

Izveštaj – Izdvajanje teksta

Zadata je grupa slika smanjenog kvaliteta, sa različitim nedostacima: smanjena vidljivost teksta, senka u pozadini i to na različitim delovima slike, senka neujednačene svetlosti. Za potrebe podizanja kvaliteta zadatih slika bilo je potrebno ukloniti senke, izoštriti slova i povećati vidljivost i oštrinu slova.

Prvo je učitana slika koja na sebi ima senku, a zatim izvršena funkcije `removing_shadow`, `sharpen_image` i na kraju funkcija `thicken_text`. Početne slike:

Prva slika

Druga slika

Treća slika

Četvrta slika

Typical results are shown in Figure 2 and Figure 3. For RCRR, it seems to have some difficulty enhancing images in underexposed and overexposed regions. The luminance in the darker regions is insufficient and unnatural, and halo artifacts are introduced which caused bigger Sd. For the original ALMF, it is easy to brighten overexposed regions, but it is easy to lose information in highlight regions to have the "bleeding out" artifact and enlarge the block effect. However, the proposed method possesses more details with high visual quality in uniform lighting conditions than ALMF. Just as discussed in [6], the histogram shows the characteristics of the image. The visibility should be preserved before and after LR. Figure 4 shows that the shadow region in the original image shifts to the better luminance range, and the sky region almost changed, for more displayed results, the proposed method restores local details and global contrast. Especially for degraded images in format of jpg, our method does not amplify the block effect badly. Besides the subjective situation, values of objective standards are listed in Table 1.

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Za uklanjanje senke sa slike korišćena je metoda closure-by-reconstruction. Metodu implementiramo (koristimo) u funkciji `removing-shadow`. Kao rezultat, na kraju, ova funkcija vraća sliku bez senke. Prvo, što ova funkcija radi je da početnu sliku, koja je argument funkcije, pretvara u gray scale sliku. Zatim se na gray scale sliku primenjuje filter – Gaussian Blur kako bismo smanjili šum na slici. Na dobijenu sliku primenjujemo adaptivni threshold. Slika dobijena kao primer ima drugaciji gradijent senki u različitim delovima. Zbog toga običan threshold ili Otsu threshold nisu primenljivi. I običan threshold i Otsu threshold imaju definisan parametar (threshold), koji se ne menja, isti je za svaki deo slike, dok adaptivni threshold prilagođava parametar u zavisnosti od dela slike na koji se primenjuje. Da bi poboljšali vidljivost na slici, uvodimo morfološke operacije, za koje pravimo kernel. Koristimo morfološko zatvaranje (closing), kako bi udružili razdvojene delove slova, koje smo izgubili pri uklanjanju senke. Slike nakon uklanjanja senke:

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Kako bi dobili izoštrana slova na slici, uvodimo funkciju `sharpen_image` koju koristimo za izoštravanje slike. Prvo uklanjamo šum sa slike uz pomoć Gaussian Blur filtera. Sliku dalje pripremamo korišćenjem Open CV funkcije, `filter2D`. Za njeno korišćenje uvodimo kernel – Laplacianov kernel. Kao rezultat, na kraju ove funkcije dobijamo izoštrenu, čitljivu sliku. Slike nakon izoštravanja:

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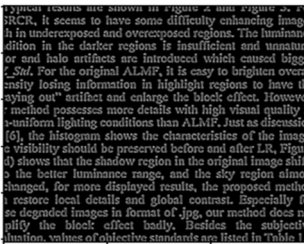
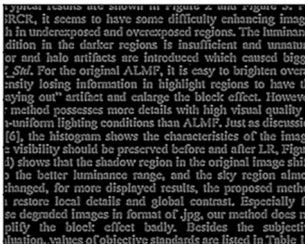
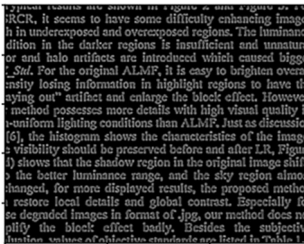
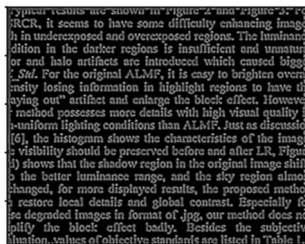
Da bi dodatno poboljšali vidljivost teksta na datom primeru slike, koristimo funkciju `thicken_text`, koja podebljava slova. Upotreba funkcije `sharpen_image`, je umanjila debljinu samih slova na slici, tako da je sledeći korak u dobijanju slike bez senki u pozadini i čitljivih slova omogućeno upotrebom diletacije u `thicken_text` funkciji. Slike nakon podebljavanja slova:

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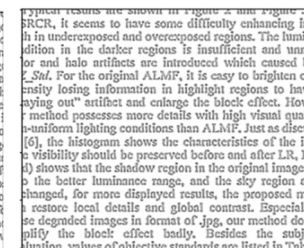
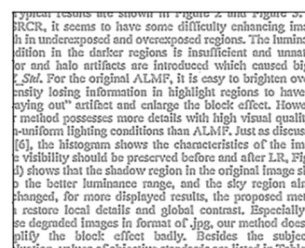
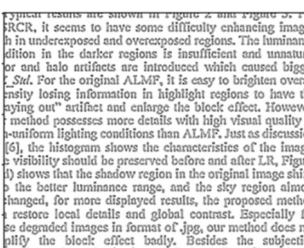
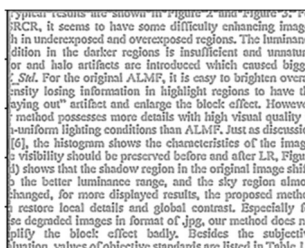
Krajnji rezultati posle inwertovanja slike, tj. nakon što sve crne piksele pretvorimo u bele i sve bele piksele pretvorimo u crne dobijamo sledeće slike:

Prva slika

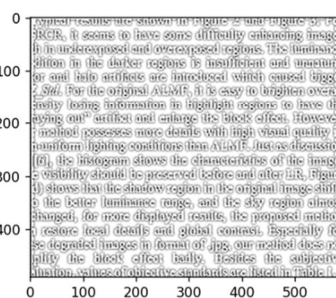
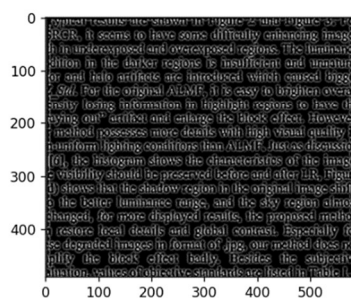
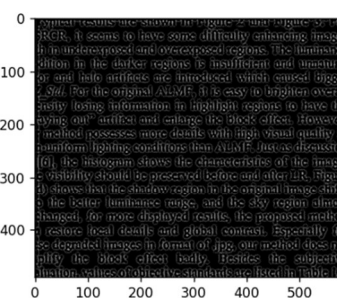
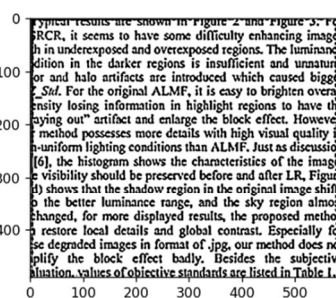
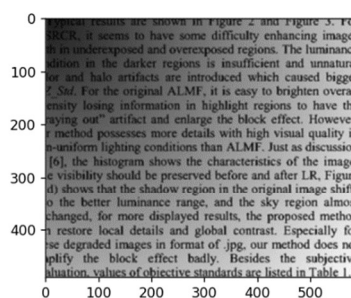
Druga slika

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Napomena za kraj: na kraju funkcije `removing_shadow` korišćena je funkcija `bitwise_not` kako bi crne piksele pretvorili u bele i obrnuto. Da ova funkcija nije uvedena, koraci u izvršavanju koda bi imali sledeći izgled:



U toku izrade samog projekta, trebalo je isprobati različite funkcije, isprobati različite parametre, da bi se došlo do optimalne verzije koja poboljšava kvalitet dobijenih slika. Sam kod je testiran i na drugim slikama, da bi se dobila tačna predstava o tome kako se koja funkcija ponaša za zadate parametre.