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Ceres: An Interactive Optical Music Recognition System

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Existing Optical Music Systems:

Notescan, Midiscan, Photoscore, Smartscore, Sharpeye, Audiveris, to name a few.

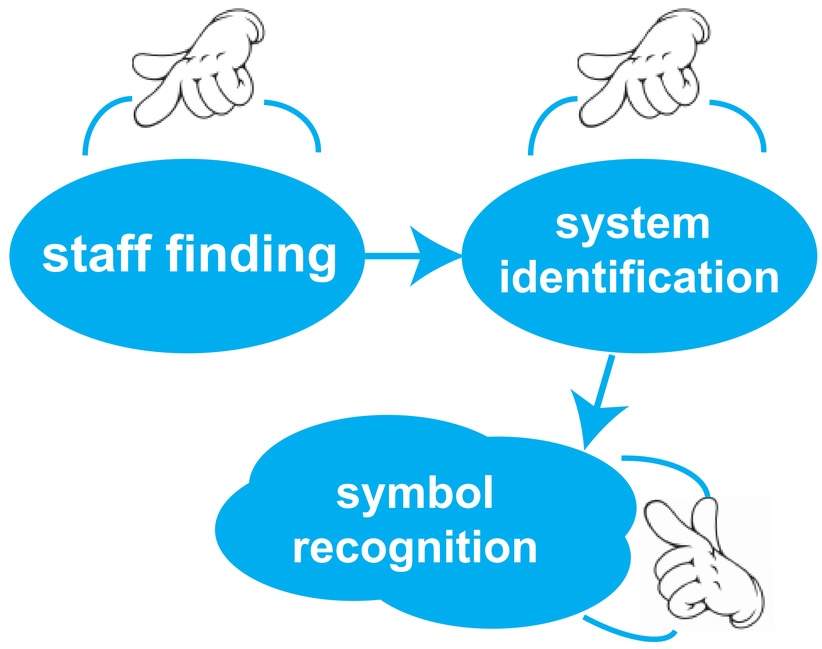
Difficulties and Current Problems:

1, hard to model measure-level configuration, so the actual recognition is often carried out on symbol level
2, a heavy tail of rare symbols
3, image degradation, noise, distortion

Consequences:

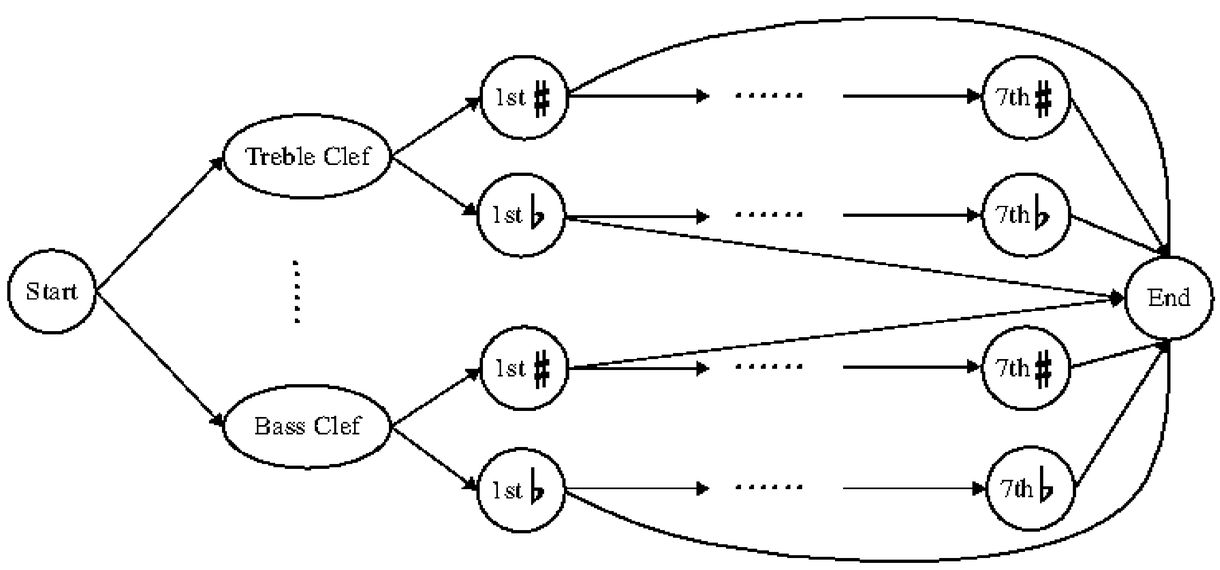
1, unreliable accuracy, uneasy to correct errors
2, requirement of heavy human-based proofreading as a post-processing step, oftentimes a laborious and time-cosuming task

One Way Out: Utilizing Human-in-the-loop Computation



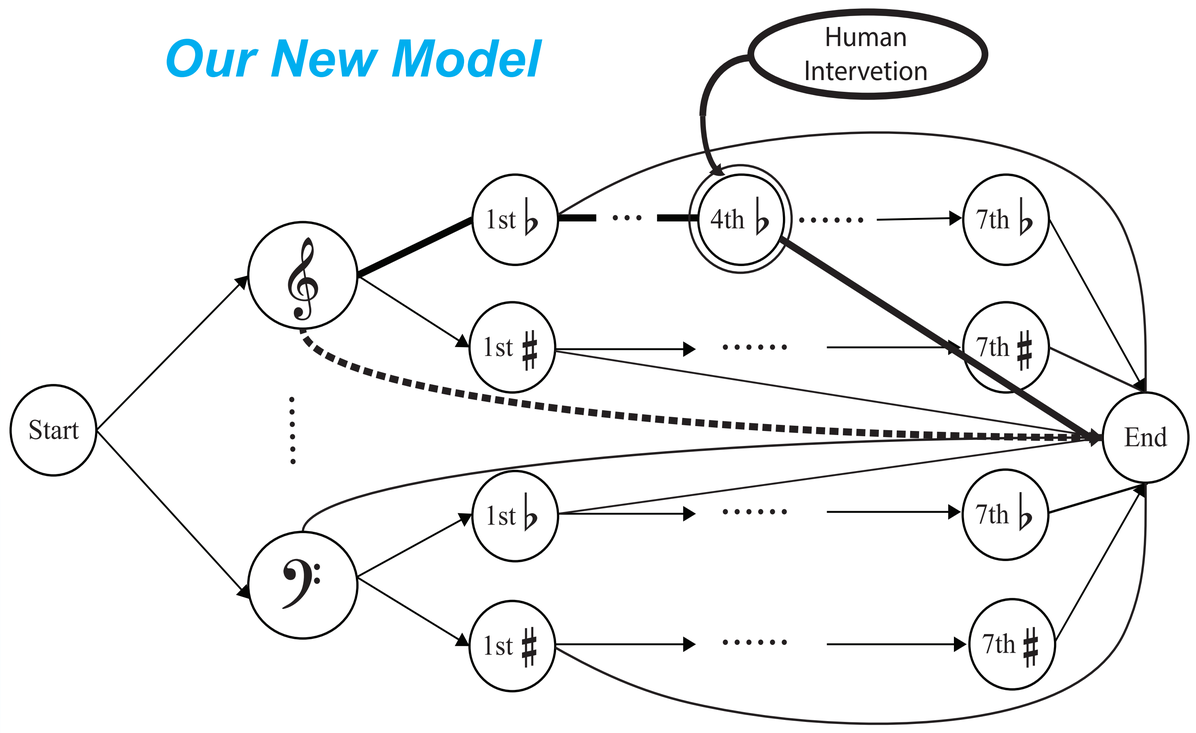
The model in the automatic version of *Ceres*

1, Automatically decode the score page into staves and measures using Dynamic Programming.
2, In each measure, we detect different types of symbol candidates, such as beamed groups, chords, rigid symbols, slurs, etc., recognize and resolve the conflicts between symbols.
3, All the symbol models are gramatically constrained and can be expressed as a graph. For instance:

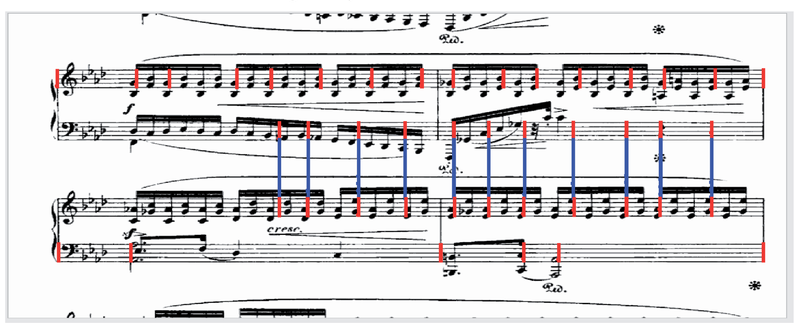


In addition to grammatical constraints, which has already been encoded into the program staically, now we has an extra set of more flexible, dynamic constraints imposed through user interface. User can label a single pixel as part of one primitive or a whole region that cannot be used during recognition.

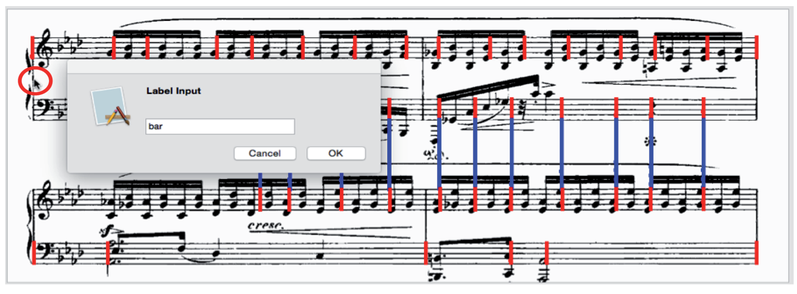
Our New Model



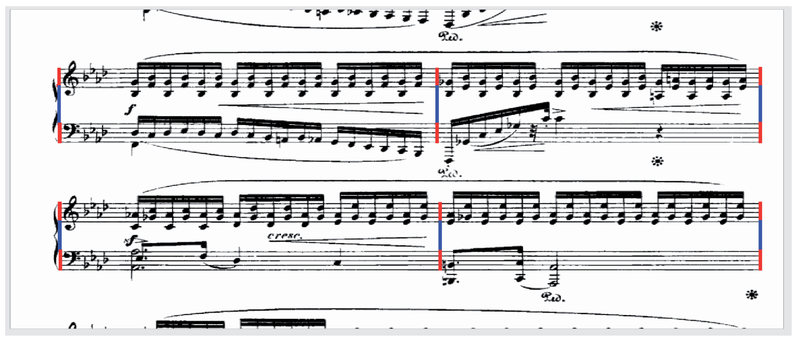
Original System Identification



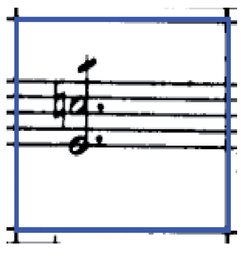
User Input (at the circled position)



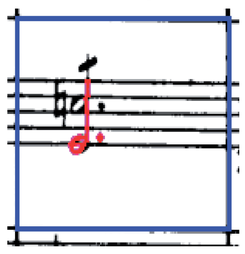
System Re-recognition after user input



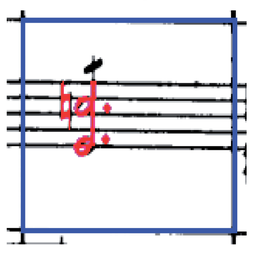
Original Measure



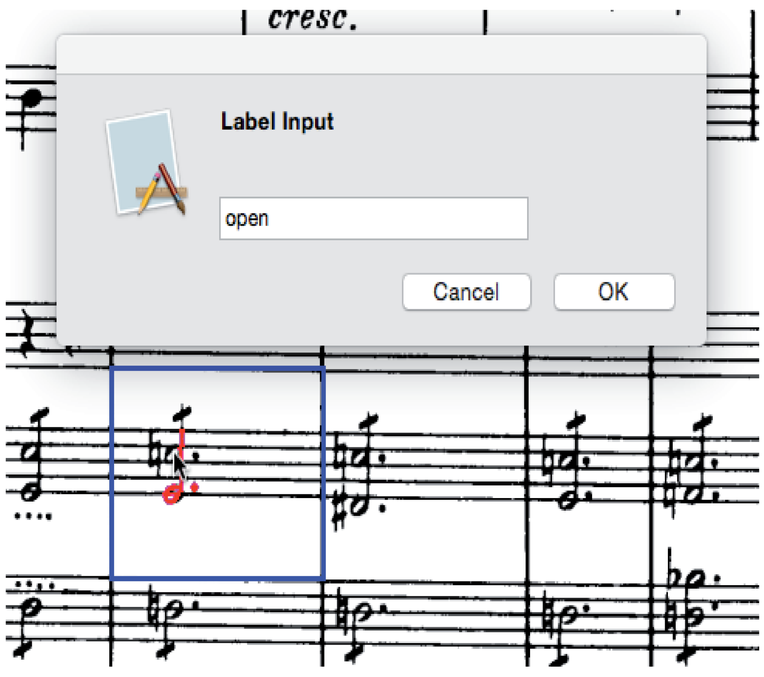
Initial Recognition



Final Recognition



User Add Constraint



Experiment Results

Pros:

1, Collaboration between machine and human. User supplies locations and labelings, while the registration and recognition is left to machine.
2, The output is always in a consistent format, containing the graphical representation of all different symbols.
3, Since all the symbols are hightly gramatically constrained, a small amount of user-imposed information may yield significant improvement.

Future Plan:

1, Thorough evaluation based on the comparison with state-of-the-art OMR systems.
2, Improve the robustness and efficiency.