

ROBUST OPTICAL RECOGNITION OF HANDWRITTEN MUSICAL SCORES BASED ON DOMAIN KNOWLEDGE

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INFORMATION

Supervisor: PhD Jaime S. Cardoso (INESC TEC, Faculdade de Engenharia, Universidade do Porto, Portugal).

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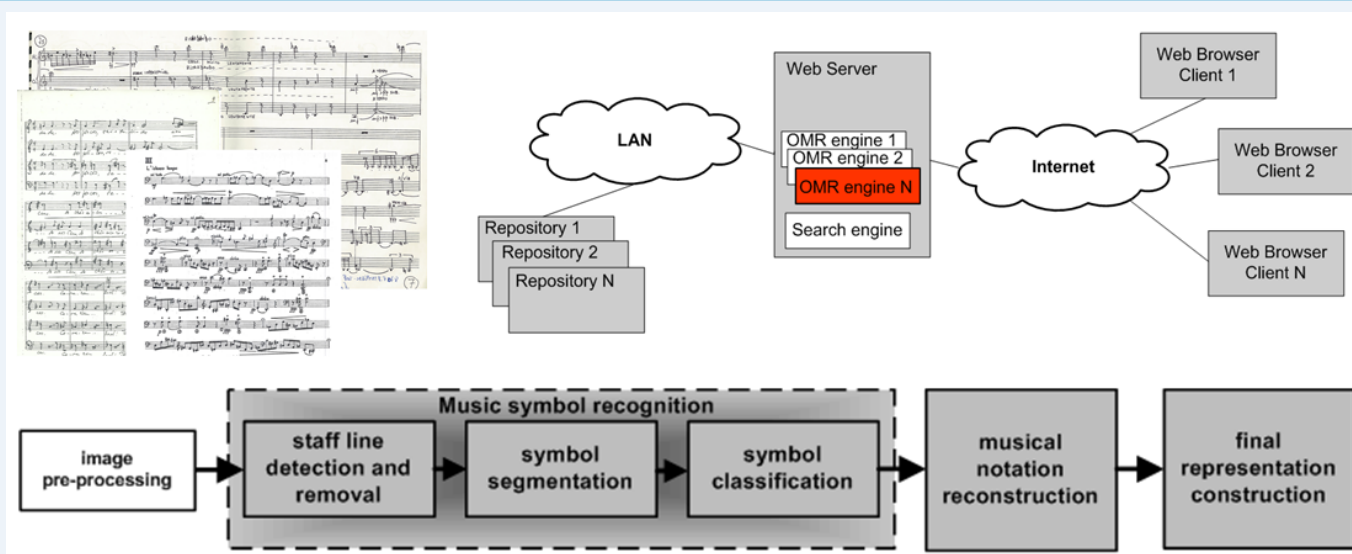
OBJECTIVES

- Research new methods for OMR for handwritten and printed scores.
- Study of pattern recognition techniques, machine learning and logic inductive programming.
- Fusion of musical rules in the OMR process to overcome the existing problems in the current algorithms.
- Integration of the algorithms developed in a web-based system that allows browsing, analysis and retrieval of a *corpus* of handwritten scores.

MAIN CONTRIBUTIONS

1. The creation of a database of real scores with its segmented references: binary images, detection and removal of the staff lines and classes and positions of the music symbols.
2. Analysis and study of different binarization methods applied to music scores, which has never been done.
3. The introduction to the music analysis community a robust method to estimate the staff line thickness and spacing in binary and gray-level music scores.
4. The introduction to the music analysis community of the Binarization based in Line Spacing and Thickness (BLIST) algorithm to binarize the music scores.
5. The introduction to the music analysis community of the algorithm of the staff lines detection based in the Stable Path approach.
6. Integration of graphical and syntactic rules in the automatic extraction algorithm of the music symbols.
7. New studies and analysis conducted in the phase of musical symbols classification.
8. Integration of the new algorithms in the web-based system being developed under the project.

OMR SYSTEM



PUBLICATIONS

- “Staff Detection with Stable Paths”, Jaime S. Cardoso, Artur Capela, Ana Rebelo, Carlos Guedes, Joaquim Pinto da Costa, in *IEEE Transaction on Pattern Analysis and Machine Intelligence*, volume 31, pages 1134–1139, 2009.
- “Robust staffline thickness and distance estimation in binary and gray-level music scores”, Jaime S. Cardoso and Ana Rebelo, in *Proceedings of The Twentieth International Conference on Pattern Recognition*, pages 1856–1859, 2010.
- “Optical Recognition of Music Symbols: a comparative study”, Ana Rebelo, Artur Capela and Jaime S. Cardoso, in *International Journal on Document Analysis and Recognition*, volume 13, pages 19–31, 2010.
- “Content aware music score pre-processing”, Ana Rebelo and Jaime S. Cardoso, in *Proceedings of 16th Portuguese Conference on Pattern Recognition*, 2010.
- “Music score binarization based on domain knowledge”, Telmo Pinto, Ana Rebelo, Gilson Giraldo and Jaime S. Cardoso, in *In Proceedings of 5th Iberian Conference on Pattern Recognition and Image Analysis*, 2011.
- “A Method for Music Symbols Extraction based on Musical Rules”, Ana Rebelo, Filipe Paszkiewicz, Carlos Guedes, Andre R. S. Marcal, and Jaime S. Cardoso, in *In Bridges: Mathematical Connections in Art, Music, and Science (BRIDGES)*, 2011.
- “Metric Learning for Music Symbols Recognition”, Ana Rebelo, Jakub Tkaczuk, Ricardo Sousa and Jaime S. Cardoso, in *In Proceedings of 10th International Conference on Machine Learning and Applications*, 2011.
- “Music Symbols Extraction Based on Domain Knowledge”, Ana Rebelo and Jaime S. Cardoso, in *Proceedings of 17th Portuguese Conference on Pattern Recognition*, 2011.