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СОДЕРЖАНИЕ

CONTENT

НОВЫЕ ПЕДАГОГИЧЕСКИЕ ТЕХНОЛОГИИ	NEW PEDAGOGICAL TECHNOLOGIES
Махсудов В.Г., Яхшибоев Р.Э., Бобожонов Б.О., Латипова К.Д., Зупаров И.Б. АВТОМАТИЧЕСКОЕ ОПРЕДЕЛЕНИЕ ТЕКСТА С ПОМОЩЬЮ МОРФОЛОГИЧЕСКИХ ОПЕРАЦИЙ И РИСОВАНИЯ	Makhsudov V.G., Yaxshiboyev R.E., Bobojonov B.O., Latipova K.D., Zuparov I.B. AUTOMATIC TEXT DETECTION USING MORPHOLOGICAL OPERATIONS AND INPAINTING 8
ОБЗОРЫ	REVIEWS
Абдуллажанов Б.Р., Девяттов А.В., Нишанов М.Ф., Рахманов Б.Б. ОСОБЕННОСТИ БИОСОВМЕСТИМОСТИ И ЭФФЕКТИВНОСТИ ФИЛЬТРОВ ДЛЯ ГИПЕРБАРИЧЕСКОЙ ПЛАЗМОСОРБЦИИ	Abdullajanov B.R., Devyatov A.V., Nishanov M.F., Rakhmanov B.B. FEATURES OF BIOCOMPATIBILITY AND EFFICIENCY OF FILTERS FOR HYPERBARIC PLASMA SORPTION 12
Алибоев М.Р., Нишанов М.Ф., Ботиров А.К., Абдуллажонов Б.Р., Ахмадбеков Б.О. НЕКОТОРЫЕ ВОПРОСЫ ЭТИОЛОГИИ И ПАТОГЕНЕЗА ДИФУЗНО-ТОКСИЧЕСКОГО ЗОБА	Aliboev M.R., Nishanov M.F., Botirov A.K., Abdullajonov B.R., Akhmadbekov B.O. SOME QUESTIONS ABOUT THE ETIOLOGY AND PATHOGENESIS OF DIFFUSE-TOXIC GOITER 16
Ахмедов Р.Ф., Карабаев Х.К., Мухаммадиев М.Х. СОВРЕМЕННОЕ СОСТОЯНИЕ ПРОФИЛАКТИКИ И ИНТЕНСИВНОЙ ТЕРАПИИ ОЖОГОВОГО СЕПСИСА	Akhmedov R.F., Karabayev Kh.K., Mukhammadiev M.Kh. CURRENT STATE OF PREVENTION AND INTENSIVE THERAPY OF BURN SEPSIS 20
Дусматов Ж.Э., Махкамова Ф.Т. СОВРЕМЕННЫЕ ПРИНЦИПЫ ПРОТЕЗИРОВАНИЯ НА ИМПЛАНТАТАХ	Dusmatov J.E., Makhkamova F.T. MODERN PRINCIPLES OF PROSTHETICS ON IMPLANTS 26
Икрамова М.Д., Муминова З.А., Аюпова Д.А. РАЗЛИЧНЫЕ ВИДЫ КОРРЕКЦИИ ИСТМИКО-ЦЕРВИКАЛЬНОЙ НЕДОСТАТОЧНОСТИ	Ikramova M.D., Muminova Z.A., Ayupova D.A. VARIOUS TYPES OF CORRECTION OF ISTHMIC-CERVICAL INSUFFICIENCY 32
Исмаилов С.И., Мухтарова М.З., Юлдашев О.С. КОМПЛЕКСНОЙ ПОДХОД К ЛЕЧЕНИЮ МАСТОПАТИИ	Ismailov S.I., Mukhtarova M.Z., Yuldashev O. S. AN INTEGRATED APPROACH TO THE TREATMENT OF MASTOPATHY 36
Каримов А.А., Арипходжаев Ф.З., Асилова С.У., Мирзаев А.Б., Саломов М.Б. ДИСПЛАСТИЧЕСКИЙ СПОНДИЛОЛИСТЕЗ: СОВРЕМЕННЫЕ АСПЕКТЫ ХИРУРГИЧЕСКОГО ЛЕЧЕНИЯ	Karimov A.A., Ariphodjaev F.Z., Asilova S.U., Mirzaev A.B., Salomov M.B. DYSPLASTIC SPONDYLOLISTHESIS: MODERN ASPECTS OF SURGICAL TREATMENT 43
Каюмов А.А. К ВОПРОСУ ДИАГНОСТИКИ И ЛЕЧЕНИЯ КИСТОЗНЫХ ПОРАЖЕНИЙ ПОЧКИ	Kayumov A.A. ON THE DIAGNOSIS AND TREATMENT OF CYSTIC KIDNEY LESIONS 47
Мамасалиев Н.С., Юсупова Ш.К., Мухамедова В.М., Сапиохунова Х.М., Бекташев И.Б. ЭПИДЕМИОЛОГИЯ И ПУТИ РАЗВИТИЯ ПРОФИЛАКТИЧЕСКОГО НАПРАВЛЕНИЯ В ДИАБЕТОЛОГИИ. СООБЩЕНИЕ 3: САХАРНЫЙ ДИАБЕТ ПРИ КОМОРБИДНОСТИ	Mamasaliev N.S., Yusupova Sh.K., Mukhamedova V.M., Sapiohunova Kh.M., Bektashev I.B. EPIDEMIOLOGY AND WAYS OF DEVELOPMENT OF THE PREVENTIVE DIRECTION IN DIABETOLOGY. MESSAGE 3: DIABETES MELLITUS IN COMORBIDITY 53
Муратова Н.Ю., Абдуллаев Ш.Ю. ПРОБЛЕМА ОСТЕОИНТЕГРАЦИИ НА ГРАНИЦЕ КОСТЬ-ИМПЛАНТАТ В ЧЕЛЮСТНО-ЛИЦЕВОЙ ХИРУРГИИ	Muratova N.Yu., Abdullaev Sh.Yu. THE PROBLEM OF OSTEOINTEGRATION AT THE BONE-IMPLANT BORDER IN MAXILLOFACIAL SURGERY 58
Муртазаев С.С., Кучкарова М.К., Кодирова М.Т., Хасанов Ф.К. ФАСНАЯ ТЕЛЕРЕНТГЕНОГРАММА КАК МЕТОД ОБСЛЕДОВАНИЯ БОЛЬНЫХ С ЗУБОЧЕЛЮСТНЫМИ АНОМАЛИЯМИ	Murtazaev S.S., Kuchkarova M.K., Kodirova M.T., Khasanov F.K. FRONTAL TELEROENTGENOGRAM AS A METHOD OF EXAMINATION OF PATIENTS WITH DENTOALVEOLAR ANOMALIES 63
Нишанов М.Ф., Абдуллажонов Б.Р., Хожиметов Д.Ш., Носиров М.М., Хабибуллаев А.П. СОВРЕМЕННЫЙ ВЗГЛЯД НА КРОВОТЕЧЕНИЕ ИЗ ВАРИКОЗНО РАСШИРЕННЫХ ВЕН ПИЩЕВОДА	Nishanov M.F., Abdullajonov B.R., Khojmetov D.Sh., Nosirov M.M., Khabibullaev A.P. A MODERN LOOK ON BLEEDING FROM VARICOSIS OF THE ESOPHAGUS 72

AUTOMATIC TEXT DETECTION USING MORPHOLOGICAL OPERATIONS AND INPAINTING

Makhsudov V.G., Yaxshiboyev R.E., Bobojonov B.O., Latipova K.D., Zuparov I.B.

АВТОМАТИЧЕСКОЕ ОПРЕДЕЛЕНИЕ ТЕКСТА С ПОМОЩЬЮ МОРФОЛОГИЧЕСКИХ ОПЕРАЦИЙ И РИСОВАНИЯ

Махсудов В.Г., Яхшибоев Р.Э., Бобожонов Б.О., Латипова К.Д., Зупаров И.Б.

МОРФОЛОГИК ОПЕРАЦИЯЛАРНИ РАНГСИЗЛАНТИРИШ ЁРДАМИДА МАТННИ АВТОМАТИК АНИҚЛАШ

Махсудов В.Г., Яхшибоев Р.Э., Бобожонов Б.О., Латипова К.Д., Зупаров И.Б.

Tashkent Medical Academy

Восстановление изображения – это процесс восстановления потерянных или поврежденных участков или незаметного изменения содержимого изображения. Описана техника для обнаружения и удаления текста с изображений. Система обнаруживает текст с помощью морфологических операций, маркировки связанных компонентов и набора критериев выбора, который помогает отфильтровать нетекстовые области. Рисование текста выполняется в два этапа: на первом этапе текстовая область определяется автоматически, без взаимодействия с пользователем, на втором этапе текст удаляется с изображения с использованием алгоритма живопись на основе образца.

Ключевые слова: обнаружение текста, рисование, морфологические операции, маркировка подключенных компонентов.

Тасвирни қайта тиклаш – тасвирнинг атрофидаги бузилган ҳудудларини қайта тиклаш ёки расм таркибини сезилмас даражада ўзгартириш жараёнига эътибор қаратилган. Бу визуал киришнинг белгиланган ҳудудида этишмаётган маълумотларни тўлдириш жараёнини англатади. Ушбу мақолада тақдим этилган техник тасвирлардан матнни аниқлаш ва уни олиб ташлашга қаратилган. Тизим матнни морфологик операциялар, уланган компонент ёрлиғи ва матнли бўлмаган ҳудудларни филтрлашга ёрдам берадиган танлов мезонлари аниқланади. Шундай қилиб, натижада олинган расм - бу фақат матнли тасвирдан иборат бўлади. Матнни бўйш икки босқичда амалга оширилади. Биринчи қадам матнли ҳудудни автоматик равишда фойдаланувчи таъсирсиз амалга оширилади, иккинчи босқичда эса матнни ажратиб олади. Расомлик алгоритми ёрдамида матнни расмдан тезда ўчириш амаллари бажарилади.

Калит сўзлар: матнни аниқлаш, бўйш, морфологик операциялар, боғланган компонентлар ёрлиғи.

Image in painting is a method for repairing damaged pictures or removing unnecessary elements from pictures. It recovers the missing or corrupted parts of an image so that the reconstructed image looks natural. In real world, many people need a system to recover damaged photographs, designs, drawings, artworks etc. damage may be due to various reasons like scratches, overlaid text or graphics etc. This system could enhance and return a good looking photograph using a technique called image in painting. Image in painting modify and fill the missing area in an image in an undetectable way, by an observer not familiar with the original image. The technique can be used to reconstruct image damage due to dirt, scratches, overlaid text etc. Some images contain mixed text-picture-graphic regions in which text characters are printed in an image. Detecting and recognizing these characters can be very important, and removing these is important in the context of removing indirect advertisements, and for aesthetic reasons. There are many applications of image in painting ranging from restoration of photographs, films, removal of occlusions such as text, subtitle, logos, stamps, scratches, red eye removal etc. Paper is organized as follows. Section II describes automatic text detection using morphological operations, connected component analysis and set of selection or rejection criteria. The flow

diagram represents the step of the algorithm. After detection of text, how text region is filled using an inpainting technique that is given in Section III. Section IV presents experimental results showing results of images tested. Finally, Section V presents conclusion.

Related work

The concept of image inpainting was first introduced by Bertamio et al. [1]. The method was inspired by the real inpainting process of artists. The image smoothness information interpolated by the image Laplacian is propagated along the isophotes directions, which are estimated by the gradient of image rotated by 90 degrees. Exemplar Based method proposed by Criminisi et al. [4] used a best exemplar patch to propagate target patch including missing pixels. This technique uses an approach which combine structure propagation with texture synthesis and hence produced very good results. In [2], the authors decompose the image into sum of two functions and then reconstruct each function separately with structure and texture filling-in algorithms. Morphological technique is used to extract text from the images presented in [11]. In [5], the inpainting technique is combined with the techniques of finding text in images and a simple algorithm that links them. The technique is insensitive to noise, skew and text orientation[6]. The authors in [3] have applied the CCL

(connected component labelling) to detect the text and fast marching algorithm is used for Inpainting [7].

The work in this paper is divided in two stages. 1) Text-Detection 2) Inpainting [8,9]. Text detection is done by applying morphological open-close and close-open filters and combines the images [10]. Thereafter, gradient is applied to detect the edges followed by thresholding and morphological dilation, erosion operation. Then, connected component labelling is performed to label each object separately. Finally, the set of selection criteria is applied to filter out non text regions. After text detection, text inpainting is accomplished by using exemplar based Inpainting algorithm.

Methodology

Exemplar based Inpainting technique is used for inpainting of text regions, which takes structure synthesis and texture synthesis together. The inpainting is done in such a manner, that it fills the damaged region or holes in an image, with surrounding colour and texture. The al-

gorithm is based on patch based filling procedure. First find target region using mask image and then find boundary of target region. For all the boundary points it defined patch and find the priority of these patches. It starts filling the target region from the highest priority patch by finding the best match patch. This procedure is repeated until entire target region is inpainted. The algorithm automatically generates mask image without user interaction that contains only text regions to be inpainted.

Experimental results

Figures shows the results of text detection from an image and inpainting by using exemplar based Inpainting algorithm. Figs. 1, 2, 3 (a) shows the original image. (b) is the image obtained by applying first set of criteria. All objects whose area greater than 10000 and filled area greater than 8000 are eliminated and major axis lengths are in between 20 to 3000 are considered to be text. Still, some small non-text objects are detected.

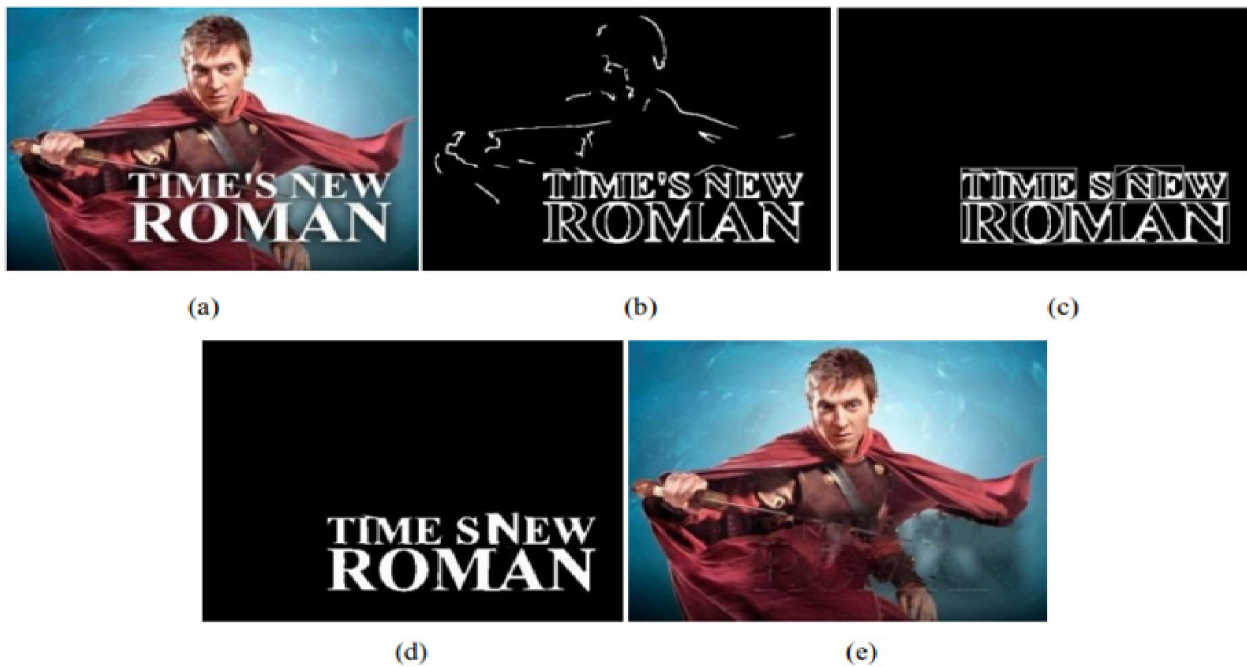
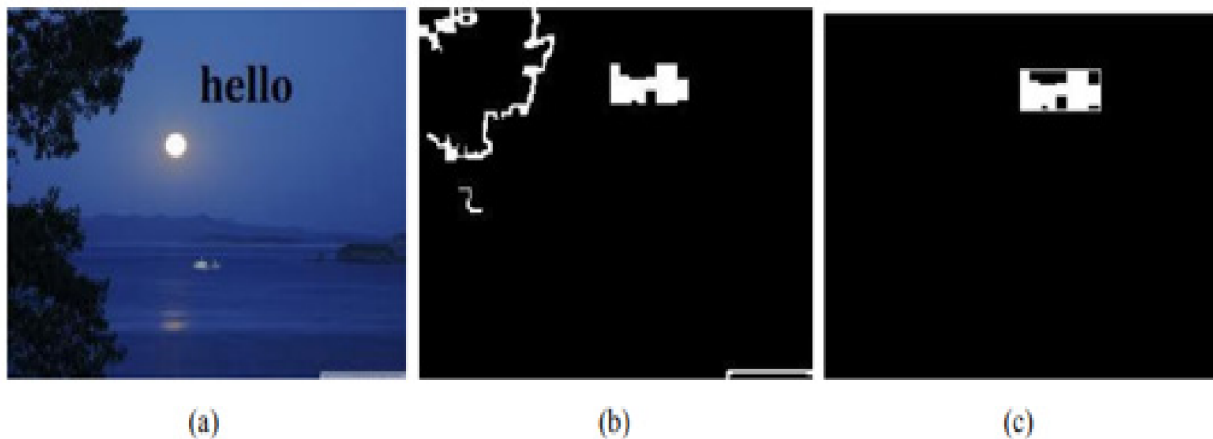
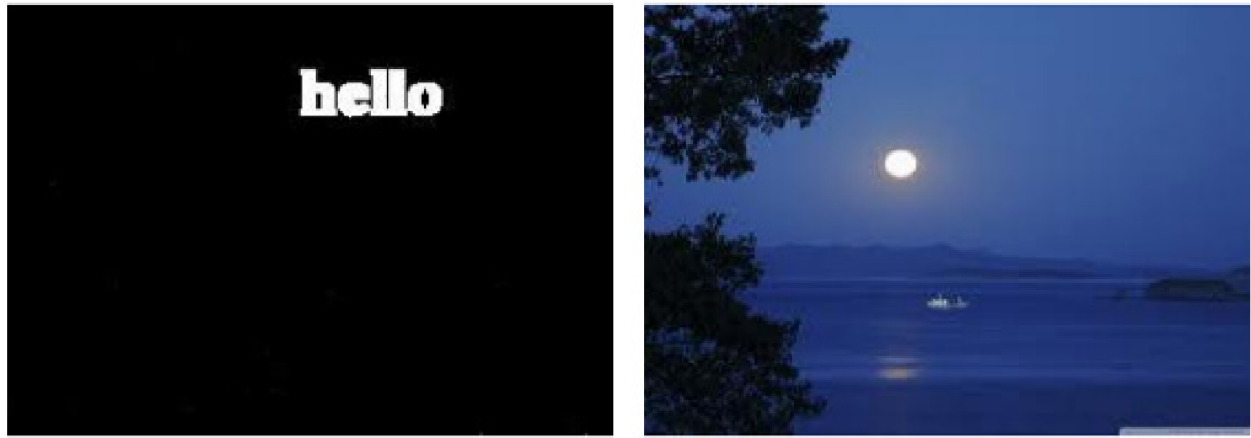


Fig. 1. Text Detection and Inpainting (a). Original image (b). Image after applying first set of criteria (c). Image after applying second set of criteria (d). Image mask (e). Inpainted image using patch size 4x4 and search window size 81x81.





(d)

(e)

Fig. 2. Text Detection and Inpainting (a). Original image (b). Image after applying first set of criteria (c). Image after applying second set of criteria (d). Image mask (e). Inpainted image using patch size 5x5 and search window size 81x81.



(a)

(b)

(c)



(d)



(e)

Fig. 3. Text Detection and Inpainting (a). Original image (b). Image after applying first set of criteria (c). Image after applying second set of criteria (d). Image mask (e). Inpainted image using patch size 5x5 and search window size 81x81.

To eliminate small objects, connected component labelling is applied to the resultant image (c) represents text detection by applying second set of criteria which eliminates all the objects whose area is less than 300 and filled area is less than 500.

Conclusion

We have implemented an automatic text detection technique from an image for Inpainting. Our algorithm successfully detects the text region from the image which consists of mixed text-picture-graphic regions. We have applied our algorithm on many images and found that it successfully detect the text region.

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AUTOMATIC TEXT DETECTION USING MORPHOLOGICAL OPERATIONS AND INPAINTING

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Image inpainting is the process of restoring the lost or damaged regions or modifying the image contents imperceptibly. It refers to the process of filling-in missing data in a designated region of the visual input. In this paper, the technique presented is for detection and removal of text from images. The system detects text using morphological operations, connected component labelling and a set of selection criteria which helps to filter out non text regions. So, the resultant image is the image with only texts. Text Inpainting is done in two steps. The first step detects the text region automatically, without user interaction and in the second step; the text is removed from the image using exemplar based Inpainting algorithm.

Key words: Text detection, Inpainting, Morphological operations, Connected component labelling.

