

Rock, Pop, Klassik

Wie kann das ein Computer unterscheiden?

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Greifswald
13.06.2014

8. Greifswalder

Kinder
und
Jugend
Uni

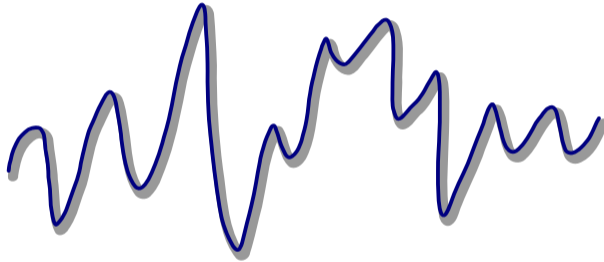


Wie Töne in den Computer passen

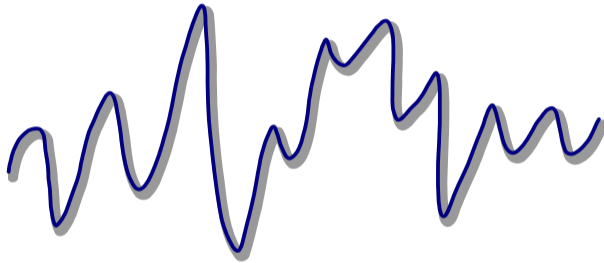








Akustisches Signal \cong Schall

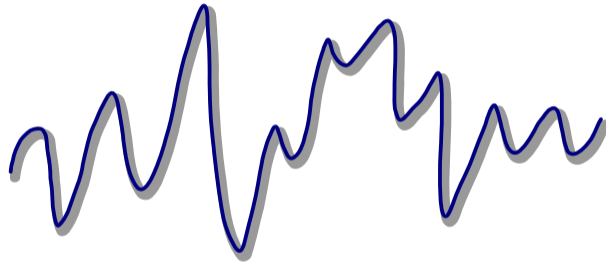


Geräusche
Töne
Sprache
Klänge
Musik

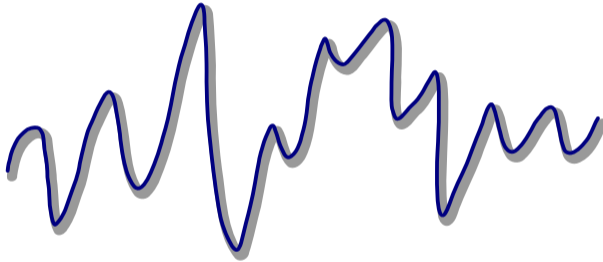
Akustisches Signal \cong Schall

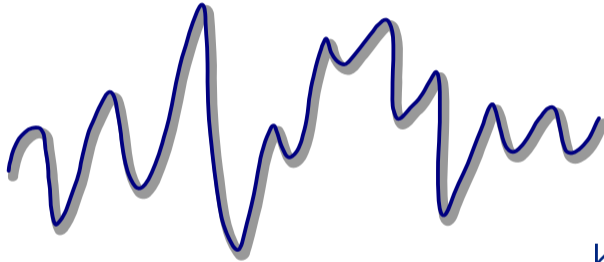


Akustisches Signal \cong Schall



Ausbreitung von Druck- und Dichteschwankungen

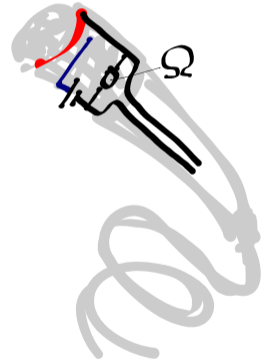
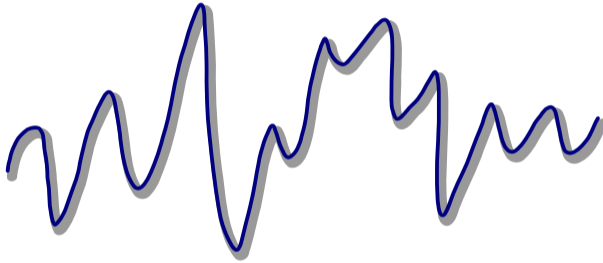


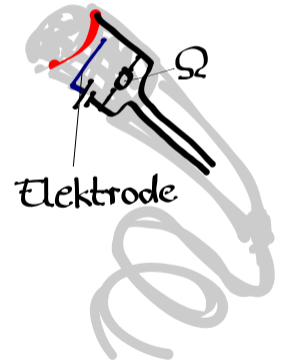
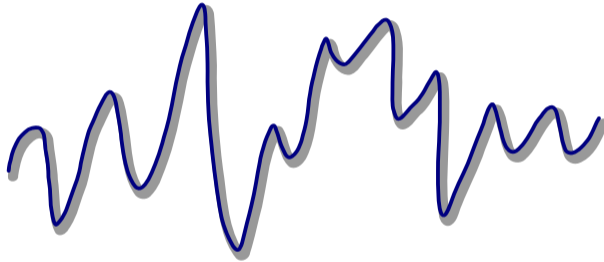


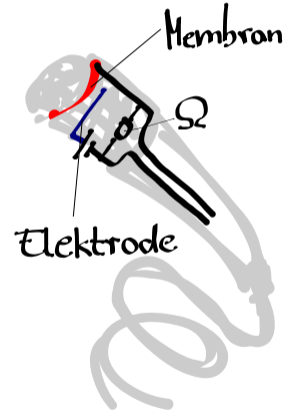
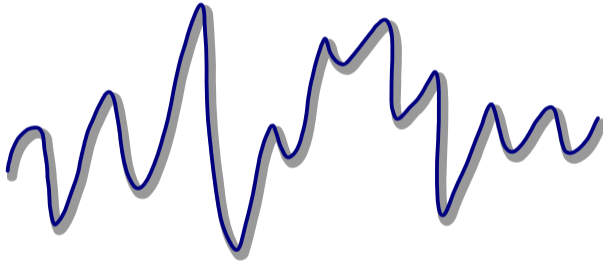
Kondensatormikrofon

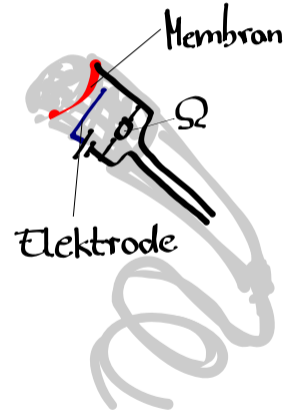
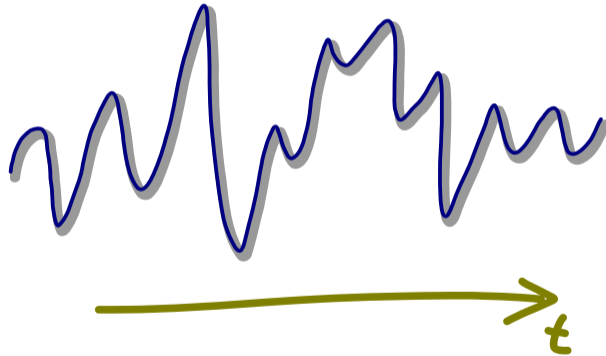


Kondensatormikrofon

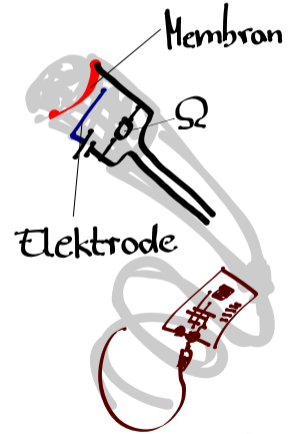
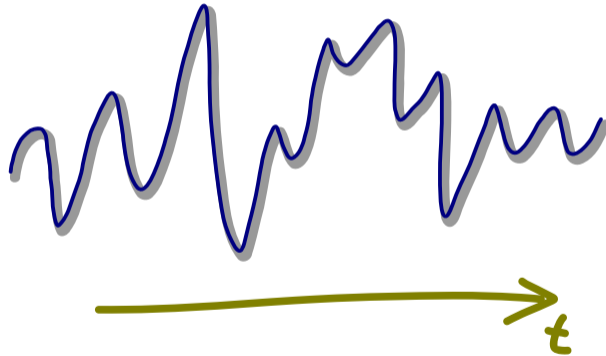




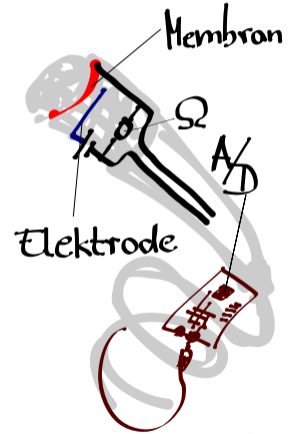
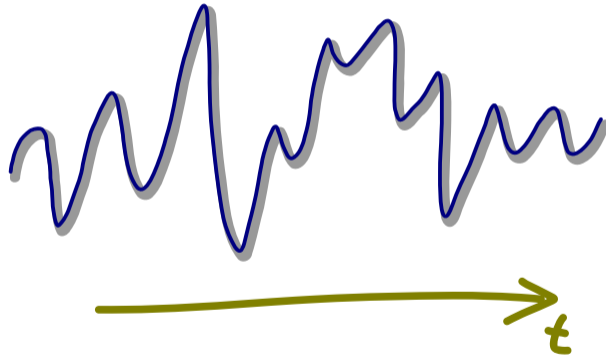


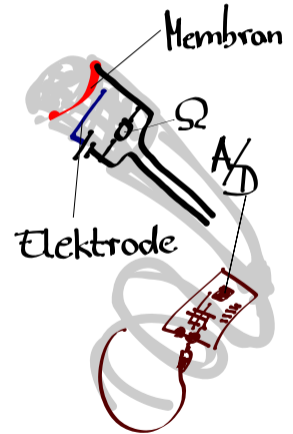
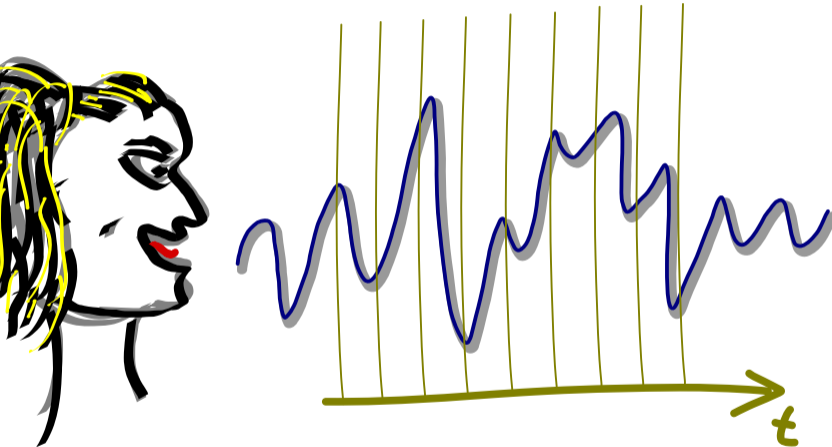


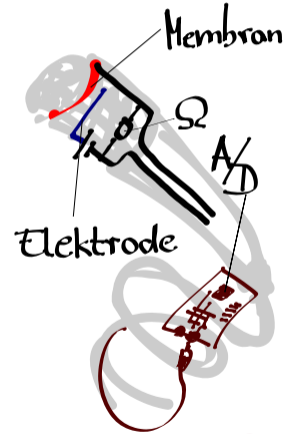
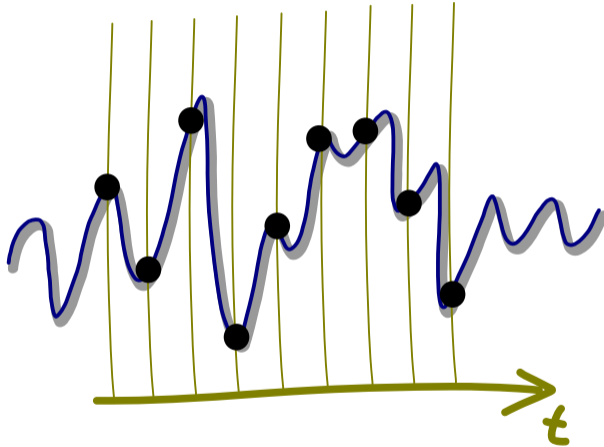
Analoges Signal



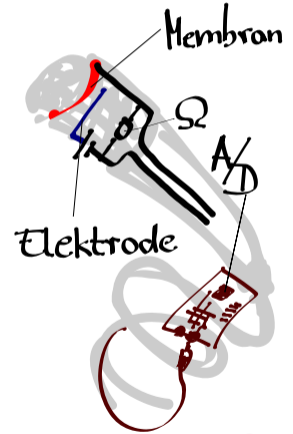
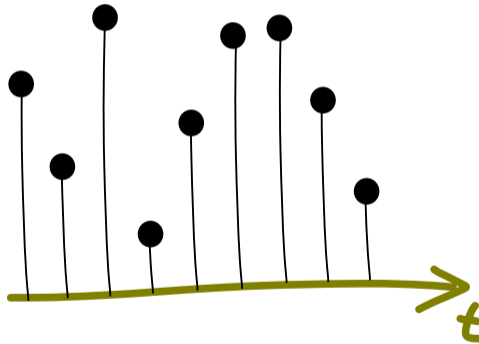
Analoges Signal



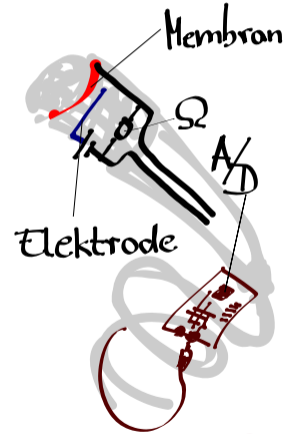
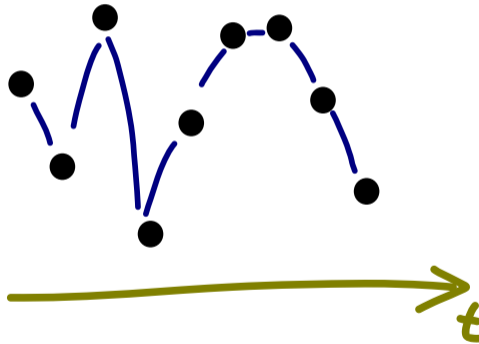




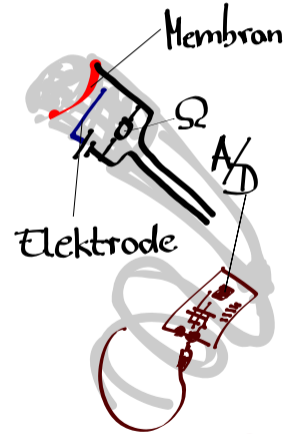
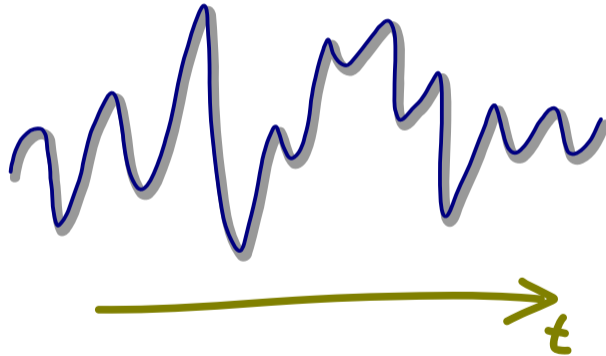
Digitales Signal



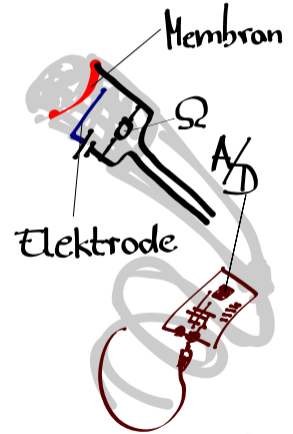
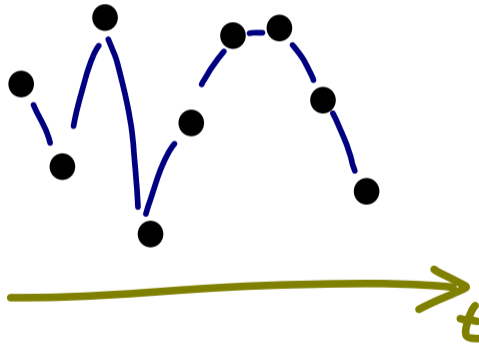
Digitales Signal



Analoges Signal



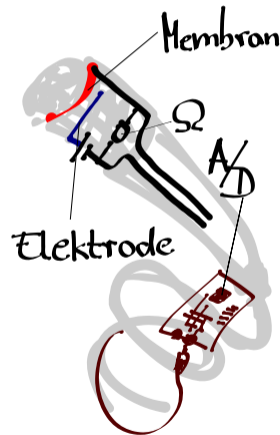
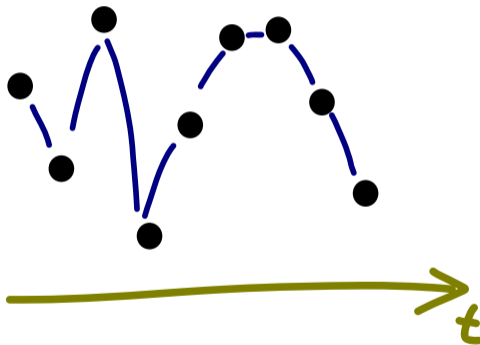
Digitales Signal



Abtastrate: 44100 Hz

Signalverarbeitung

Digitales Signal



Spache und Musik

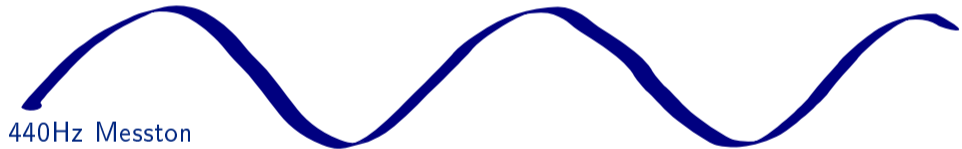
Wie sieht das aus?



Langwellig



Langwellig

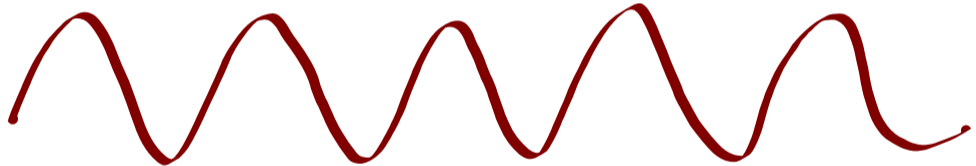


440Hz Messton

Kurzweilig



Kurzwellig



1kHz Pegelton

440Hz Messton

1kHz Pegelton

4kHz

8kHz

16kHz



18/19kHz Hörtest

20kHz

440Hz Messton

1kHz Pegelton

4kHz

8kHz

16kHz



Ultraschall

18/19kHz Hörtest

20kHz



440Hz Messton

1kHz Pegelton

4kHz

8kHz

16kHz

Infraschall



18/19kHz Hörtest Auflösung

Ultraschall

20kHz

440Hz Messton

1kHz Pegelton

Infraschall

4kHz

8kHz

16kHz



18/19kHz Hörtest

2x18kHz
3x19kHz

Ultraschall

20kHz



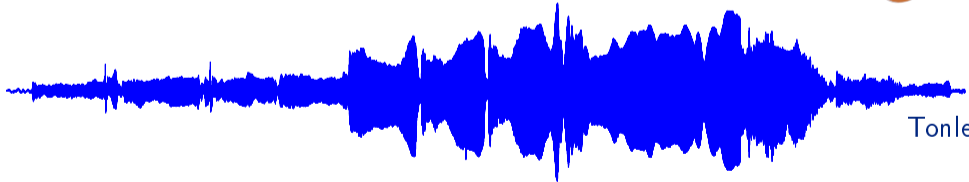
Töne



Flöte c''



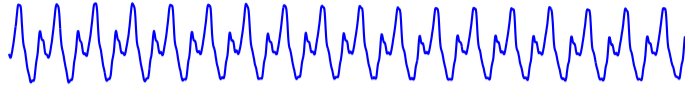
Flöte g''



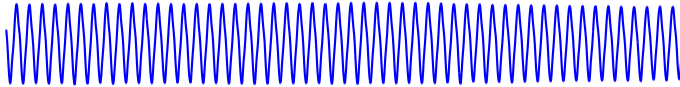
Tonleiter c-dur



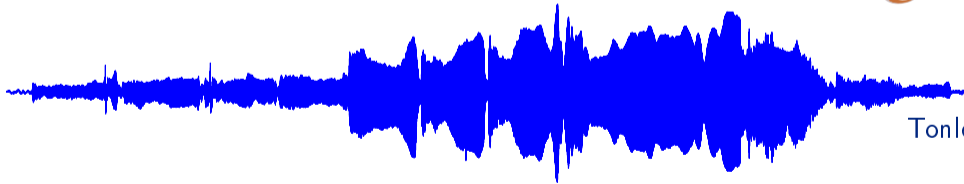
Töne



Flöte c''

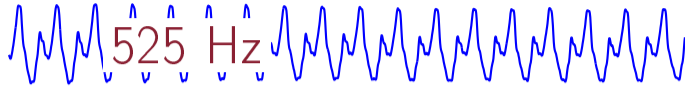


Flöte g''

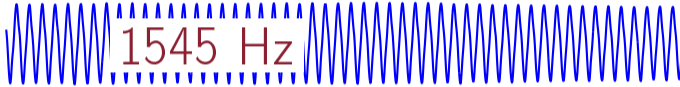


Tonleiter c-dur

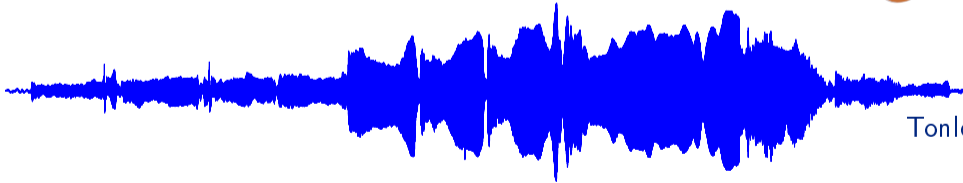
Töne



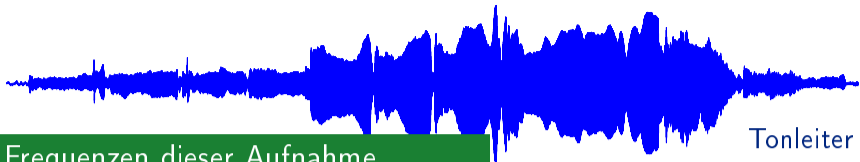
Flöte c''



Flöte g''



Tonleiter c-dur



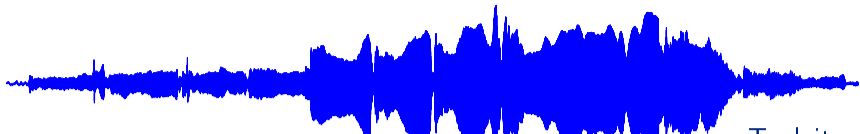
Töne

Tonleiter c-dur



Frequenzen dieser Aufnahme

Ton	Frequenz	Quotient
c''	522 Hz	
d''	584 Hz	1,119
e''	646 Hz	1,106
f''	686 Hz	1,063
g''	772 Hz	1,126
a''	869 Hz	1,125
h''	974 Hz	1,121
c'''	1023 Hz	1,050



Töne

Tonleiter c-dur

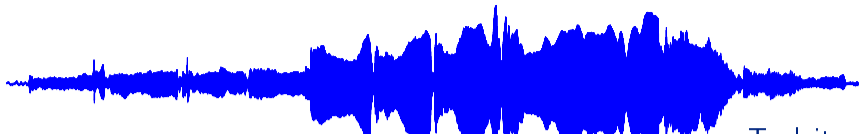


Frequenzen dieser Aufnahme

.2

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Töne

Tonleiter c-dur



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·2

$$\sqrt[12]{2}$$

$$\sqrt[6]{2}$$



Tonleiter c-dur



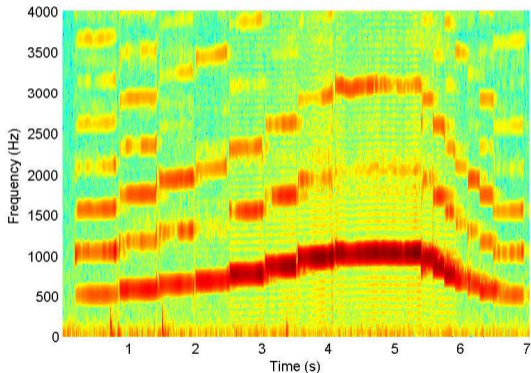
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c'''	1023 Hz	1,050

$\cdot 2$ (indicated by a blue bracket on the left side of the table, spanning from c'' to c''')

$\sqrt[12]{2}$ (indicated by a red box on the right side of the table, spanning from d'' to h'')

$\sqrt[6]{2}$ (indicated by a red box on the right side of the table, spanning from a'' to c''')



Starte LiveRecording



Wie kann man Rock/Pop/Klassik unterscheiden?



Rock

Scorpions - Tease Me, Please Me

Pop

Stromae - Papaoutai

Klassik

Edvard Grieg - Peer Gynt - Suite No. 1, Op. 46

<http://www.youtube.com/v/VBHQr09lTgY>

<http://www.youtube.com/v/d5X4iAAE0uU>

<http://www.youtube.com/v/ZAiEPUu0i04>



Rock

Scorpions - Tease Me, Please Me

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Gesang, E-Gitarre, Bassgitarre und Schlagzeug
Keyboard

Chor, Orchester
Klavier, Streicher, Blasinstr.

Rock

Scorpions - Tease Me, Please Me

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Gesang, E-Gitarre, Bassgitarre und Schlagzeug
Keyboard

Chor, Orchester
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Aggressivität
Strophe/Refrain

komplexer Aufbau
Dynamik, Hauptmotiv

Rock

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Gesang, E-Gitarre, Bassgitarre und Schlagzeug
Keyboard

Chor, Orchester
Klavier, Streicher, Blasinstr.

Strophe/Refrain

Aggressivität
dominante Gitarren

sanfter melodiebetonter Gesang

komplexer Aufbau

Dynamik, Hauptmotiv

Charakter eines Musikstücks

Tempo	Tongeschlecht
Takt	Klangfarbe (Instrumentation)
Metrum	Harmonik
Rhythmus	Artikulation
Dynamik	Melodik
Tonhöhe	

A Zeit fließt dahin



B Grundsclag: gleichmäßige Impulse



C Takt: Gruppierung von Grundsclägen
(hier: 4er-Takt)



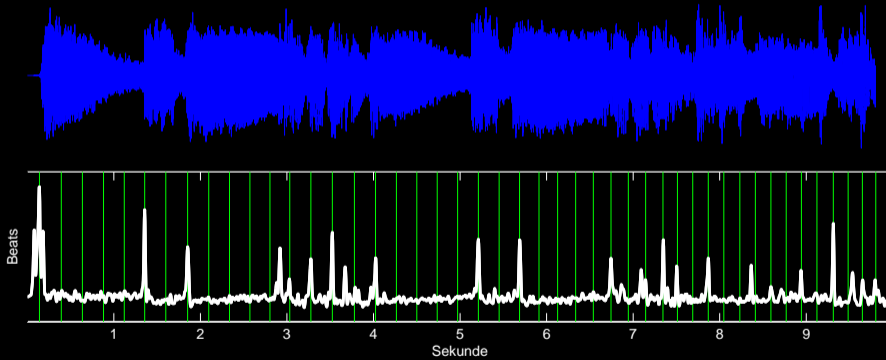
D Metrum: Betonungsordnung
(hier: schwer, leicht, halbschwer, ganz leicht)



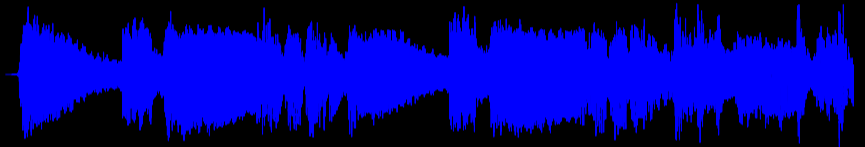
E Rhythmus: Akzentmuster über Takt/Metrum
(hier: Beispielrhythmus)



The Black Keys - Stop Stop

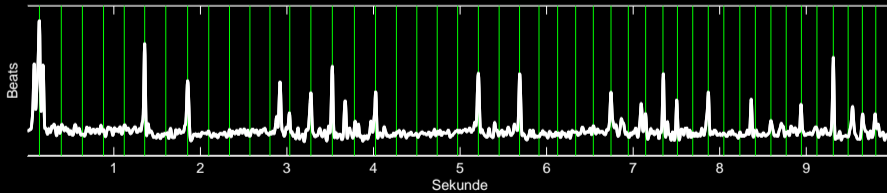


The Black Keys - Stop Stop

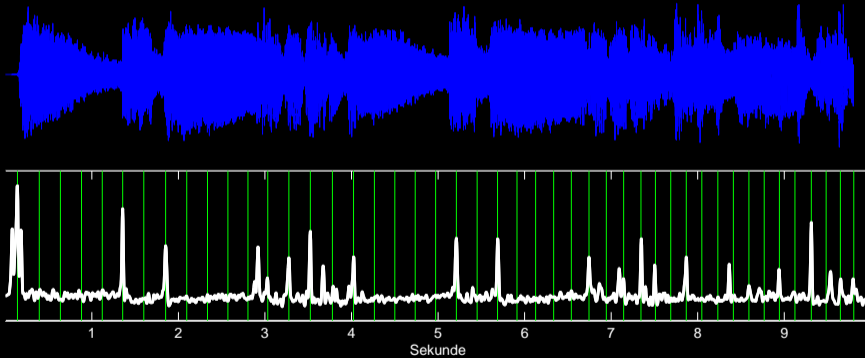


Bpm: 250

*Tempo in Bpm:
62.5 (63%), 125 (37%)*



The Black Keys - Stop Stop



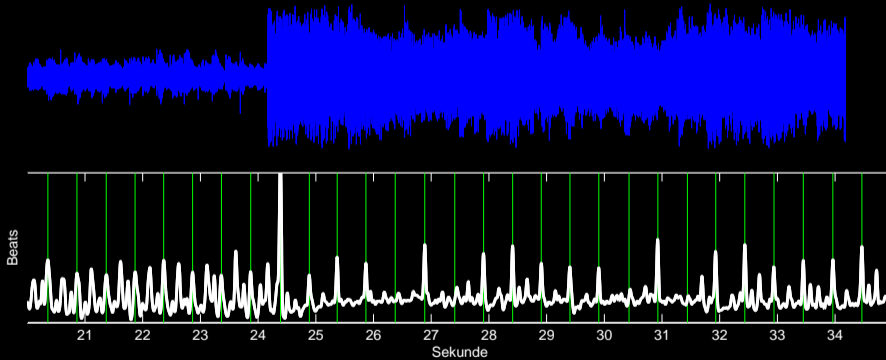
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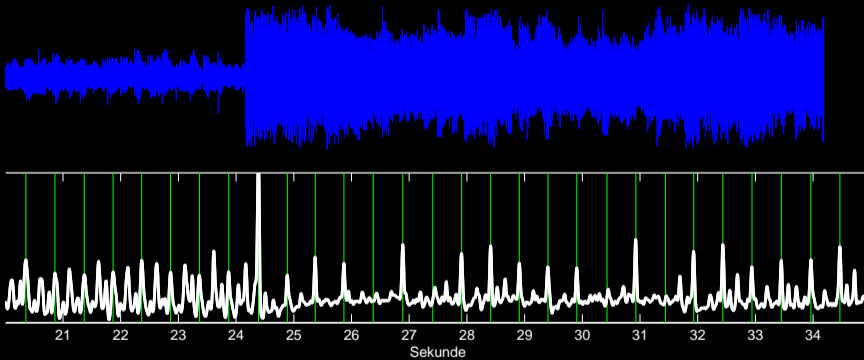
*Acoustic Complexity:
6733*

*Acoustic Evenness:
0.26*

Other Lives - Tamer Animals



Other Lives - Tamer Animals

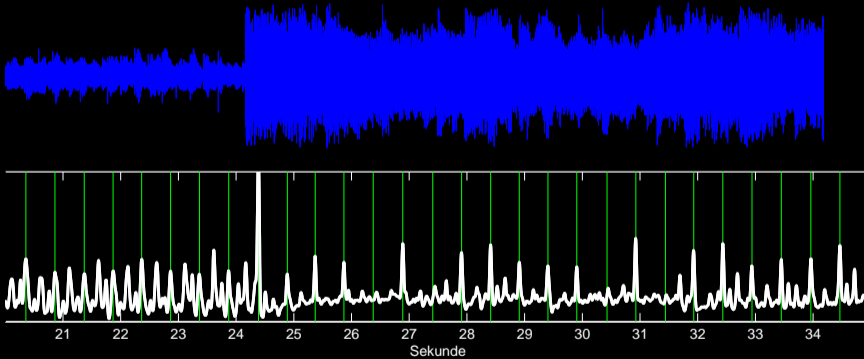


Bpm: 119

Tempo in Bpm:

59.5 (39%), 119 (61%)

Other Lives - Tamer Animals



Bpm: 119

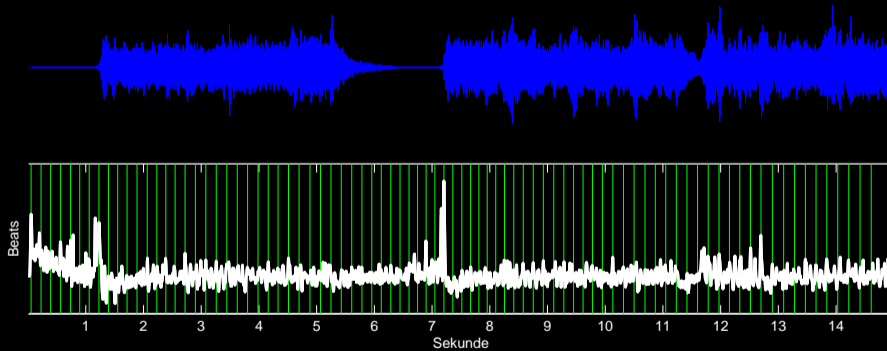
*Tempo in Bpm:
59.5 (39%), 119 (61%)*

*Acoustic Complexity:
8824*

*Acoustic Evenness:
0.39*

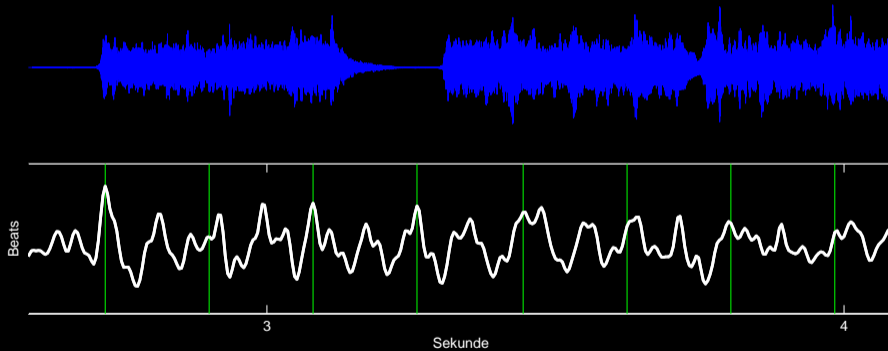
*The Four Seasons (Vivaldi) by John Harrison with the Wichita State University
Chamber Players*

Vier Jahreszeiten - Sommer



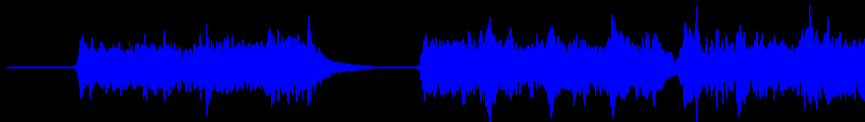
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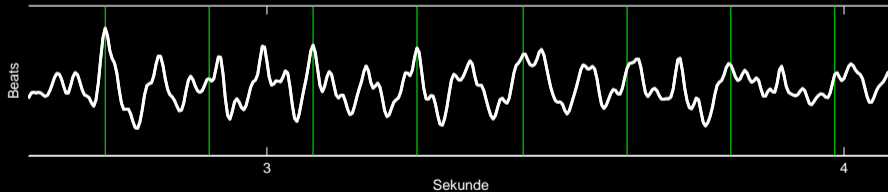


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Vier Jahreszeiten - Sommer

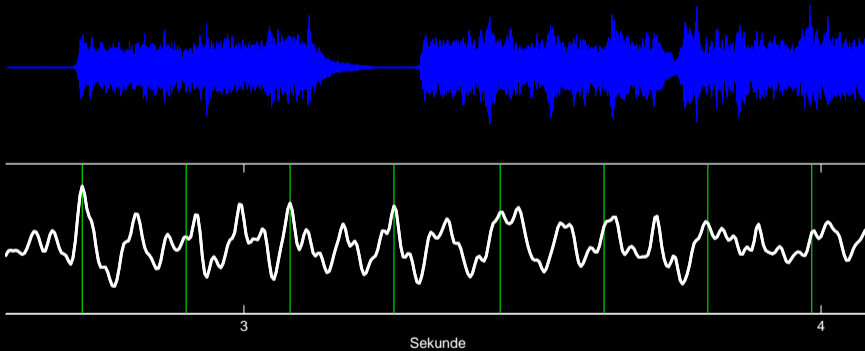


Bpm: 312.5



*The Four Seasons (Vivaldi) by John Harrison with the Wichita State University
Chamber Players*

Vier Jahreszeiten - Sommer



Bpm: 312.5

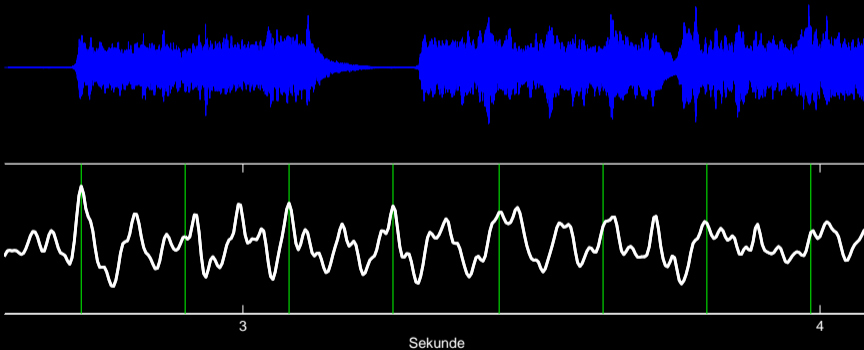
Tempo in Bpm:

77.3 (27%), 154.6 (73%)



*The Four Seasons (Vivaldi) by John Harrison with the Wichita State University
Chamber Players*

Vier Jahreszeiten - Sommer



Bpm: 312.5

Tempo in Bpm:

77.3 (27%), 154.6 (73%)

Acoustic Complexity:
4933

Acoustic Evenness:
0.60



Es gibt objektive Kriterien, nach denen sich Musik klassifizieren lässt.
Kenntnisse von Mathematik und Programmierung sind für Berechnungen nötig.
Wir haben die Möglichkeit kennen gelernt Tonhöhen zu bestimmen.



labrosa-coversongid



soundecology, tuneR

Vielen Dank für Euer Kommen!

Die Folien zum nachlesen/nachhören:

`www.math-inf.uni-greifswald.de/~vollmer`

8. Greifswalder

Kinder
und
Jugend
Uni

