Thing i’ve seen come up: Hidden Markov Models.

<https://www.youtube.com/watch?v=TPRoLreU9lA> <<< VIDEO

NOT RELATED !!!

Neil P. McAngus Todd and Guy Brown, "Visualization of Rhythm, Time and

Meter," Artificial Intelligence Review pp. 99-119, No. 10, 1996.

Abstract. Developments in the theory of auditory processing of rhythmic signals have enabled the construction of a robust algorithm for recovery of rhythmic grouping structure. This algorithm appears to be effective for both speech and music signals. The theory upon which the algorithm was based was inspired by the theory of edge detection in vision. The output of the algorithm can be visualised in the form of a "rhythmogram", examples of which are shown for a variety of speech signals. The relationship between rhythm, time perception and metre is discussed in the light of a recent "auditory-motor" theory of beat induction.

<http://asa.scitation.org/doi/10.1121/1.2890742>

<http://link.springer.com/chapter/10.1007/978-94-009-1716-3_7#page-1> <<< NEED TO LOOK UVIC LIBRARY

<http://lg5jh7pa3n.search.serialssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info%3Aofi%2Fenc%3AUTF-8&rfr_id=info%3Asid%2Fsummon.serialssolutions.com&rft_val_fmt=info%3Aofi%2Ffmt%3Akev%3Amtx%3Ajournal&rft.genre=article&rft.atitle=Visualization+of+rhythm%2C+time+and+metre&rft.jtitle=Artificial+Intelligence+Review&rft.au=McAngus+Todd%2C+Neil+P&rft.au=Brown%2C+Guy+J&rft.date=1996-08-01&rft.issn=0269-2821&rft.eissn=1573-7462&rft.volume=10&rft.issue=3-4&rft.spage=253&rft.epage=273&rft_id=info:doi/10.1007%2FBF00127682&rft.externalDBID=n%2Fa&rft.externalDocID=10_1007_BF00127682&paramdict=en-US>

FOUND:

Rosenthal, D. (1992). Machine Rhythm: Computer Emulation of Human Rhythm Perception. MIT Media Lab. Ph.D Thesis.

<https://dspace.mit.edu/handle/1721.1/12855>

DOWNLOADED IT TO ‘KYLE’ FOLDER

HMMM -> IT IS ABOUT POLYPHONIC MIDI RHYTHM DETECTION -> ‘’MACHINE RHYTHM”

[6] Eric D. Scheirer, "Tempo and beat analysis of acoustic musical signals," J.

Aeoast. Soc. Am pp. 588-601, Val 103, No. 1, January 1998.

E.D. Scheirer, "Tempo and Beat Analysis of Acoustic Musical Signals," Journal of the Acoustic Society of America, 103 (1), pp. 588-601, 1998.

<http://asa.scitation.org.ezproxy.library.uvic.ca/doi/10.1121/1.421129>

POLYPHONIC MULTI TIMBRAL BEAT DETECTION !!!! YEAAAAAAAH

GREAT REFERENCES LIST.

(Actual instruments)

USE A BANK OF RESONATORS TO DETECT PHASE LOCKING.

Found:

Brown, J. C. ~1993!. ‘‘Determination of the meter of musical scores by autocorrelation,’’ J. Acoust. Soc. Am. 94, 1953–1957.

Desain, P., and Honing, H. ~1992!. Music, Mind, and Machine: Studies in Computer Music, Music Cognition, and Artificial Intelligence ~Thesis Publishers, Amsterdam!.

Goto, M., and Muraoka, Y. ~in press!. ‘‘Music understanding at the beat level: Real-time beat tracking for audio signals,’’ in Readings in Computational Auditory Scene Analysis, edited by D. Rosenthal and H. Okuno ~Erlbaum, Mahwah, NJ!.

Large, E., and Kolen, J. F. ~1994!. ‘‘Resonance and the perception of musical meter,’’ Connection Science 6, 177–208. <<< MAIN THING USED.

Multiple fundamental frequency estimation using Gaussian smoothness

<http://ieeexplore.ieee.org/document/4517557/>

-> ON UVIC LIBRARY SITE.

<http://ieeexplore.ieee.org.ezproxy.library.uvic.ca/document/4517557?reload=true>

DOESN’T HELP US

D. Rosenthal, M. Goto, and Y. Muraoka, "Rhythm Tracking Using Multiple Hypotheses," Proc. of the 1994 Int. Computer Music Conference, International Computer Music Association, San Francisco, pp. 85-87, 1994.

I THINK I READ THIS BEFORE -> INTERESTING, BUT SUPER COMPLICATED.

<http://quod.lib.umich.edu/i/icmc/bbp2372.1994.022/1>

→ REFERENCES ‘’MACHINE RHYTHM’’ (ABOVE).

<http://dblp.uni-trier.de/search?q=goto+muraoka> -> look here for multiple articles on beat tracking. Newest one is <http://www.sciencedirect.com/science/article/pii/S0167639398000764> IT IS AVAILABLE ON UVIC LIBRARY.

### **Real**-**time** **beat** **tracking** **for drumless** **audio** **signals**:**Chord** **change** **detection** **for musical** **decisions**

<http://www.sciencedirect.com.ezproxy.library.uvic.ca/science/article/pii/S0167639398000764>

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Key, Chord, and Rhythm Tracking of Popular Music Recordings

<http://www.mitpressjournals.org.ezproxy.library.uvic.ca/doi/abs/10.1162/0148926054798205#.WK_ZtzsrK00> Arun Shenoy /// Ye Wang

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-----found --- -----found --- -----found ON Uvic Library --- -----found --- -----found ---

P. Cariani, "Temporal Codes, Timing Nets, and Music Perception," Journal of New Music Research, 30 (2), pp. 1-52, 2001.

ON UVIC LIBRARY .

<http://www-tandfonline-com.ezproxy.library.uvic.ca/doi/abs/10.1076/jnmr.30.2.107.7115>

NOT SO DETAILED.. IDEA MIGHT BE USEFUL...

Cariani, P. (2001d). Neural timing nets. Neural Networks, 14, 737–753. (ON UVIC LIB)

Bookmarked - Seems to apply

Scheirer, E.D. (1998). Tempo and beat analysis of acoustic musical signals. Journal of the Acoustical Society of America, 103, 588–601.

C. Duxbury, M. Sandler, and M.E. Davies, "A Hybrid Approach to Musical Note Onset Detection," Proc. of the 5th Int. Conf. on Digital Audio Effects, Hamburg, Germany, pp. 32-38, September 2002.

I DONT THINK THIS HELPS

Allen, P.E., Dannenberg, R.B., 1990. Tracking musical beats in real time. In: Proceedings of the 1990 International Computer Music Conference. pp. 140–143

<http://quod.lib.umich.edu/i/icmc/bbp2372.1990.036/1>

Based on tracking states and pruning by different criterion to reduce computational overhead.

Desain, P., Honing, H., 1994. Advanced issues in beat induction modeling: syncopation, tempo and timing. In: Proceedings of the 1994 International Computer Music Conference. pp. 92–94

Expectancy curves and inter-onset intervals.

<http://quod.lib.umich.edu/i/icmc/bbp2372.1994.025/1>

Driesse, A., 1991. Real-time tempo tracking using rules to analyze rhythmic qualities. In: Proceedings of the 1991 International Computer Music Conference. pp. 578–581

<http://quod.lib.umich.edu/cgi/p/pod/dod-idx/real-time-tempo-tracking-using-rules-to-analyze-rythmic.pdf?c=icmc;idno=bbp2372.1991.144>

DOWNLOADED IT

VERY GOOD. - HAS BEAT GENERATION TOO. - Really short and no implementation details.

Davy, M. and S. J. Godsill (2003). Bayesian harmonic models  
for musical signal analysis. In Bayesian Statistics 7.

<http://www-labs.iro.umontreal.ca/~pift6080/H08/documents/papers/davy_bayes_extraction.pdf>

Long and complicated - polyphonici and monophonic pitch extraction with bayesian networks.

Quinn, B. G. and E. J. Hannan (2001). The Estimation and  
Tracking of Frequency. Cambridge University Press.

Raphael, C. and J. Stoddard (2003). Harmonic analysis with  
probabilistic graphical models. In Proc. ISMIR.