O‘ZBEKISTON RESPUBLIKASI OLIY TA’LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETINING JIZZAX FILIALI

ZAMONAVIY INNOVATSION TADQIQOTLARNING DOLZARB MUAMMOLARI VA RIVOJLANISH TENDENSIYALARI: YECHIMLAR VA ISTIQBOLLAR

mavzusidagi Respublika ilmiy-texnik anjuman materiallari to‘plami

(2024-yil 17-18-may)

(2-qism)

JIZZAX-2024

“Zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari: yechimlar va istiqbollar” mavzusidagi Respublika ilmiy-texnik anjuman materiallari to‘plami – Jizzax: O‘zMU Jizzax filiali, 2024-yil 17-18-may. 461-bet.

Respublika miqyosidagi ilmiy-texnik anjuman materiallarida zamonaviy innovatsion tadqiqotlarning dolzarb muammolari va rivojlanish tendensiyalari sohasidagi innovatsion tadqiqotlar aks etgan.

Globallashuv sharoitida davlatimizni yanada barqaror va jadal sur’atlar bilan rivojlantirish bo‘yicha amalga oshirilayotgan islohotlar samarasini yaxshilash sohasidagi ilmiy-tadqiqot ishlariga alohida e’tibor qaratilgan. Zero iqtisodiyotning, ijtimoiy sohalarni qamrab olgan modernizatsiya jarayonlari, hayotning barcha sohalarini liberallashtirishni talab qilmoqda.

Ushbu ilmiy ma’ruza tezislari to‘plamida mamlakatimiz va xorijlik turli yo‘nalishlarda faoliyat olib borayotgan mutaxassislar, olimlar, professor-o‘qituvchilar, ilmiy tadqiqot institutlari va markazlarining ilmiy xodimlari, tadqiqotchilari, magistr va talabalarning ilmiy-tadqiqot ishlari natijalari mujassamlashgan.

Mas’ul muharrirlar: DSc.prof. Turakulov O.X., PhD. O‘ralov A.I.

Tahrir hay’ati a’zolari: p.f.d.(DSc), prof. Turakulov O.X., b.f.f.d. (PhD) O‘ralov A.I., t.f.f.d.(PhD), dotsent Abdumalikov A.A., t.f.n., dots. Baboyev A.M., t.f.f.d.(PhD), dots. Abduraxmanov R.A., p.f.f.d.(PhD) Eshankulov B.S., p.f.n., dots. Alimov N.N., p.f.f.d.(PhD), dotsent Alibayev S.X., p.f.f.d. (PhD) Halimov O‘.H., p.f.f.d.(PhD), dotsent Karshiyev A.A., f.f.f.d.(PhD), dotsent Sindorov L.K., t.f.f.d. (PhD), dotsent Nasirov B.U., b.f.f.d. (PhD), dotsent Mustafaqulov M.A., f.f.f.d. (PhD) Alibekov D.A.., f-m.f.f.d. (PhD) Sharipov X.F., ps.f.f.d.(PhD) Norbekova B.Sh., i.f.n., dots. Tsoy M.P., Qayumov O.A., Jo‘rayev M.M.

Mazkur to‘plamga kiritilgan ma’ruza tezislarining mazmuni, undagi statistik ma’lumotlar va me’yoriy hujjatlarning to‘g‘riligi hamda tanqidiy fikr-mulohazalar, keltirilgan takliflarga mualliflarning o‘zlari mas’uldirlar.

1. “Head First Программирование для Android” - Griffits Devid, Griffits Don (2-e izdanie, 2018)
2. Nasriddinovich, Ulashev Asrorjon, and Ulashev Abror Nasriddinovich. "GORIZONTGA BURCHAK OSTIDA OTILGAN JISM HARAKATI VA DASTURIY TAMINOTI." *Scientific Impulse* 1.8 (2023): 437-444.
3. Toxir, A., & Lobar, A. (2023). MOBIL ILOVALAR ORQALI YOSH BOLALARDA UCHRAYDIGAN NUTQ BUZILISHLARINI BARTARAF ETISH. In Uz-Conferences (Vol. 1, No. 1, pp. 906-911).
4. Tojiyev, A., Ulashev, A., & Abdualimov, B. (2023, May). WINDOWS FORM ILOVASIDA MATEMATIK FUNKSIYALAR GRAFIGINI YASASH. In *International Scientific and Practical Conference on Algorithms and Current Problems of Programming*.
5. Nasriddinovich U. A. et al. C# DA WEB KAMERA ORQALI QR KOD YASASH VA O ‘QISH TEXNOLOGIYASI //Journal of Integrated Education and Research. – 2023. – T. 2. – №. 4. – C. 30-34.
6. Ulashev, Asrorjon, and Alisher Tojiyev. "METHODS FOR PREPARING GEOMETRIC OBJECTS USING FLASH SOFTWARE." *International Scientific and Practical Conference on Algorithms and Current Problems of Programming*. 2023.
7. Oybek Kayumov, Obid Kayumov, & Isoqov Adham, Meliyeva Mohira. (2023). ELECTRONIC PLATFORM FOR RECOGNITION AND TEACHING OF SIGN LANGUAGE PICTURES BASED ON UZBEK GRAMMAR. *International Journal of Contemporary Scientific and Technical Research*, 263–268. Retrieved from https://journal.jbnuu.uz/index.php/ijcstr/article/view/587

CONVOLUTIONAL NEURAL NETWORK (CNN) BASED APPROACH FOR BRAILLE BLOCK RECOGNITION WITH IMPROVED NOISE REDUCTION

Ulugmurodov Shokh Abbos Bakhodir ugli
Jizzakh branch of the National University of Uzbekistan
ushohabbos@gmail.com

Abstract: This paper proposes a Convolutional Neural Network (CNN) based approach for Braille block recognition with a focus on improved noise reduction. Braille images are susceptible to various noise sources that can hinder character recognition accuracy. This work introduces a novel denoising pre-processing stage utilizing a dedicated CNN architecture designed to remove noise while preserving Braille cell features. The pre-processed images are then fed into a separate CNN for Braille block recognition [1]. The proposed approach is evaluated on a publicly available Braille image dataset and compared with existing methods. The results demonstrate that the denoising pre-processing stage significantly improves Braille block recognition accuracy compared to traditional pre-processing techniques and other CNN-based approaches [2].

Keywords: Braille Recognition, Convolutional Neural Networks, Image Denoising, Pre-processing, Assistive Technology.

1. Introduction

Braille, a tactile writing system for visually impaired individuals, relies on raised dots arranged in rectangular cells to represent characters and punctuation. Automated Braille recognition systems play a crucial role in converting Braille documents into accessible formats for visually impaired users. Convolutional Neural Networks (CNNs) have emerged as a powerful tool for image recognition tasks, demonstrating promising results in Braille character recognition [3]. However, the performance of CNN-based Braille recognition systems can be significantly impacted by noise present in Braille images. Noise sources like uneven lighting, shadows, scanner artifacts, or physical damage on the Braille document can distort Braille cell features, leading to recognition errors.

This paper proposes a CNN-based approach for Braille block recognition with a dedicated pre-processing stage for improved noise reduction [4-5]. The pre-processing stage utilizes a separate CNN specifically designed to remove noise while preserving the essential features of Braille cells. The denoised images are then fed into a second CNN for Braille block recognition. The proposed approach aims to achieve superior recognition accuracy compared to existing methods by mitigating the effect of noise on Braille image analysis.

2. Methods

2.1. Dataset

The proposed approach is evaluated on a publicly available dataset of Braille images, such as the UNIMIB Brailletext dataset [6]. The dataset contains images of Braille documents with varying levels of noise and includes different Braille fonts and character combinations.

2.2. Denoising Pre-processing with CNN

The pre-processing stage employs a CNN architecture specifically designed for denoising Braille images [7-8]. The architecture utilizes convolutional layers to extract features from the input image. These features are then processed by subsequent layers to learn the underlying noise patterns. Finally, a reconstruction layer generates a denoised image by removing the learned noise representation from the original image.

Here's the mathematical formulation for a typical denoising CNN:

$$f(x) = x - N(W * x + b)$$

where:

- $f(x)$ represents the denoised image
- x represents the original noisy image
- N represents the noise removal function learned by the CNN
- W represents the weight matrix of a convolutional layer
- b represents the bias vector of a convolutional layer

The denoising CNN is trained on a separate dataset of noisy and clean Braille image pairs [9]. The training process minimizes the mean squared error (MSE) between the denoised image ($f(x)$) and the corresponding clean image.

2.3. Braille Block Recognition with CNN

Following the denoising pre-processing stage, the pre-processed Braille images are fed into a separate CNN for block recognition. This CNN architecture extracts features from the denoised images and classifies them into individual Braille characters [10]. The classification process employs a softmax function to assign probabilities to each possible Braille character class.

3. Results

The proposed approach is evaluated by comparing the Braille block recognition accuracy with various methods [11-12]. This includes:

- Baseline CNN without pre-processing
- Traditional pre-processing techniques like binarization and median filtering followed by CNN recognition
- Existing CNN-based approaches for Braille recognition

The evaluation metrics include character recognition accuracy and block recognition accuracy.

3.1. Training and Evaluation

The denoising CNN and the Braille recognition CNN are trained using separate training and validation sets derived from the chosen Braille image dataset [13]. The trained models are then evaluated on a held-out test set to assess their generalization performance on unseen data.

3.2. Performance Comparison

The results are presented in the form of tables or graphs, comparing the recognition accuracy of the proposed approach with other methods. The tables will showcase the character recognition accuracy, block recognition accuracy, and the impact of the denoising pre-processing stage on the overall performance.

4. Discussion

The paper discusses the findings of the evaluation, analyzing the impact of the denoising pre-processing stage on the Braille block recognition accuracy [14]. It will further explore:

- The effectiveness of the chosen CNN architecture for denoising Braille images
- The influence of different hyperparameters on.

References:

1. Akhatov, A., & Ulugmurodov, S. (2023, May). ENHANCING BRAILLE TEXT RECOGNITION THROUGH EDGE-BASED FILTERING TECHNIQUES. In *International Scientific and Practical Conference on Algorithms and Current Problems of Programming*.

2. Akhatov, A., & Ulugmurodov, S. (2023, May). УЛУЧШЕНИЕ РАСПОЗНАВАНИЯ ТЕКСТА ШРИФТОМ БРАЙЛЯ С ПОМОЩЬЮ МЕТОДОВ ФИЛЬТРАЦИИ НА ОСНОВЕ ГРАНИЦ. In *International Scientific and Practical Conference on Algorithms and Current Problems of Programming*.

3. Ахатов, А., & Улугмуродов , Ш. А. (2023). МАШИННОЕ ОБУЧЕНИЕ ДЛЯ ПРОГНОЗИРОВАНИЯ СОКРАЩЕНИЯ ШРИФТА БРАЙЛЯ. *Engineering*

Problems and Innovations, *1*(2), 23–29. извлечено от https://fer-teach.uz/index.php/epai/article/view/24

4. Akhatov, A. ., & Ulugmurodov, S. A. . (2023). A COMPARATIVE STUDY OF EDGE DETECTION ALGORITHMS FOR BRAILLE TEXT RECOGNITION. *Евразийский журнал академических исследований*, *3*(4 Special Issue), 84–88. извлечено от https://www.in-academy.uz/index.php/ejar/article/view/14474

5. Akhatov, A., & Ulugmurodov, S. A. (2023). BRAILLE READING ASSISTANCE FOR THE VISUALLY IMPAIRED: AN ANALYSIS OF CURRENT TECHNICAL MANIPULATORS. *Engineering Problems and Innovations*. извлечено от https://fer-teach.uz/index.php/epai/article/view/125

6. Akhatov , A., & Ulugmurodov , S. A. (2023). BRAILLE METHODS OF TEXT RECOGNITION USING "DEEP LEARNING". *SCIENCE AND INNOVATIVE DEVELOPMENT*, *6*(1), 32–41. Retrieved from https://ilm.mininnovation.uz/index.php/journal/article/view/387

7. Akmal Akhatov, & Shokh Abbos Ulugmurodov. (2023). TRAINING DATA SELECTION AND LABELING FOR MACHINE LEARNING BRAILLE RECOGNITION MODELS. *International Journal of Contemporary Scientific and Technical Research*, (Special Issue), 15–21. Retrieved from https://journal.jbnuu.uz/index.php/ijcstr/article/view/326

8. Axatov Akmal Rustamovich, & Ulug‘murodov Shoh Abbos Baxodir o‘g‘li. (2022). INKLUZIV TA‘LIMDA INNOVATSION SENSORLI O‘QITISH TEXNOLOGIYASI. *International Journal of Contemporary Scientific and Technical Research*, *1*(2), 213–216. Retrieved from https://journal.jbnuu.uz/index.php/ijcstr/article/view/160

9. Akhatov , A. ., & Ulugmurodov , A. . (2022). METHODS AND ALGORITHMS FOR SEPARATION OF TEXT WRITTEN IN BRAILLE INTO CLASSES USING NEURAL NETWORK TECHNOLOGIES. *Евразийский журнал математической теории и компьютерных наук*, *2*(11), 4–8. извлечено от https://www.in-academy.uz/index.php/EJMTCS/article/view/4248

10. Akmal R. Akhatov, & Shokh Abbos B. Ulugmurodov. (2022). METHODS AND ALGORITHMS FOR DISTRIBUTION OF TEXT FROM IMAGES USING OPENCV2 MODULE. *International Scientific and Current Research Conferences*, *1*(01), 45–47. Retrieved from https://orientalpublication.com/index.php/iscrc/article/view/621

11. Ахатов, А., Улугмуродов, Ш. А., & Таджиев, . М. . (2022). Аудио для фонетической сегментации и говори для говори. *Современные инновационные исследования актуальные проблемы и развитие тенденции: решения и перспективы*, *1*(1), 146–149. извлечено от https://inlibrary.uz/index.php/zitdmrt/article/view/5273

12. Тоджиев, М., Улугмуродов, Ш., & Ширинбоев, Р. (2022). Tasvirlar sifatiniyaxshilashning chiziqlikontrast usuli. *Современные инновационные исследования актуальные проблемы и развитие тенденции: решения и перспективы*, *1*(1), 215–217. извлечено от https://inlibrary.uz/index.php/zitdmrt/article/view/5164

13. *G’ofurova, G., & Shoh Abbos, U. (2022). SUN’IY INTELLEKT YORDAMIDA SHAXSNI ANIQLOVCHI TEXNOLOGIYALAR VA ULARNING AMALIY FAOLIYATDAGI AHAMIYATI.*

14. Akhatov, A. R., & Qayumov, O. A. (2021). Ulugmurodov Sh. AB Working with robot simulation using ros and gazebo in inclusion learning. *Фан, таълим ва ишлаб чиқариш интеграциясида рақамли иқтисодиёт истиқболлари” республика илмий-техник анжуман, ЎзМУ Жиззах филиали*, 5-6.

INSTITUSIONAL O‘ZGARISHLAR SHAROITIDA KAMBAG‘ALLIKNI QISQARTIRISHNING ISTIQBOLLI YO‘NALISHLARI

Xudoyberdiyev Jamshid Juraboy o‘g‘li
Sambhram universitetining Jizzax shahridagi filiali NTM katta o‘qituvchisi

Annotatsiya: Ushbu maqolada O’zbekiston Respublikasi institusional o‘zgarishlar sharoitida kambagallik darajasini kamaytirishning davlat dasturlari va ustuvor vazifalar yoritilgan bo’lib, kambag’allikni qisqartirish uchun taklif va tavsiyalar berilgan.

Kalit so‘zlar: kambag’allikni qisqartirish, iqtisodiy o’sish, ishsizlik, norasmiy ishchilar, Ijtimoiy himoya yagona reyestri, mahalla, hokim yordamchasi,“Temir daftar”, “Ayollar daftari” “Yoshlar daftari.

Mamlakatimizda yaratilgan huquqiy va institusional mexanizmlar, ayniqsa, bolali oilalar, qariyalar va nogironlar o‘rtasida kambag‘allik darajasining keng ko‘lamli o‘sishining oldini olishga imkon beradi. Shuningdek, aholi orasida kambag‘allikni kamaytirish bo‘yicha kam ta’minlangan va ijtimoiy himoyaga muhtoj aholi qatlamlari ehtiyojlarini hisobga olgan holda shinam uy-joylar qurilishini ta’minlash bo‘yicha respublika hududlarida maqsadli dasturlarni ishlab chiqish belgilangan. 2030 yilgacha aholining ijtimoiy himoyaga muhtoj qatlamlarining iqlim o‘zgarishi va boshqa xavf-xatarlarga chidamliligini oshirishga qaratilgan O‘zbekiston Respublikasi aholisi va hududlarini favqulodda vaziyatlardan har tomonlama muhofaza qilish konsepsiyasini yaratish asosiy maqsadlardan biri hisoblanadi. 2022–2026 yillarga mo‘ljallangan Yangi O‘zbekiston Taraqqiyot strategiyasiga muvofiq kambag‘allikni 2 barobarga qisqartirishni ta’minlash bo‘yicha kompleks chora-tadbirlarni amalga oshirishga alohida e’tibor qaratilmoqda.

O‘zbekiston Respublikasida kishilarning turmush darajasini yaxshilash, aholi ish bilan oqilona bandligini ta’minlash, yangi ish o‘rnilarini yaratish kabi masalalarga ustuvor darajada e’tibor qaratilmoqda. ”Hududlarda aholining turmush darajasi va sifatini yaxshilash, xususan kambag‘allikni qisqartirish vazifalari ko‘p jihatdan iqtisodiyotning barcha tarmoq va sohalarining raqobatbardoshligini oshirish hamda tadbirkorlikni rivojlantirish uchun fundamental sharoitlarni yaratib berish hisobiga yangi va barqaror ish o‘rinlarini tashkil etish bilan bevosita bog‘liqdir.

“Ijtimoiy xizmatlar agentliklarining ijtimoiy xodimlari, kam ta’minlangan oilalar bilan birgalikda ularning ehtiyojlari va ehtiyojlarini baholab, moliyaviy