ARTIFICIAL INTELLIGENCE TECHNOLOGIES FOR SMART INFRASTRUCTURE SYSTEMS

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SMART INFRASTRUCTURE SYSTEMS

CASE 1: AI FOR SMART HEALTHCARE

Hidden Markov random field model based brain MR image segmentation using clonal selection algorithm and Markov chain Monte Carlo method

- Statistical models and model estimation methods for MR image segmentation are investigated.
- Proposed a HMRF based method that can jointly segment MR images and correct bias fields.
- The HMRF is stepwise learned by MCMC-based voxel labelling and CSA-based model estimation.
- The results of the proposed algorithm are very promising and robust to image artefacts.

Results on Brainweb dataset

(a) 88th transverse slice in the simulated study (with 7% noise and 40% INU); (b) INU corrected image; (c) Estimated INU; (d) Result of the HMRF-EM algorithm; (e) Result of the D-C algorithm; (f) Result of the SPM package; (g) Result of the GA-EM algorithm; (h) Result of the eHMRF algorithm; (i) Result of the proposed HMRF-CSA algorithm; (j) Ground truth

RESULTS ON IBSR (Version 2.0) DATASET

CONCLUSION

In Case 1, we incorporate CSA and MCMC methods into HMRF model estimation, and thus propose the HMRF-CSA algorithm for brain MR image segmentation to overcome the drawback of traditional HMRF-based segmentation approaches. Our results show that the proposed algorithm is robust to image artefacts and can differentiate major brain structures more accurately than other three algorithms.

In Case 2, EDAs are applied to finite element model updating process for structural damage detection. The results show that the performances of EDAs for model updating are efficient and reliable.

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REFERENCE
