

PANAKO 2.0 Updates for an acoustic fingerprinting system

Joren Six - IPEM, Ghent University

Introduction

This work presents **updates** to Panako, an acoustic fingerprinting system first presented at ISMIR 2014 [1] Later it was found to be similar to [2].

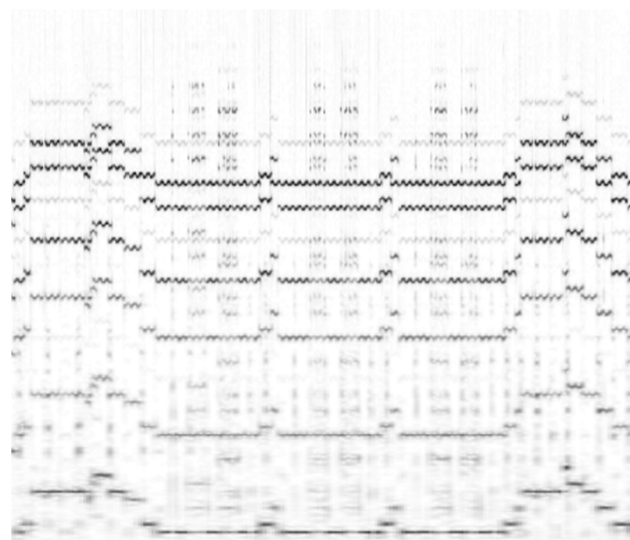
In Panako, a fingerprint combines information of tree peaks in a spectral representation. This makes the acoustic fingerprinting system is robust against pitch-shifting, time stretching and speed-up. Panako is available as open source software.

Now, **two changes** improve retrieval performance significantly.

Changes

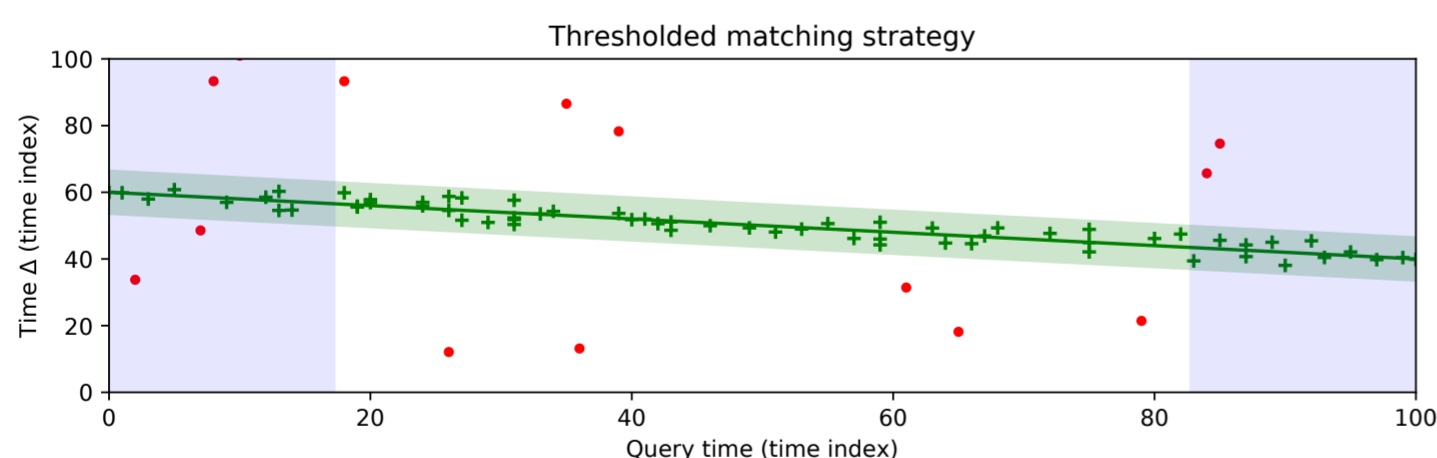


a.



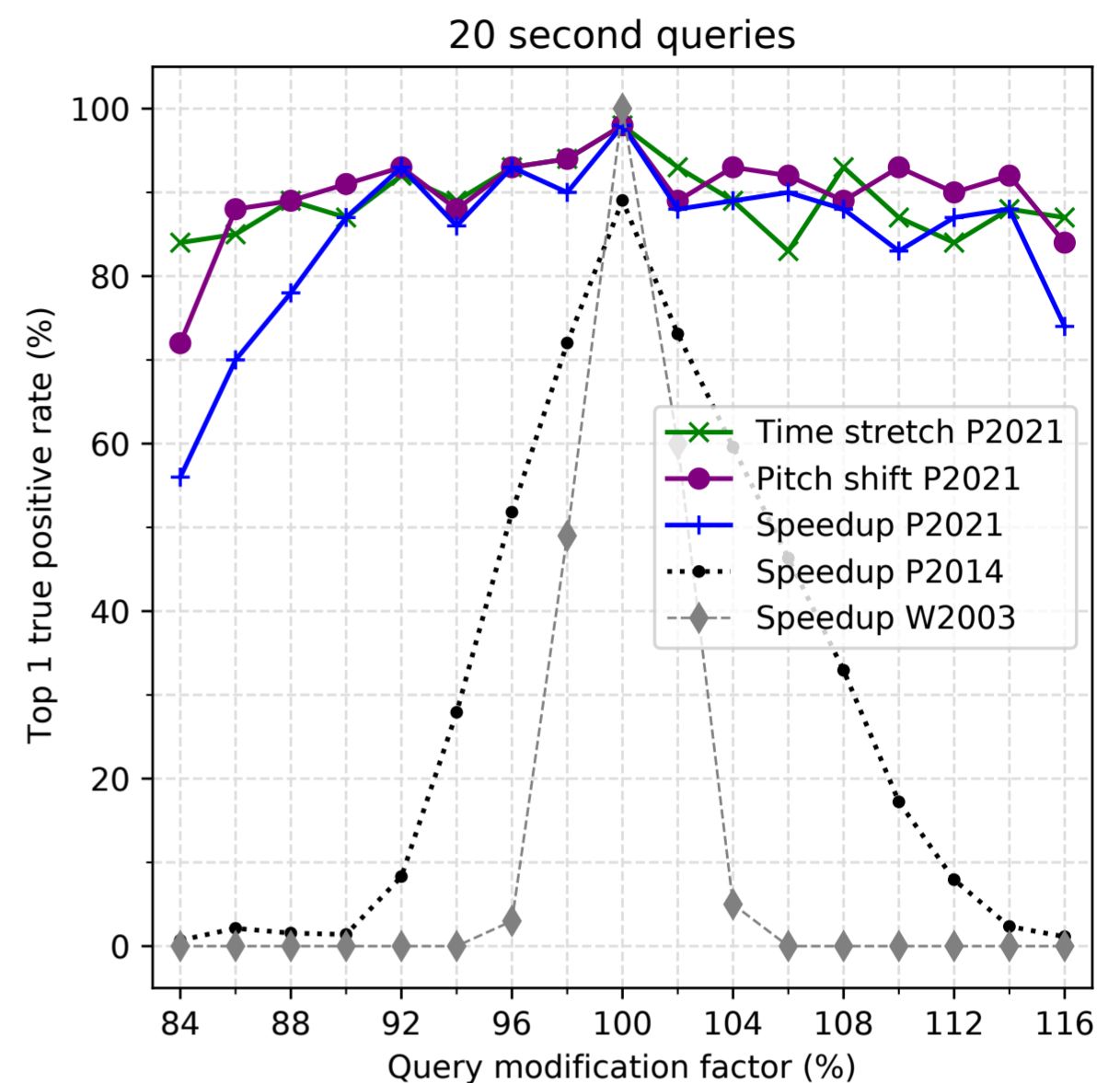
b.

First change: To form fingerprints, peaks are extracted from a spectral representation. Previously a constant-Q transform (a) was used. Now this has been changed (b) to a finer grained **constant-Q non-stationary Gabor transform** [3] for the same computational cost.



Second change: During matching, the time of each fingerprint extracted from a query is compared with the time of matching fingerprints in the reference database. This to discriminate true from false positives. Previously a time ratio needed to match exactly. Now **matches are accepted around a regression line**, the green area above. This allows to find more true positives after more severe linear time stretching or speed modifications.

Evaluation & Conclusion



The evaluation compares the 2014 version of Panako with the new version and a baseline system. It shows that queries are found more easily after a substantial (10%) time stretch, speed up or pitch shift.

The evaluation logic is part of the Panako GitHub repository and readers are encouraged to run it.

The improved retrieval rates do not affect the speed at which queries are handled. Panako also still supports many tracks (100k+) in a single key-value store on commodity hardware.

References

- [1] Six, J., & Leman, M. (2014). Panako: a scalable acoustic fingerprinting system handling time-scale and pitch modification. ISMIR-2014)
- [2] Wang, A. L. C., & Culbert, D. (2009). U.S. Patent No. 7,627,477.
- [3] Velasco, G. A., Holighaus, N., Dörfler, M., & Grill, T. (2011). Constructing an invertible constant-Q transform with non-stationary Gabor frames. Proceedings of DAFX11.

More Info

joren.six@ugent.be

<https://github.com/JorenSix/Panako>

<https://github.com/JorenSix/JGaborator>