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Bangla handwritten numeral recognition using convolutional neural network (Conference Paper)Akhand, M.A.H.^a, Rahman, M.M.^a, Shill, P.C.^a, Islam, S.^a, Hafizur Rahman, M.M.^b^aDept. of Computer Science and Engineering, Khulna University of Engineering and Technology, Khulna, Bangladesh^bDept. of Computer Science, International Islamic University Malaysia, Selangor, Malaysia

Abstract

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Recognition of handwritten numerals has gained much interest in recent years due to its various application potentials. Although Bangla is a major language in Indian subcontinent and is the first language of Bangladesh study regarding Bangla handwritten numeral recognition (BHNR) is very few with respect to other major languages such as Roman. The existing BHNR methods use distinct feature extraction techniques and various classification tools in their recognition schemes. Recently, convolutional neural network (CNN) is found efficient for image classification with its distinct features. It also automatically provides some degree of translation invariance. In this paper, a CNN based BHNR is investigated. The proposed BHNR-CNN normalizes the written numeral images and then employ CNN to classify individual numerals. It does not employ any feature extraction method like other related works. 17000 hand written numerals with different shapes, sizes and variations are used in this study. The proposed method is shown satisfactory recognition accuracy and outperformed other prominent exiting methods. © 2015 IEEE.

Author keywords

Bangla Numeral Convolutional Neural Network Handwritten Numeral Recognition

Indexed keywords

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Feature extraction Image classification Neural networks Telemedicine

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References (12)

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- 1 Plamondon, R., Srihari, S.N.
 On-line and off-line handwriting recognition: A comprehensive survey
 (2000) *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 22 (1), pp. 63-84. Cited 1416 times.
 doi: 10.1109/34.824821
[View at Publisher](#)

- 2 Pal, U., Chaudhuri, B.B., Belaid, A.
 A complete system for bangla handwritten numeral recognition
 (2006) *IETE Journal of Research*, 52 (1), pp. 27-34. Cited 17 times.
 doi: 10.1080/03772063.2006.11416437
[View at Publisher](#)

- 3 Basu, S., Sarkar, R., Das, N., Kundu, M., Nasipuri, M., Basu, D.K.
 Handwritten Bangla digit recognition using classifier combination through DS technique
 (2005) *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 3776 LNCS, pp. 236-241. Cited 18 times.
 ISBN: 3540305068; 978-354030506-4
 doi: 10.1007/11590316_32
[View at Publisher](#)

- 4 Bashar, M.R., Hasan, M.A.F.M.R., Hossain, M.A., Das, D.
 Handwritten bangia numerical digit recognition using histogram technique
 (2004) *Asian Journal of Information Technology*, 3, pp. 611-615.

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-
- 5 Khan, M.M.R., Rahman, S.M.A., Alam, M.M.
Bangla handwritten digits recognition using evolutionary artificial neural networks
(2004) *Proc. of the 7th International Conference on Computer and Information Technology (TCCIT 2004)*
26-28 December Dhaka, Bangladesh
-
- 6 Wen, Y., Lu, Y., Shi, P.
Handwritten Bangla numeral recognition system and its application to postal automation

(2007) *Pattern Recognition*, 40 (1), pp. 99-107. Cited 56 times.
doi: 10.1016/j.patcog.2006.07.001

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-
- 7 Wen, Y., He, L.
A classifier for Bangla handwritten numeral recognition

(2012) *Expert Systems with Applications*, 39 (1), pp. 948-953. Cited 14 times.
doi: 10.1016/j.eswa.2011.07.092

View at Publisher
-
- 8 Nasir, M.K., Uddin, M.S.
Hand written bangla numerals recognition for automated postal system
(2013) *TOSR Journal of Computer Engineering (IOSR-JCE)*, 8 (6), pp. 43-48. Cited 9 times.
-
- 9 LeCun, Y., Bengio, Y.
Pattern recognition and neural networks
(1995) *The Handbook of Brain Theory and Neural Networks*. Cited 10 times.
Arbib, M. A. (Eds) MIT Press
-
- 10 LeCun, Y., Bottou, L., Bengio, Y., Haffner, P.
Gradient-based learning applied to document recognition

(1998) *Proceedings of the IEEE*, 86 (11), pp. 2278-2323. Cited 4666 times.
doi: 10.1109/5.726791

View at Publisher
-
- 11 *Feature Extraction Using Convolution*. Cited 2 times.
<http://deeplearning.stanford.edu/wikilindex.php>
-
- 12 *A Comparative Description of Proposed BHNR-CNN with Some Contemporary Methods*
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-

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