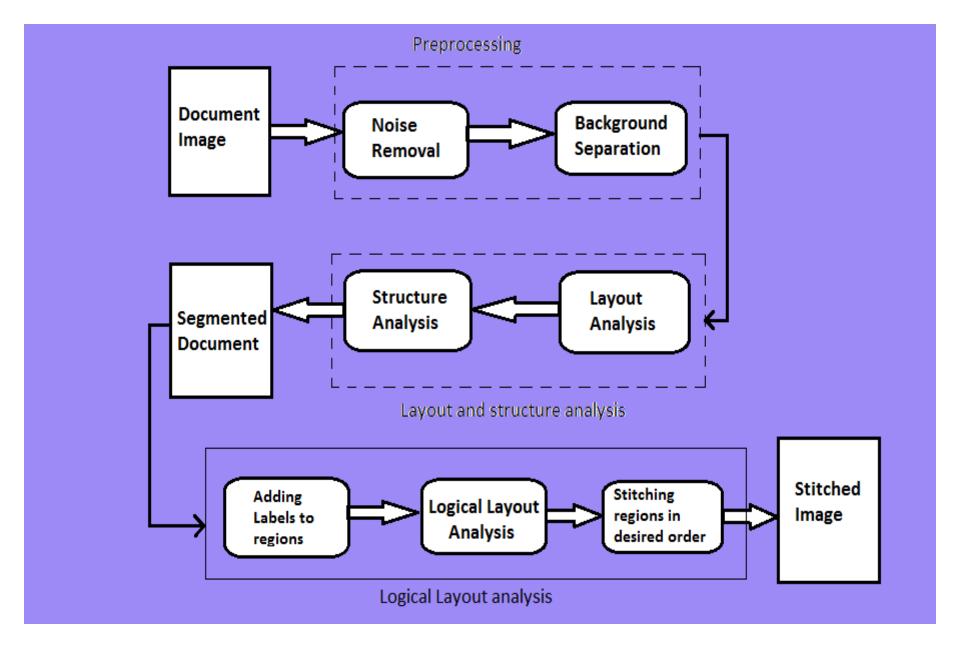
"We have a lot of natural resources, but unfortunately the area is still unexplored," he said and sought media's help to promote the tourist destinations of the area, especially the Suppat Valley.



A WATERFALL on Karakoram Highway.-Dawn

Block Diagram/Flow of Work

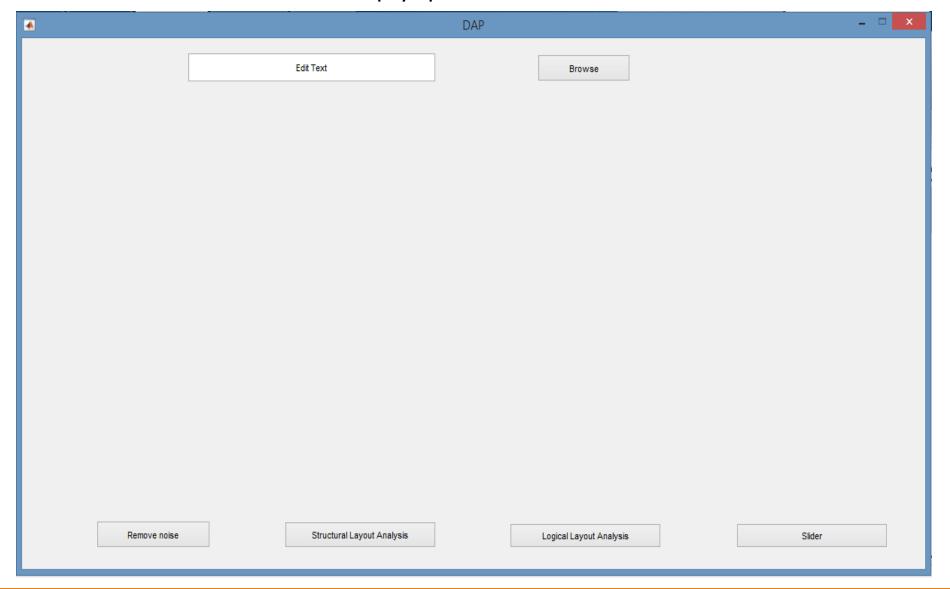
IN THIS SECTION WE DESCRIBED WITH THE HELP OF BLOCK DIAGRAM, THE PRINCIPLES WE STUDIED AND APPLY TO INPUT IMAGES TO ADDRESS THE MENTIONED PROBLEM.



GUI

IN THIS SECTION WE SHOW OUR GUI SO THAT VIEWERS CAN UNDERSTAND THE INTERACTION IN BETWEEN INPUT AND OUTPUT.

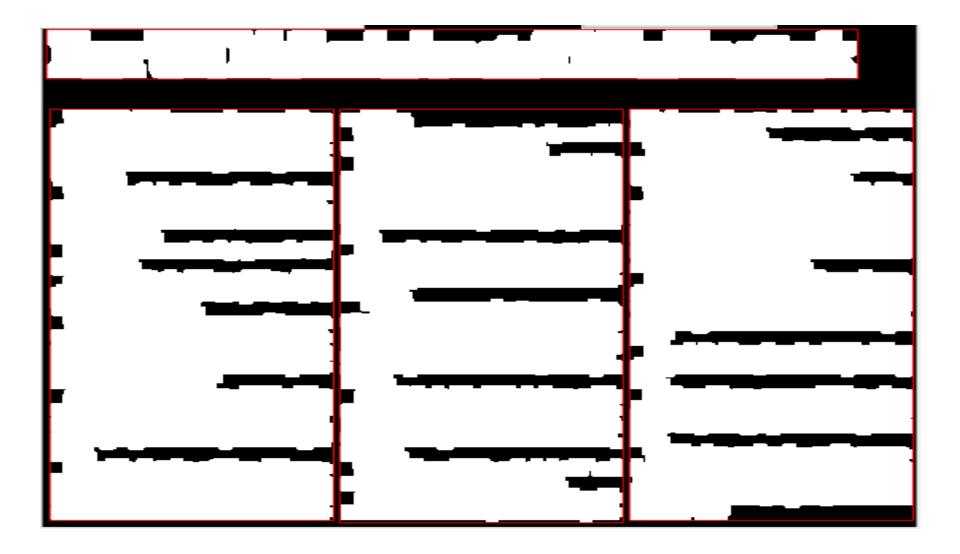
It's a simple GUI in which user have to browse the image for the processing. Results will be shown in the empty space in between.



Results

BEFORE GETTING INTO THE THEORETICAL/MATHEMATICAL DETAILS WE WILL SHOW VIEWERS SOME IMPORTANT RESULTS TO GRASP THE TECHNIQUES AND CONCEPTS.

Dilation (Structural layout)



Labelling (Logical Layout)

Four UN Mali mission staff killed in attack

head col

BAMAKO: A Chinese peacekeeper and three civilians working for the UN's Mali mission have become the latest casualties of the troubled outfit, the UN and China's foreign ministry said on Wednesday.

The last month alone has seen three attacks on members of the mission, known as MINUSMA, fuelling concern over its future with 65 killed in under three years.

It is the deadliest active deployment for UN peacekeepers.

Al Qaeda's North African affiliate AQIM claimed responsibility for Tuesday's attacks, the US monitoring SITE said.

The MINUSMA camp was targeted in a mortar or rocket attack on Tuesday night, a statement from the mission said, during which "a peacekeeper was killed and and three peacekeepers seriously wounded."

A second armed attack on a UN de-mining unit killed "two security guards and an international expert", said the same statement said, without giving the nationality of the foreigner killed.

It was "the first time a Chinese UN peacekeeper has been killed in the north," an African military source told AFP, adding that among the civilians killed one was French and the two oth-

col

ers Malian.

The three peacekeepers seriously wounded were all Chinese, the source added.

Five Togolese peacekeepers were killed in an ambush by unidentified gummen in central Mali on May 29, and five Chadians died on May 19 when their vehicle hit a landmine and then came under fire by Islamist group Ansar Dine.

Chinese foreign ministry spokeswoman Hua Chunying confirmed the dead peacekeeper was from China, and killed what she called a "terrorist attack".

"This is a grave and outrageous crime, China strongly condemns it, we call for the UN and Mali to carry out a thorough investigation and bring the perpetrators to justice," she told a press conference on Wednesday in Beijing.

Al Qaeda in the Islamic Maghreb meanwhile said that fighters from its "al-Murabitoun battalion engaged in a clash with 'crusader occupation forces'," referring to the UN mission in Mali, SUTE said.

The jihadists called it an "epic battle" and said they were "thrashing" the enemy.

Al-Murabitoun, led by one-eyed Algerian militant Mokhtar Belmokhtar, has claimed responsi-

col

bility for several spectacular and bloody attacks in sub-Saharan Africa.

The UN deployed belicopters to monitor the area and a rapid reaction force was patrolling Gao, MINUSMA said in its statement.

Mission chief Mahamat Saleh Annadif said he was "disgusted by these vicious, cowardly and totally unacceptable attacks," calling on the Malian government to track down the attackers and bring them to justice. "These crimes can no longer be tolerated," he added.

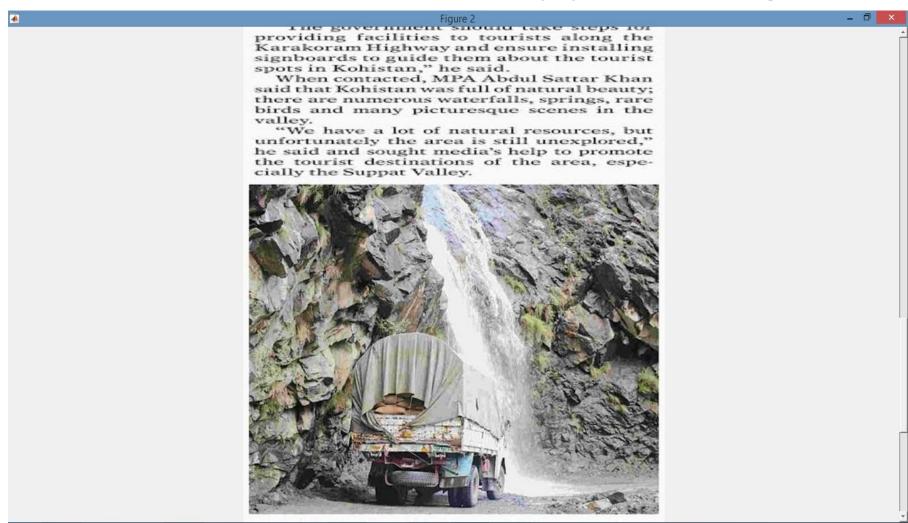
Mali's former colonial ruler France also condemned the attack and said it was "at the side of the Malian authorities and MINUSMA in their efforts to fight terrorism and usher in stability in Mali."

France's Barkhane force has 3,500 soldiers deployed across five Sahel countries, including Mali.

Mali's north has seen repeated violence since it fell under the control of Tuareg-led rebels who allied with jihadist groups linked to Al-Qaeda in 2012.

The Islamists were largely ousted by an ongoing French-led military operation launched in January 2013, but they have since carried out sporadic attacks on security forces from desert hideouts.—AFP

Concatenation of cropped images



Preprocessing

IN THIS SECTION WE DESCRIBED THE PREPROCESSING APPLIED ON INPUT IMAGES ALONG WITH NECESSARY MATLAB CODE.

Noise Removal (Halftone)



After applying median filter.



Aspect ratio

Waterfalls add to beauty of Shangla, Kohistan tourist sites

By Umar Bacha

SHANGLA: The northern areas of Pakistan are famous for their beautiful waterfalls, mostly located in Kohistan and Shangla districts.

About 100 waterfalls are located in Bisham, Shangla and upper Kohistan dis-tricts and most of them could be seen stretching along Indus River while travelling through the Karakoram Highway.

The large and charming waterfalls originating at 1,000 to 5,000 meters height and falling with a great speed attract large crowds. These are regarded as tourist spots and a large number of domestic and foreign tourists visit them. The tourists also enjo seeing scenic waterfalls wherever they travel in Giligt-Baltistan and Hunza.

"The waterfall is really amazing to see besides enjoying cool winds and humming sounds," said Aksa Nauman, a member of a tourist family making snaps with a waterfall

She said that from Bisham to Chilas they had seen many beautiful waterfalls from their vehicle. She said that the Indus River flowing along Karakoram Highway also presents another scenic view.

Ashfaq Ahmed, a tourist from Lahore, said that he had only seen such beautiful water-

falls in movies, but today he enjoyed the panoramic view of the waterfall from atop and its roaring noise punctuated by chirping

"The government could generate big revenue by developing these waterfalls into proper tourist spots in Shangla and Kohistan districts. There are no such facilities for tourists like hotels here," he said.

A foreign tourist, Adeen Kalam, told this correspondent that he enjoyed seeing natural scenery and the queue of waterfalls along the Karakoram Highway and Indus River besides the lush green mountains. However, he complained that the road from Dassu to Chilas was in a dilapidated condition and created difficulties for tourists.

"The government should take steps for providing facilities to tourists along the Karakoram Highway and ensure installing signboards to guide them about the tourist spots in Kohistan," he said.

When contacted, MPA Abdul Sattar Khan said that Kohistan was full of natural beauty; there are numerous waterfalls, springs, rare birds and many picturesque scenes in the

"We have a lot of natural resources, but unfortunately the area is still unexplored," he said and sought media's help to promote the tourist destinations of the area, espe cially the Suppat Valley.



A WATERFALL on Karakoram Highway.-Dawn

Waterfalls add to beauty of Shangla, Kohistan tourist sites

By Umar Bacha

SHANGLA: The northern areas of Pakistan are famous for their beautiful. Shangia districts.

Risham, Shangla and upper Richistan dis-teurists like hotels here," he said. tricts and most of them could be seen stretch- A foreign tourist, Adeen Kalam, told this through the Karakoram Highway.

and a large number of domestic and foreign - created difficulties for tourists. tourists visit them. The tourists also enjoy "The government should take steps for travel in Giliet-Baltistan and Hunca.

besides enjoying coal winds and humming spots in Kohistan," he said, sounds," said Aksa Nauman, a member of a When contacted, MPA Abdul Sartar Khan tourist family making snaps with a waterfull said that Kohistan was full of natural beauty: at Dassu.

had seen many beautiful waterfalls from valley their vehicle. She said that the Indus River "We have a lot of natural resources, but flowing along Karakoram Highway also pre-unfortunately the area is still unexplored," sents another scenic view.

that he had only seen such beautiful water- cally the Support Valley.

falls in movies, but today he enjoyed the panoranic view of the waterfall from atop and its rouring noise punctuated by thirping

"The government could generate big revwaterfalls, mostly located in Kehistan and emie by developing these waterfalls into proper tour st spots in Shangla and Kohistan About 100 waterfalls are located in districts. There are no such facilities for

ing along Indus River while travelling correspondent that he enjoyed seeing natural scenery and the queue of waterfalls along The large and charming waterfalls origithe Karakovam Highway and Indus River nating at 1,000 to 5,000 meters height and besides the lash green mountains. However, falling with a great speed attract large the complained that the road from Dassu to crowds. These are regarded as tourist spots. Chilas was in a dilapidated condition and

seeing scenic waterfalls wherever they providing facilities to tourists along the Karakoram Highway and ensure installing "The waterfall is really amazing to see signboards to guide them about the tourist

there are numerous waterfalls, springs, rare She said that from Bisham to Chilas they birds and many picturesque scenes in the

he said and sought media's help to promote Ashian Ahmed, atourist from Labore, said the tourist destinations of the area, espe-



A WATERFALL on Karakoram Highwax.-Dawn

After applying aspect ratio

Original image

Foreground detection

Threshold the image using graythresh function.

Waterfalls add to beauty of Shangla, Kohistan tourist sites

By Umar Bocha

SHANGEA: The nuclears areas of eithinks Pakistan sve famous for aben beschfal Seanth districts

Bisham, Shangla and upper Robisson dis — thurises like hotels boss;" he sais. taroadi the Karabean Highway.

and a large number of compact and burger - desired difficulties for tours as taxel in lishgolish star and Huna.

beades acrowns coal minds and huterans - sucts -: Konistan hie said. a Dasso.

ligg spen many legatiful waterfalls from mally. serts aucthors to ite view.

frat he had galy seen such beautiting water - loady the Suppot Valley.

falls in decise but today he enjoyed the penanymic view of the waterfall from atop and its maximum companions of by chimics

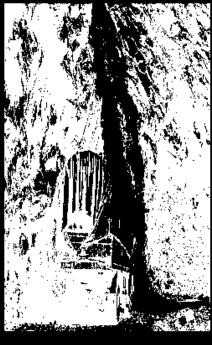
"The government could generate big revwaterfalls mustly located in Robinson and Lerus by developing these waterfalls into proper trout at sons in Shang a and Kohistan. About 100 waterfalls are beautiful at firstness Their act in such pelificies are

tricts and mean of them post of Seeseen stretch — A foreign counist, Adean, Kalam, Itali this ing along from Room while standing to respect that he showed society halo auseene yant teopiere of valurially along The large and channing waterfalls ong. The Karakoran Highway and Endus River nating at 1,000 to 5,000 meters height and - decides the both green proportions. However, falling with a great speed attent large the completed from the head from facts to crowdy Talest are recepted as four id spets. Childs was un a calcidated condition and

courises visit caers. The courses also enjoy — "The government should take maps for seeing scenic waterfalls whenever they providing facilities to countsts along the Karabeam Lithous and ensure in calling "The trotafall is really among to see a against date guide there about the course

sourcest said Alesa Vacman, a member of a When conserved, MPA Apolal Sotta: Khan thorist family making shaps with a waterfall — god that Kohistan was full of natural hearty; that are common waterfalls, sprices, rare She said that from Bellum to Chib's they is sinds and many picture-sque species in the

their repide. She said that the Indus Rives a ""We have a lot of patiers, respectes, but flowing along Kanderran Blighway also president constitution and is still order planel, resaid and single medals been to person Availagé hand, avoir a transfer federes said in the hourist destinations of the large, expe-



A WATERFALL on Karakorem Highway —Dawn

Algorithm Description

HERE WE DESCRIBES THE KEY STEPS OF ALGORITHM THAT WE USED FOR IMAGE SEGMENTATION AND/OR FEATURE EXTRACTION

- >Approach: Top-down
- Region segmentation: regionprops('BoundingBox').
- > Region classification: Text vs Image using OCR-based approach.
- Algorithm: X-Y cut (imcrop())
- Concatenation of images: cat(cell{ })

Step 1:

Background separation was done by thresholding and inverting the image.

Step 2:

Structural layout analysis is done by morphological operations.

Step 3:

Logical layout analysis is done by adding labels to the segmented image regions.

Textual and non-textual regions are separated by OCR.

Step 4:

Image stitching is then performed on the segments formed in the previous steps and are placed together vertically with a scrollbar on it.

Challenges and difficulties

1. Single Dilation applied in image doesn't work in all images. Especially the head part always need some extra dilation so that it make an unbreakable rectangle.



Solution:

We cropped out the upper portion in which head lies and applied a different structuring element. Put back the cropped part back in its position.



2. To make almost all images of same size.

Solution:

We used the aspect ratio property.

Here the width is fixed and according to that new height is calculated.

%Aspect Ratio

```
R=w/h;
newh=h*R;
img=imresize(img1,[newh 3075]);
```

3. To classify between column vs image.

Waterfalls add to beauty of Shangla, Kohistan tourist sites

head

By Umar Bacha

SHANGA: The nothern area of others. Pakista are larger for their beautist. "The government could generate higher warrially, mostly horsel in Linisten and come by developing these vaterfalls into Shark-Barin.

Bitum, Surgia and upper Litistan its - toxics file-bedding "he soft tricts and mest of them could be seen stooch- \$4 for size rouning, Achien Kalam, wild this Orough the Kamilmorn Highway.

and a large methors from state and longer, could difficult a formation. tourists visit them. The tourists also enjoy "The government should take steps for towin Gig Adren and from

leads mixing ool vints and hurning sorts in Boiston," he soil. torst halvesling superit a work). softer Kabagawa hill distand books.

had see many beautiful waterfulls into a vulley their peticle. See said that the balan Sixer - "Se how a set of natural resources, but fiving alog Karakaran Bighouyake pre-materiantals for one is still mentioned." sests another senie view.

finthe indonly sees such beautiful cases - cash the Super Valley.

falls in movies, but many he anjoyed the pacamic view of the vaterial from any and is recing occupant until by chiping

popertoura poca Soudina i krista. Abort 20 wantfully are located in districts. Then are no such facilities for

ing song Indo Roor while tradling consequent that be enjoyed seing natuni senevani ir mane dwarfalkaina The large and clumping waterfulls orgal- the Karolocus, Figitives and India River nating at 1,700 to 5,000 motors height and ill heights the larking term monetains. However, falling with a great good stract large. In compact of that the road from Descent crouds These are regarded as tourist opers. Chilas was in a fillipping condition and

solid sons weeds's where they mondra facilities in buries along the Kesisca Egiver indescriptuling "The sateful is only among a see signbank to pole themshow the tourist

the care numerous waterfuls, entity, ner-She said that from Richards Chilarday. Birth and many potamengan scenes in the

to said mit ought media's help to promote Addin Amel, mount from Laters, six: the point detractions of the coursespe-





A MATERIAL or Masician Hybras -- Oron

Solution:

We used OCR to distinguish between textual and non textual region.

Waterfalls add to beauty of Shangla, Kohistan tourist sites

By Umar Bacha

col

SEANGLA: The nothern areas of cilicis. Pakistan are famous for their bentiful worthly, notify board in Baltista and leave by developing these searchly into Standa districts.

Trium, Stangla and upper Kolistan dis tracists like books here," be said. time to Sankons Heise.

mis large number of consect and Sevice - cross dellicates for true sec tourists visit than. The tourists also miss. "The government should take stops for travel in Gdigo Bolts ton and Honza.

beades eriovate ood winds and humaing sapets in Louisten," he said. tourist innily making maps with a worrfull and the Kohistan was full of normal beauty, alsu.

bul soon many beautiful waterfalls from 20Hztheir whicle. She said that the ladus Einer susauther ciricvies.

that he had only seen such beneriful water cally the Sugar Valley.

falls in movies, but today he exicted the paranic view of the waterful from any adis nengone nucrassi n dirrit

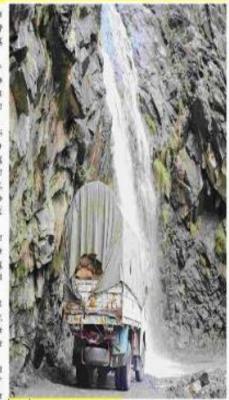
"The government oxidigeneous big revprograms one in Starg and Koistar About 100 vanerfuls are located in districts. Then are so such incibits for

trinsaninosof flemenful/bessenstrath - A forim vorist Aden Jahm, this tike ing along hales. From while travelling correspondent that he mayor being natual consumitioner of submilliolog The large and charming waterfalls origin the Taraboran Highway and Tables Diver mating at 1,000 to 5,000 meters beight and - breddes the hall green monocales. However, faling with a great speed attract large. To complain that the modifiess Design crowds. These are regarded as nourist spots. Citize was in a citized to different condition and

sering scanic waterfalls whenever they prevoling facilities to recrists along the Karabaca Bigbas cales on invalin "The waterful is really amoning to see significants to paid others about the correct

then are namonus waterfalls, springs, rare She said that from Richard to Chilas they - Sieles and many pictures are seened in the

"The have a lot of nature, necessity, but flowing along Karakoran Highway also pro-miter contributes over it still unexplosed," he said and smalle regials belon to geometre Addresidated a transit from Labore, said the transit destructions of the area, eag-



A VATERFALL on Kataker and Highway — Dates

Learning and Achievements

IN THIS SECTION WE DESCRIBE THE THINGS THAT MAKES US FEEL THAT WE HAVE LEARNED, WE DID SOMETHING NEW, WE DID SOMETHING THAT IS DIFFERENT AND THUS WE SHOULD GET FULL MARKS OR EVEN WE DESERVES BONUS MARKS.

- We tried to build a document understanding system, something we never heard and thought of before this course.
- We have learned the basics of physical and logical layout of a newspaper.
- We can crop the region of interest and put it back in their original position after applying some processing in order to work partially on that image.
- Also, we can reduce the time of processing by making it efficient.
- How to deal with different types of images.
- Learned to code on MATLAB.

Improvements and future work

IN THIS SECTION WE MENTION THE TASKS THAT ARE STILL UNRESOLVED. THE EXCEPTIONAL CASES WHERE STILL IMPROVEMENT IS NEEDED. WE ALSO MENTION THE APPLICATIONS THAT CAN BUILD ON TOP OF OUR CURRENT WORK.

Improvement

 There is need of tuning limits of bounding box for further sub divisions like sub-heading, line, word etc.

 Also, a more efficient approach could be applied for concatenation of images so that the cropped images of different size would not matter in the future. Images with small width can't have a proper dilation, they merge into each other.

Unelected African chiefs make their countries more democratic

By Kate Baldwin

BN April, a traditional chief cressell a stir in Ghena when he sugmented support the the incurrient president, John-Mahama, in the country's specialog peridential station. The same meant, two drons chiefs from mathem. Zarrhia allegedly endoesed the ordiscisse of the Zarrhian president, Edgar Longo.

More rural Africans flow in cammunities for by undersoft multificent closels, and traditional localesration and the multificent in African electrons. How democratic care countries results be if citizens onvit Il guarante by undersoft closels. On the parvert the democratic process to constituy voters into supporting their posterroot constituy voters into supporting their posterroot considerate.

These questions gard sated the concarch released in my new book, The Paradon of Traditional Chiefe in Democratic Africa.

Traditional chiefs have power by virtue of their



TWO decen chiefs from northern Zambia alagadly enclosed the re-election of the Zambian gresident. Edger Lungs.

nonclarities with community common. They are represently selected from within local rading families and rule for life, an arma otherway are concerned that their conclosed power undertaines despectacy.

But I find that traditional chiefs efrom improve, rather than form, demonstrate representation. Arizon others are uniquely positioned to get policymelates to impred to rural system — not despite being unspected, but because of it.

This mognitude claim makes more some in light of a few flars above A frican position. First, most read voters want their elected representatives to deliver basic infrastructure and guidale sorvices. They demand schools, bealth claims, bereloides and reads for their communities. Second, most African governments are weak. Their administration presence and power are limited, especially in rural areas. Their bedans now right. On their even, they are not very good an governing that power that water, water.

Estre traditional chiefs. They can fill the gaps in the procuse of translating venurs' priorities into perects on the ground.

Specifically, chiefs often Jobby for government perpets and organise community correlations that complement government investment. Chiefs can organise local vulnement in satisf with construction projects or meeting the activities of communities. With these officers, many local projects succeed. In this seem, characteristic projects succeed. In this seem, characteristic projects with supported.

But why are chiefs uniquely able to overdinate communities to demand and facilitate local projects? Why cas't decred councillers or members of parliament do this moeffest/boby?

Testificad chiefs regionly have stronger both level institution that there can tue to regardie reflective commentity action. Does have networks of subdicide and willage benefitses to help them melitims will age, and they was institution of over systems that can stronger are supported by the complete of the can show no compensation and opposite them.

As unrelected leaders, cliefs have little political incurries to act in the interest of the majorist. Ho boad chiefs after have strong economic and social ties that align their interests with their communities. Chiefs to benefit from boad development projects, so they make affaire to broker them even with our abouteral forcemities.

Furthermore, maditional chiefs have stronger local-land institutions than chered pollutions in part because they on think further about from the same discrime. China are willing to enale large-term investments in building and maintaining contrastity institutions because they expect to reads for life. Electral publicitions seems at likely so the thic. Their termore in office is more precedites and they are loss likely to reap the large-term remarks.

Puradocically, democratic representation works better through unclosted local leaders in rural Africa.

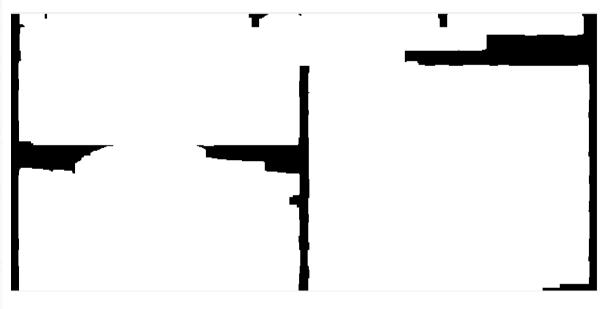
Because they are so central in local development, projects, chiefs' political endescencent can also be constructive. A chief can more offsectively liably for manusces and collaborate with the government of his (or, must), their preferred candidate is also not. Visters may wout to know that of the professed conditates so they can also it the politicas after will and an everying them been, so I argued in this article.

My book is full of evidence that chiefs can make descountly governments more respective to rural ammunities, drawing especially on the case of Zantku. For immune, after their die ben before see leaders step in, lesses one editorsom and leacheler get built. Communities receive more charreons and road rehabilitation projects when their have stronger relativistics projects when their have stronger relativistics projects only an their chiefs endocements to usees which political candidate with the control of their community.

Traditional elisels should not be remainiscised, they are just as soli-interested as elected politicisms. But, in Artical Folgilia, electron cacies, their ellient are far used constructive in helping of cital pullations serve need constituents than observed on the assume.

-By arrangement with The Washington Post





References

- 1. https://cvit.iiit.ac.in/papers/DocStructure.pdf
- 2. http://www.mathworks.com/
- 3. http://stackoverflow.com/

Demo and Queries

34