Introduction of Forehead Lesion Assessment with House-Brackmann Score for Facial Nerve Paralysis Evaluation

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Abstract

This paper present a novel approach of forehead lesion assessment using Gabor filter method to identify the type of facial nerve paralysis and proposed a forehead-HB score table to assist the clinicians in assessing the facial nerve function quantitatively, quicker and in a convenient way. A 100% of accuracy has been obtained in identifying the two type of facial lesion, Upper Motor Neuron (UMN) and Lower Motor Neuron (LMN) lesion. Increasing more data may enhance the performance of the accuracy.

Keywords: Facial Nerve Paralysis, Gabor Filter, Upper Motor Neuron (UMN) lesion, Lower Motor Neuron (LMN) lesion, House-Brackmann (HB)

based key points detection with hybrid classifier, *BMC Medical Imaging*, vol. 16 (2016), pp. 23.

- J. Finsterer, Management of peripheral facial nerve palsy, European Archives of Oto-Rhino-Laryngology. 265(7) (2008) 743-752.
- L. Masterson, M. Vallis, R. Quinlivan, and P. Prinsley, Assessment and management of facial nerve palsy, *BMJ*, *British Medical Journal*, 351, 2015.
- J. Barbosa, W.-K. Seo, and J. Kang, "paraFaceTest: an ensemble of regression tree-based facial features extraction for efficient facial paralysis classification," BMC medical imaging, 19(1) (2019), 30.
- J. Barbosa et al., "Efficient quantitative assessment of facial paralysis using iris segmentation and active contourbased key points detection with hybrid classifier," BMC Medical Imaging, 16 (2016), p. 23.
- H.S. Hira, Clinical Examination: a practical guide in medicine (Jaypee Brothers Medical Publisher, New Delhi, 2011).
- J.W. House and D.E. Brackmann, Facial Nerve Grading System, Otolaryngology-Head and Neck Surgery, 93(2) (1985), pp.146-147.
- 13. J.K. Kamarainen, Gabor features in image analysis, *Image Processing Theory, Tools and Applications (IPTA)*, 2012 3rd International Conference (2012), pp. 13-14.
- W. Zhao, J. Park, and S. Lee, Fully Automatic face detection and facial feature points extraction using Local Gabor filter bank and PCA, *in 2011 International Conference on Machine Learning and Cybernetics*, 4 (2011), pp. 1789-1792.
- W.S.W. Samsudin, R. Samad, M.Z. Ahmad, K. Sundaraj, Forehead Lesion Score for Facial Nerve Paralysis Evaluation, in 2019 IEEE International Conference on Automatic Control and Intelligent Systems (I2CACIS), 2019, pp. 102-107.
- P. Heroux, S. Diana, A. Ribert, and E. Trupin, "Classification method study for automatic form class identification," in *Proceedings. Fourteenth International Conference on Pattern Recognition (Cat. No. 98EX170)*, 1998, vol. 1, pp. 926-928: IEEE.
- I. Ismail, M. Ramadan, T. El Danf, and A. Samak, "Multiresolution Fourier-wavelet descriptor for fingerprint recognition," in 2008 International Conference on Computer Science and Information Technology, 2008, pp. 951-955: IEEE.