



KORT 1.4.0

by zplane.development

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July 9, 2019

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# 1 Kort Documentation

## 1.1 Introduction

Kort is zplane's chord recognition SDK. It analyzes the harmonic content of a music signal and outputs a sequence of chords with corresponding time stamps. Kort assumes that the input signal contains music in Western tonality with 12 pitches per octave (C, C#, D,..., B) and in equal temperament. It furthermore assumes that the music contains simultaneously sounding notes that form musical chords consisting of three to four different pitches.

Each chord in the output chord sequence is specified by a root pitch (e.g. C, C#, D, ...) and a chord type (e.g. major, minor, diminished, 7, ...). The output also provides information about the pitch classes contained in a chord (e.g. "C, E and G" in a C major chord). For each chord in the resulting chord sequence, the user can retrieve a list of alternative chords together with corresponding probabilities.

Kort can be used in three different modes: A basic mode that outputs only major and minor chords, and an extended mode that outputs a larger set of chord types containing between three and four pitches, and a custom mode in which users can define their own set of chords.

Chords can be aligned with beat times. Zplane's [aufTAKT] beat tracking SDK seamlessly integrates with Kort, but the algorithm can also be provided with beat information from a different source such as a fixed beat grid. Likewise, the tuning frequency of the input signal can be specified manually if this information is available.

Kort is an offline process which means it requires the complete audio file as input and outputs the chord sequence result only after the file has been processed in its entirety. It is *not* an online or real-time chord recognition system. In extended mode the algorithm is able to process audio files approx. 40 times faster than realtime on a 64-bit 2.5 GHz processor. The minimum sample rate is 16 kHz. There is no restriction on the number of input channels.

The project contains the required libraries for the operating system Kort was licensed for with the appropriate header files. An example application illustrates the functionality of this SDK.

This document is structured as follows: The first part contains the API documentation of the Kort SDK. The API documentation contains naming conventions and function descriptions of the C++-API. In the second part, a detailed explanation of the example application is provided.

### 1.1.1 What's new

v1.4: added feature to boost the probability of chord in a given key, added clean up feature, that summerizes successive chords of the same type (eg. Dmaj, Dmaj7, D6 to Dmaj).

### 1.1.2 Naming Conventions

The following naming conventions are used throughout this manual: A **frame** denotes the number of audio samples per channel, i.e. 512 stereo frames correspond to 1024 float values (samples).

A **pitch class** describes the name of a pitch independent of the octave it occurred in. In other words, notes with pitches at *C0*, *C1*, *C2*, etc. all belong to pitch class *C*.

The **root pitch** refers to the pitch class of the root of the chord, i.e. the root pitch of a *C major* chord is pitch class *C*.

A **chord type** is defined as a set of intervals above a root. The chord type *major*, for example, consists of the intervals: *unison*, *major third*, and *fifth*.

**Chords** consists of a *root pitch* and a chord type, e.g. *C major*.

A **chord dictionary** or simply **dictionary** is a set of chord types. The dictionary [KortIf::majorMinor](#) for example consists of the chord types *major* and *minor*.

## 1.2 API Documentation

The analysis consists of two stages: a pre-processing stage in which the audio is analyzed, and a processing stage that carries out the actual chord estimation.

The pre-processing stage is based on the push principle: successive blocks of input audio frames are pushed into the [KortIf::PreProcess\(\)](#) function. It finishes by calling [KortIf::FinishPreProcess\(\)](#) after the audio file has been entirely pushed into [KortIf::PreProcess\(\)](#). The [KortIf::Process\(\)](#) function is called subsequently and results can be obtained by calling [KortIf::GetResult\(\)](#).

### 1.2.1 Memory Allocation

The Kort SDK does not allocate any buffers handled by the calling application. The input buffer as well as the result objects have to be allocated/created by the calling application.

### 1.2.2 Instance Control Functions

- **static ErrorType KortIf::CreateInstance (KortIf\*& pCKortIf, float fSampleRate, int iFileSizeInFrames, int iNumOfChannels)**  
Creates a new instance of Kort. The handle to the new instance is returned in parameter pCKortIf. fSampleRate and iNumChannels denote the input samplerate and number of channels, respectively. The expected length of the input file in frames is provided by the argument iFileSizeInFrames. This value is used to initialize internal buffers required for the chord estimation. It is possible to push more frames into [KortIf::PreProcess\(\)](#) than initially specified, but this will cause further memory allocations during [KortIf::PreProcess\(\)](#). The function returns an error code (see [KortIf::ErrorType](#)). A call to this function is mandatory.
- **static ErrorType DestroyInstance (KortIf\*& pCKortIf)**  
Destroys the Kort instance provided by pCKortIf. The function returns an error

code (see [KortIf::ErrorType](#)). A call to this function is mandatory.

### 1.2.3 Parameter Setting Functions

- **ErrorType [KortIf::SetChordDictionaryType](#) (ChordDictionaryType eChordDict)**  
Sets the chord dictionary Kort will use (see [KortIf::ChordDictionaryType](#)). This function is optional but it needs to be called before [KortIf::Process\(\)](#). The default dictionary is `KortIf::ChordDictionaryType::extended`.
- **ErrorType [SetCustomChordDictionary](#) (const KortDictionaryIf\* const pDictionary)**  
Sets a custom chord dictionary. To initialize the dictionary please refer to the interface [KortDictionaryIf](#).
- **ErrorType [KortIf::SetTuningFrequency](#) (float fTuningFrequency)**  
Sets the tuning frequency of the input audio. When called before [KortIf::PreProcess\(\)](#), this will bypass the internal tuning frequency estimation which will lead to overall shorter processing times.
- **ErrorType [KortIf::SetBassWeight](#) (float fBassWeight)**  
Sets the weight of the estimated bass pitches against the estimate of the remaining chord notes. The value must be in the range between 0 and 1. A value of 0 means that the chord estimation is done without bass estimation, a value of 1 means that only the bass (and no other pitches) is taken into account for the chord estimation. The default value is 0.35.

### 1.2.4 Processing Functions

- **ErrorType [KortIf::PreProcess](#) (float const const \*const ppfInputBuffer, int iNumberOfFrames)**  
*Pre-processing function. ppfInputBuffer is an array of pointers to the audio data. ppfInputBuffer[0] is a pointer to the data of the first channel, ppfInputBuffer[1] points to the data of the second channel etc. iNumberOfFrames specifies the number of frames, i.e. the number of samples in each channel. This function can repeatedly be called with successive chunks of audio until the entire signal has been pushed into Kort. This function will return an error if it is called after [KortIf::FinishPreProcess\(\)](#) has been called.*
- **ErrorType [KortIf::FinishPreProcess\(\)](#)**  
*This function has to be called after all audio frames have been pushed into Kort by [KortIf::PreProcess\(\)](#). It can (and needs to) be called only once and will return an error if called before [KortIf::PreProcess\(\)](#) or after [KortIf::Process\(\)](#).*
- **ErrorType [KortIf::Process](#)(const CaufTAKTResultIf const pBeatResult = nullptr)**  
*This function does the actual chord estimation. It can be called without any input arguments, in which case the algorithm will figure out the chord boundaries by itself. If a CaufTAKTResultIf beat info object is provided, Kort will use this information to match the chord boundaries with the provided beat times. This function has to be called after [KortIf::FinishPreProcess\(\)](#).*

### 1.2.5 Result Retrieving Function

- **ErrorType** `KortIf::GetResult (KortResultIf *pCResult)`  
*Returns the chord sequence as a KortResultIf object. The KortResultIf object needs to be instantiated first before it is passed to this function. This function can only be called after KortIf::Process() has been called.*
- **ErrorType** `KortIf::GetTuningFrequency (float& fTuningFrequency)`  
*Returns the estimated tuning frequency. This function can only be called after the preprocessing stage.*

## 1.3 Command Line Usage Example

*The command line example can be executed by the following command*

```
KortCl -i <inputFile> -r <chordResultFile>
```

*The complete code can be found in the example source file KortClMain.cpp.*

*In the first step, we declare a KortIf pointer and a KortResultIf pointer and create an instance of the KortIf class:*

```
KortIf*          pInstanceHandle = 0;
KortResultIf*    pResult          = 0;

eError = KortIf::CreateInstance (pInstanceHandle,
                                inputFile.GetSampleRate(),
                                inputFile.GetFileSize(),
                                inputFile.GetNumOfChannels());
```

*We can select a chord dictionary as follows:*

```
pInstanceHandle->SetChordDictionaryType (
    KortIf::extended);
```

*We can set the tuning frequency of the input file in case this information is available. It is advisable to do this immediately after instance creation.*

```
// set tuning frequency (optional)
//pInstanceHandle->SetTuningFrequency (fTuningFreq);
```

*We then read chunks of data from our input file,*

```
while (bReadNextFrame)
{
    // read audio data
    int iNumFramesRead (inputFile.Read (ppfInput, kBlockSize));

    if(iNumFramesRead < kBlockSize)
    {
        for (int ch = 0; ch < inputFile.GetNumOfChannels(); ch++)
            memset(&ppfInput[ch][iNumFramesRead], 0, (kBlockSize-iNumFramesRead)*sizeof(float));
        bReadNextFrame = false;
    }
}
```

*And push each chunk into our PreProcess() function.*

```
// preprocessing
clStartTime = clock();
eError = pInstanceHandle->PreProcess (ppfInput, iNumFramesRead);
}
```

*After the entire file has been read and pushed into Kort, we call `FinishPreProcess()` once to terminate the preprocessing stage*

```
eError = pInstanceHandle->FinishPreProcess();
```

*The bass weight can be set by calling `SetBassWeight()`*

```
// set bass weight (optional)
//pInstanceHandle->SetBassWeight (0.1f);
```

*We then call Kort's process function:*

```
eError = pInstanceHandle->Process ();
```

*If beat information is available we could provide Kort with a `CaufTAKTResultIf*`*

```
//eError = pInstanceHandle->Process (pCBeatResult); // beat results can optionally be provided
```

*To obtain the resulting chord sequence, we create an instance of `KortResultIf`,*

```
// create results instance
if (KortResultIf::CreateInstance (pResult) == false)
```

*and call Kort's `GetResult()` function*

```
// get chord results
pInstanceHandle->GetResult (pResult);
```

*We can access the individual chords of the resulting chord sequence (e.g. in order to print them on the command line) as well as a list of alternative chords:*

```
cout << "Printing Results!" << endl;

float fTuningFreq;
pInstanceHandle->GetTuningFrequency (fTuningFreq);
cout << "Tuning frequency: " << fTuningFreq << endl;

for (int i = 0; i < pResult->GetNumEntries (); i++)
{
    const KortResultIf::ChordSequenceElement element = pResult->
GetEntry (i);
    cout << element.GetChord().GetName() << " ";

    // get alternative chords for the current entry
    //std::vector<KortResultIf::ChordSequenceElement> alternativeChords =
pResult->GetAlternativeChords (i);
}
cout << endl;
```

*Finally we destroy the `KortIf` instance and eventually the `KortResultIf` instance*

```
KortResultIf::DestroyInstance (pCResult);
KortIf::DestroyInstance (pInstanceHandle);
```

*The above code snippets demonstrated the basic functionality of the Kort library.*



## 1.4 Support

*Support for the source code is - within the limits of the agreement - available from:*

zplane.development GmbH & Co KG  
grunewaldstr. 83  
d-10823 berlin  
germany

fon: +49.30.854 09 15.0

fax: +49.30.854 09 15.5

@: [info@zplane.de](mailto:info@zplane.de)

## 2 Namespace Index

### 2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

<b>KortGlobals</b>	
Global defines and class interfaces	8

## 3 Class Index

### 3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

<b>KortGlobals::Chord</b>	
Class representing a musical chord	10
<b>KortResultIf::ChordSequenceElement</b>	
Class representing an element of a resulting chord sequence	11
<b>KortGlobals::Key</b>	
Class representing a musical key	13
<b>KortDictionaryIf</b>	
Interface class for a chord dictionary	14
<b>KortIf</b>	
Interface class for the Kort SDK	17
<b>KortResultIf</b>	
Interface class for the resulting chord sequence	22

## 4 File Index

### 4.1 File List

Here is a list of all files with brief descriptions:

<a href="#">KortDictionaryIf.h</a> Interface of the <a href="#">KortDictionaryIf</a> class	24
<a href="#">KortGlobalsIf.h</a> Interface of the <a href="#">KortGlobals</a> namespace	25
<a href="#">KortIf.h</a> Interface of the <a href="#">KortIf</a> class	25
<a href="#">KortResultIf.h</a> Interface of the <a href="#">KortResultIf</a> class	26

## 5 Namespace Documentation

### 5.1 KortGlobals Namespace Reference

Global defines and class interfaces.

#### Classes

- class [Chord](#)  
*Class representing a musical chord.*
- class [Key](#)  
*Class representing a musical key.*

#### Enumerations

- enum [PitchClass](#) {  
noPitch = -1, C, CSharp, D,  
DSharp, E, F, FSharp,  
G, GSharp, A, ASharp,  
B }
- enum [ChordType](#) {  
noChord, major, minor, diminished,  
augmented, majorSeventh, minorSeventh, seventh,  
diminishedSeventh, halfDiminishedSeventh, majorSixth, minorSixth,  
numChordTypes }
- enum [KeyType](#) { majorKey, minorKey }

#### Variables

- static const int [numPitchClasses](#) = 12

### 5.1.1 Enumeration Type Documentation

**PitchClass** enum `KortGlobals::PitchClass`  
Pitch classes

Enumerator

noPitch	
C	
CSharp	
D	
DSharp	
E	
F	
FSharp	
G	
GSharp	
A	
ASharp	
B	

**ChordType** enum `KortGlobals::ChordType`  
Chord types

Enumerator

noChord	
major	
minor	
diminished	
augmented	
majorSeventh	
minorSeventh	
seventh	
diminishedSeventh	
halfDiminishedSeventh	
majorSixth	
minorSixth	
numChordTypes	

**KeyType** enum `KortGlobals::KeyType`  
Key types

Enumerator

majorKey	
minorKey	

## 5.1.2 Variable Documentation

**numPitchClasses** `const int KortGlobals::numPitchClasses = 12 [static]`

# 6 Class Documentation

## 6.1 KortGlobals::Chord Class Reference

Class representing a musical chord.

```
#include <KortGlobalsIf.h>
```

Collaboration diagram for KortGlobals::Chord:

### Public Member Functions

- `Chord ()`
- `Chord (PitchClass rootPitch, ChordType chordType)`
- `Chord (const Chord &other)`
- `Chord (Impl *pImpl)`
- `~Chord ()`
- `Chord & operator= (const Chord &rhs)`
- `const bool operator== (const Chord &rhs) const`
- `const bool operator!= (const Chord &rhs) const`
- `PitchClass GetRootPitch () const`
- `ChordType GetChordType () const`
- `std::vector< PitchClass > GetPitches () const`
- `std::string GetName () const`

### 6.1.1 Constructor & Destructor Documentation

**Chord()** [1/4] `KortGlobals::Chord::Chord ( )`  
Constructs an empty chord object.

**Chord()** [2/4] `KortGlobals::Chord::Chord (`  
`PitchClass rootPitch,`  
`ChordType chordType )`  
Constructs a chord with a given rootPitch and chordType.

**Chord()** [3/4] `KortGlobals::Chord::Chord ( const Chord & other )`

Constructs a copy of the provided chord.

**Chord()** [4/4] `KortGlobals::Chord::Chord ( Impl * pImpl )`

Constructs a chord given an existing implementation. This constructor is only for internal use.

**~Chord()** `KortGlobals::Chord::~Chord ( )`

Destroys a chord object.

### 6.1.2 Member Function Documentation

**operator=()** `Chord& KortGlobals::Chord::operator= ( const Chord & rhs )`

Assignment operator.

**operator==()** `const bool KortGlobals::Chord::operator== ( const Chord & rhs ) const`

Equality operator.

**operator!=()** `const bool KortGlobals::Chord::operator!= ( const Chord & rhs ) const`

Inequality operator.

**GetRootPitch()** `PitchClass KortGlobals::Chord::GetRootPitch ( ) const`

Returns the pitch class of the root of the chord.

**GetChordType()** `ChordType KortGlobals::Chord::GetChordType ( ) const`

Returns the chord type of the chord.

**GetPitches()** `std::vector<PitchClass> KortGlobals::Chord::GetPitches ( ) const`

Returns the pitch classes of the chord.

**GetName()** `std::string KortGlobals::Chord::GetName ( ) const`

Returns the name string of the chord in the format `<rootPitch>:<chordType>`.

The documentation for this class was generated from the following file:

- [KortGlobalsIf.h](#)

## 6.2 KortResultIf::ChordSequenceElement Class Reference

Class representing an element of a resulting chord sequence.

```
#include <KortResultIf.h>
```

Collaboration diagram for `KortResultIf::ChordSequenceElement`:

## Public Member Functions

- `ChordSequenceElement` (const `ChordSequenceElement` &)
- `ChordSequenceElement` (Impl \*pImpl)
- `~ChordSequenceElement` ()
- `ChordSequenceElement` & operator= (const `ChordSequenceElement` &rhs)
- float `GetStartTimeInS` () const
- const `KortGlobals::Chord` `GetChord` () const
- float `GetProbability` () const
- bool `IsValid` () const

### 6.2.1 Constructor & Destructor Documentation

**ChordSequenceElement()** [1/2] `KortResultIf::ChordSequenceElement::ChordSequenceElement` ( const `ChordSequenceElement` & )  
Copy constructor. For internal use only.

**ChordSequenceElement()** [2/2] `KortResultIf::ChordSequenceElement::ChordSequenceElement` ( Impl \* pImpl )  
Constructor for a given implementation. For internal use only.

**~ChordSequenceElement()** `KortResultIf::ChordSequenceElement::~ChordSequenceElement` ( )  
Destructor.

### 6.2.2 Member Function Documentation

**operator=()** `ChordSequenceElement` & `KortResultIf::ChordSequenceElement::operator=` ( const `ChordSequenceElement` & rhs )  
Assignment operator.

**GetStartTimeInS()** float `KortResultIf::ChordSequenceElement::GetStartTimeInS` ( ) const  
Returns the start time of the chord in seconds.

**GetChord()** const `KortGlobals::Chord` `KortResultIf::ChordSequenceElement::GetChord` ( ) const  
Returns the chord of this sequence element.

**GetProbability()** float `KortResultIf::ChordSequenceElement::GetProbability` ( ) const  
Returns the probability of this sequence element.

**IsValid()** `bool KortResultIf::ChordSequenceElement::IsValid ( ) const`  
Checks if this sequence element is valid.

The documentation for this class was generated from the following file:

- [KortResultf.h](#)

## 6.3 KortGlobals::Key Class Reference

Class representing a musical key.

```
#include <KortGlobalsIf.h>
```

Collaboration diagram for KortGlobals::Key:

### Public Member Functions

- [Key \(\)](#)
- [Key \(PitchClass rootPitch, KeyType keyType\)](#)
- [Key \(const Key &other\)](#)
- [Key \(Impl \\*pImpl\)](#)
- [~Key \(\)](#)
- [Key & operator= \(const Key &rhs\)](#)
- [const bool operator== \(const Key &rhs\) const](#)
- [const bool operator!= \(const Key &rhs\) const](#)
- [PitchClass GetRootPitch \(\) const](#)
- [KeyType GetKeyType \(\) const](#)
- [std::string GetName \(\) const](#)

### 6.3.1 Constructor & Destructor Documentation

**Key()** [1/4] `KortGlobals::Key::Key ( )`  
Constructs an empty key object.

**Key()** [2/4] `KortGlobals::Key::Key (`  
`PitchClass rootPitch,`  
`KeyType keyType )`  
Constructs a key with a given rootPitch and keyType.

**Key()** [3/4] `KortGlobals::Key::Key (`  
`const Key & other )`  
Constructs a copy of the provided key.

**Key()** [4/4] `KortGlobals::Key::Key (`  
`Impl * pImpl )`  
Constructs a key given an existing implementation. This constructor is only for internal use.

**~Key()** `KortGlobals::Key::~Key ( )`  
Destroys a key object.

### 6.3.2 Member Function Documentation

**operator=()** `Key& KortGlobals::Key::operator= ( const Key & rhs )`

Assignment operator.

**operator==()** `const bool KortGlobals::Key::operator== ( const Key & rhs ) const`

Equality operator.

**operator!=()** `const bool KortGlobals::Key::operator!= ( const Key & rhs ) const`

Inequality operator.

**GetRootPitch()** `PitchClass KortGlobals::Key::GetRootPitch ( ) const`  
Returns the pitch class of the root of the key.

**GetKeyType()** `KeyType KortGlobals::Key::GetKeyType ( ) const`  
Returns the key type of the key.

**GetName()** `std::string KortGlobals::Key::GetName ( ) const`  
Returns the name string of the key in the format <rootPitch>:<keyType>.  
The documentation for this class was generated from the following file:

- [KortGlobalsIf.h](#)

### 6.4 KortDictionaryIf Class Reference

Interface class for a chord dictionary.

```
#include <KortDictionaryIf.h>
```

Collaboration diagram for KortDictionaryIf:

#### Public Types

- enum `ErrorType` {  
    `noError`, `memError`, `likelihoodOutOfRangeError`, `invalidChordError`,  
    `chordNotInDictionaryError`, `numErrors` }

#### Public Member Functions

- virtual `ErrorType AddChord` (const `KortGlobals::Chord` &chord, float fLikelihood)=0
- virtual int `GetNumChords` ( ) const =0
- virtual const `KortGlobals::Chord GetChord` (int iIndex) const =0
- virtual float `GetLikelihood` (int iIndex) const =0



### Static Public Member Functions

- static `ErrorType CreateInstance (KortDictionaryIf *&pKortDictionary)`
- static void `DestroyInstance (KortDictionaryIf *&pKortDictionary)`

### Protected Member Functions

- virtual `~KortDictionaryIf ()`

### 6.4.1 Member Enumeration Documentation

**ErrorType** enum `KortDictionaryIf::ErrorType`  
Error codes

Enumerator

<code>noError</code>	no error occurred
<code>memError</code>	memory allocation failed
<code>likelihoodOutOfRangeError</code>	likelihood argument is invalid
<code>invalidChordError</code>	combination of rootPitch and chordType is invalid
<code>chordNotInDictionaryError</code>	chord is not part of the dictionary
<code>numErrors</code>	

### 6.4.2 Constructor & Destructor Documentation

`~KortDictionaryIf()` virtual `KortDictionaryIf::~~KortDictionaryIf ()` [inline],  
[protected], [virtual]

### 6.4.3 Member Function Documentation

**CreateInstance()** static `ErrorType KortDictionaryIf::CreateInstance (`  
`KortDictionaryIf *& pKortDictionary )` [static]

Creates an instance of the Kort dictionary class.

Parameters

<code>pKortDictionary</code>	reference to Kort dictionary instance pointer
------------------------------	---

**DestroyInstance()** static void `KortDictionaryIf::DestroyInstance (`  
`KortDictionaryIf *& pKortDictionary )` [static]

Destroys an instance of the Kort dictionary class.

Parameters

<i>pKortDictionary</i>	reference to Kort dictionary instance pointer
------------------------	---

**AddChord()** virtual `ErrorType` KortDictionaryIf::AddChord ( const `KortGlobals::Chord` & *chord*, float *fLikelihood* ) [pure virtual]

Adds a single chord to the chord dictionary.

Parameters

<i>chord</i>	Chord to add
<i>fLikelihood</i>	Likelihood of the chord given in the range [0, ..., 1]

**GetNumChords()** virtual int KortDictionaryIf::GetNumChords ( ) const [pure virtual]

Returns the number of chords in the dictionary

**GetChord()** virtual const `KortGlobals::Chord` KortDictionaryIf::GetChord ( int *iIndex* ) const [pure virtual]

Returns the chord from the dictionary at a specific sequence index.

Parameters

<i>iIndex</i>	Index of the chord in the dictionary. It must be in the range [0, ..., <a href="#">GetNumChords()-1</a> ]
---------------	---

**GetLikelihood()** virtual float KortDictionaryIf::GetLikelihood ( int *iIndex* ) const [pure virtual]

Returns the likelihood of a chord from the dictionary at a specific index.

Parameters

<i>iIndex</i>	Index of the chord in the dictionary. It must be in the range [0, ..., <a href="#">GetNumChords()-1</a> ]
---------------	---

The documentation for this class was generated from the following file:

- [KortDictionaryIf.h](#)

## 6.5 KortIf Class Reference

Interface class for the Kort SDK.

```
#include <KortIf.h>
```

Collaboration diagram for KortIf:

### Public Types

- enum [ErrorType](#) {  
    [noError](#), [memError](#), [invalidFunctionParamError](#), [invalidFunctionCallError](#),  
    [notInitializedError](#), [notPreProcessedError](#), [notProcessedError](#), [invalidDataChunk](#),  
    [numErrors](#) }
- enum [VersionType](#) { [major](#), [minor](#), [patch](#), [revision](#) }
- enum [ChordDictionaryType](#) { [majorMinor](#), [extended](#), [custom](#) }

### Public Member Functions

- virtual [ErrorType](#) [SetTuningFrequency](#) (float fTuningFrequency)=0
- virtual [ErrorType](#) [SetKey](#) ([KortGlobals::Key](#) key, float fStrictness=0.038)=0
- virtual [ErrorType](#) [SetBassWeight](#) (float fBassWeight)=0
- virtual [ErrorType](#) [SetChordDictionaryType](#) ([ChordDictionaryType](#) eChordDict)=0
- virtual [ChordDictionaryType](#) [GetChordDictionaryType](#) () const =0
- virtual [ErrorType](#) [SetCustomChordDictionary](#) (const [KortDictionaryIf](#) \*const p↔  
Dictionary)=0
- virtual [ErrorType](#) [PreProcess](#) (float const \*const \*const ppfInputBuffer, int i↔  
NumberOfFrames)=0
- virtual [ErrorType](#) [FinishPreProcess](#) ()=0
- virtual [ErrorType](#) [Process](#) (const [CaufTAKTRResultIf](#) \*const pBeatResult=0)=0
- virtual [ErrorType](#) [GetResult](#) ([KortResultIf](#) \*pCResult, bool bChordSmoothing=false)  
const =0
- virtual [ErrorType](#) [GetTuningFrequency](#) (float &fTuningFrequency)=0
- virtual void [GetDataChunk](#) (void \*pPreAllocatedDataChunk)=0
- virtual size\_t [GetDataChunkSizeInBytes](#) ()=0
- virtual [ErrorType](#) [SetDataChunk](#) (void \*pDataChunk, int iDataChunkSizeIn↔  
Bytes)=0

### Static Public Member Functions

- static const int [GetVersion](#) (const [VersionType](#) eVersionIdx)
- static const char \* [GetBuildDate](#) ()
- static [ErrorType](#) [CreateInstance](#) ([KortIf](#) \*&pKortIf, float fSampleRate, int iFile↔  
SizeInFrames, int iNumOfChannels)
- static void [DestroyInstance](#) ([KortIf](#) \*&pKortIf)

### Protected Member Functions

- virtual [~KortIf](#) ()

### 6.5.1 Member Enumeration Documentation

**ErrorType** enum [KortIf::ErrorType](#)  
Error codes

Enumerator

noError	no error occurred
memError	memory allocation failed
invalidFunctionParamError	one or more function parameters are not valid
invalidFunctionCallError	function call not allowed at this stage
notInitializedError	instance has not been initialized yet
notPreProcessedError	instance has not been preprocessed yet
notProcessedError	instance has not been processed yet
invalidDataChunk	data chunk was invalid
numErrors	

**VersionType** enum [KortIf::VersionType](#)  
Version number

Enumerator

major	major version number
minor	minor version number
patch	patch version number
revision	revision number

**ChordDictionaryType** enum [KortIf::ChordDictionaryType](#)  
Chord dictionary

Enumerator

majorMinor	only major and minor chords
extended	dictionary containing triads and tetrads
custom	custom dictionary, return type only when custom dictionary is set

### 6.5.2 Constructor & Destructor Documentation

**~KortIf()** virtual KortIf::~~KortIf ( ) [inline], [protected], [virtual]

### 6.5.3 Member Function Documentation

**GetVersion()** static const int KortIf::GetVersion (   
const [VersionType](#) eVersionIdx ) [static]

Returns major version, minor version, patch and build number of this Kort version.

Parameters

<i>eVersionIdx</i>	requested version number part
--------------------	-------------------------------

Returns

version number part

**GetBuildDate()** static const char\* KortIf::GetBuildDate ( ) [static]

Returns the build date string.

**CreateInstance()** static [ErrorType](#) KortIf::CreateInstance (   
[KortIf](#) \*& pKortIf,   
float fSampleRate,   
int iFileSizeInFrames,   
int iNumOfChannels ) [static]

Creates an instance of Kort.

Parameters

<i>pKortIf</i>	reference to Kort instance pointer
<i>fSampleRate</i>	sample rate of input audio
<i>iFileSizeInFrames</i>	length of input audio in frames
<i>iNumOfChannels</i>	number of input audio channels

Returns

an error code, or 0 if no error occurred

**DestroyInstance()** static void KortIf::DestroyInstance (   
[KortIf](#) \*& pKortIf ) [static]

Destroys an instance of Kort.

Parameters

$p \leftarrow$ <i>KortIf</i>	reference to Kort instance pointer
---------------------------------	------------------------------------

**SetTuningFrequency()** virtual `ErrorType KortIf::SetTuningFrequency ( float fTuningFrequency ) [pure virtual]`

Sets the tuning frequency.

This function is optional. When called before the preprocessing stage it bypasses Kort's internal tuning frequency estimation which can speed up the computation.

**SetKey()** virtual `ErrorType KortIf::SetKey ( KortGlobals::Key key, float fStrictness = 0.038 ) [pure virtual]`

Sets the key.

Whether to prefer chords that are in detected key. This function is optional. The value "fStrictness" must be in range between 0 and 1.

Parameters

<i>key</i>	detected key of song
<i>fStrictness</i>	determines how much chords are preferred that are in the same key, default is 0.038.

**SetBassWeight()** virtual `ErrorType KortIf::SetBassWeight ( float fBassWeight ) [pure virtual]`

Sets the bass weight.

The bass weight controls the influence of the estimated bass pitches against the estimate of the remaining chord notes. The value must be in the range between 0 and 1. A value of 0 means that the chord estimation is done without bass estimation, a value of 1 means that only the bass (and no other pitches) is taken into account for the chord estimation.

This function is optional. The default value for the bass weight is 0.35.

**SetChordDictionaryType()** virtual `ErrorType KortIf::SetChordDictionaryType ( ChordDictionaryType eChordDict ) [pure virtual]`

Set the chord dictionary type.

The chord dictionary determines the types of chords that Kort can detect. The default value is `KortIf::ChordDictionaryType::extended`. `KortIf::ChordDictionaryType::custom` cannot be set; a custom dictionary has to be set by `KortIf::SetCustomChordDictionary`. The chord dictionary type needs to be set before calling `KortIf::Process()`.

**GetChordDictionaryType()** virtual `ChordDictionaryType` KortIf::GetChordDictionaryType ( ) const [pure virtual]

Returns the current chord dictionary type.

**SetCustomChordDictionary()** virtual `ErrorType` KortIf::SetCustomChordDictionary ( const KortDictionaryIf \*const pDictionary ) [pure virtual]

Sets a custom chord dictionary.

The dictionary needs to be set before calling `KortIf::Process()`.

**PreProcess()** virtual `ErrorType` KortIf::PreProcess ( float const \*const \*const ppfInputBuffer, int iNumberOfFrames ) [pure virtual]

Preprocesses a block of audio.

This function can be called multiple times in order to provide successive chunks of the input audio signal.

Parameters

<i>ppfInputBuffer</i>	pointer to the input data chunk. ppfInputBuffer[i] points to the i-th audio channel.
<i>iNumberOfFrames</i>	The number of audio samples in each audio channel of the provided input data chunk.

**FinishPreProcess()** virtual `ErrorType` KortIf::FinishPreProcess ( ) [pure virtual]

Terminates the preprocessing stage.

This function should only be called *once* after the last input frames have been provided by the PreProcess function. A call to this function is required before proceeding to the `Process()` function.

**Process()** virtual `ErrorType` KortIf::Process ( const CaufTAKTResultIf \*const pBeatResult = 0 ) [pure virtual]

Performs the chord estimation.

Performs the chord estimation. This function can only be called when the preprocessing stage has finished or a previously analyzed data chunk has been set.

Parameters

<i>pBeatResult</i>	pointer to beat information (optional). default is a null pointer, which means that no beat information is available.
--------------------	---

**GetResult()** virtual `ErrorType` KortIf::GetResult ( KortResultIf \* pCResult, bool bChordSmoothing = false ) const [pure virtual]

Returns resulting chord sequence.

Parameters

<i>bChordSmoothing</i>	whether to combine adjacent chords that have the same basic triad (optional).
------------------------	---

**GetTuningFrequency()** virtual `ErrorType` KortIf::GetTuningFrequency ( float & *fTuningFrequency* ) [pure virtual]

Returns the tuning frequency.

**GetDataChunk()** virtual void KortIf::GetDataChunk ( void \* *pPreAllocatedDataChunk* ) [pure virtual]

Returns internal analysis data after preprocessing in an pre-allocated memory chunk.

This can be used to save analysis data for later processing. The memory handling has to be done by the calling application. The size of pre-allocated memory can be retrieved by [GetDataChunkSizeInBytes\(\)](#)

**GetDataChunkSizeInBytes()** virtual `size_t` KortIf::GetDataChunkSizeInBytes ( ) [pure virtual]

Returns the length in bytes to be pre allocated in order to properly call `GetDataChunk`.

**SetDataChunk()** virtual `ErrorType` KortIf::SetDataChunk ( void \* *pDataChunk*, int *iDataChunkSizeInBytes* ) [pure virtual]

Set a saved data chunk in order to recover a previous pre-analysis state.

Parameters

<i>pDataChunk</i>	pointer to data chunk
<i>iDataChunkSizeInBytes</i>	size of the data chunk

Returns

`noError` if data recovery was performed without error, otherwise `invalidDataChunk`

The documentation for this class was generated from the following file:

- [KortIf.h](#)

## 6.6 KortResultIf Class Reference

Interface class for the resulting chord sequence.

```
#include <KortResultIf.h>
```

Collaboration diagram for KortResultIf:



## Classes

- class [ChordSequenceElement](#)

*Class representing an element of a resulting chord sequence.*

## Public Member Functions

- virtual int [GetNumEntries](#) () const =0
- virtual const [ChordSequenceElement](#) [GetEntry](#) (int iIndex) const =0
- virtual std::vector< [ChordSequenceElement](#) > [GetAlternativeChords](#) (int i↔EntryIndex) const =0

## Static Public Member Functions

- static bool [CreateInstance](#) ([KortResultIf](#) \*&pKortResultIf)
- static void [DestroyInstance](#) ([KortResultIf](#) \*&pKortResultIf)

## Protected Member Functions

- virtual [~KortResultIf](#) ()

### 6.6.1 Constructor & Destructor Documentation

[~KortResultIf\(\)](#) virtual KortResultIf::~~KortResultIf ( ) [inline], [protected], [virtual]

### 6.6.2 Member Function Documentation

[CreateInstance\(\)](#) static bool KortResultIf::CreateInstance ( [KortResultIf](#) \*& pKortResultIf ) [static]

Creates an instance of the Kort result class

Parameters

<i>pKort↔ResultIf</i>	Reference to Kort result instance pointer
-----------------------	---

Returns

true when the instance could be created, otherwise false

[DestroyInstance\(\)](#) static void KortResultIf::DestroyInstance ( [KortResultIf](#) \*& pKortResultIf ) [static]

Destroys a [KortResultIf](#) instance

Parameters

<i>pKort</i> ↔ <i>ResultIf</i>	Reference to Kort result instance pointer
-----------------------------------	---

**GetNumEntries()** `virtual int KortResultIf::GetNumEntries ( ) const [pure virtual]`

Returns the number of entries in the chord sequence of the Kort result instance

**GetEntry()** `virtual const ChordSequenceElement KortResultIf::GetEntry ( int iIndex ) const [pure virtual]`

Returns a chord sequence element at a given sequence index

**GetAlternativeChords()** `virtual std::vector<ChordSequenceElement> KortResult↔If::GetAlternativeChords ( int iEntryIndex ) const [pure virtual]`

Returns a list of alternative chords for a given chord sequence element.

Parameters

<i>iEntryIndex</i>	Sequence index of the target chord sequence element
--------------------	---

Returns

Vector of [ChordSequenceElement](#) objects in decreasing order of their probability.

The documentation for this class was generated from the following file:

- [KortResultIf.h](#)

## 7 File Documentation

### 7.1 docugen.txt File Reference

#### 7.1.1 Detailed Description

source documentation main file

### 7.2 KortDictionaryIf.h File Reference

interface of the [KortDictionaryIf](#) class.

```
#include "KortGlobalsIf.h"
```

Include dependency graph for KortDictionaryIf.h:

## 7.3 KortGlobalsIf.h File Reference

interface of the [KortGlobals](#) namespace.

```
#include <string>
#include <vector>
```

Include dependency graph for KortGlobalsIf.h: This graph shows which files directly or indirectly include this file:

### Classes

- class [KortGlobals::Chord](#)  
*Class representing a musical chord.*
- class [KortGlobals::Key](#)  
*Class representing a musical key.*

### Namespaces

- [KortGlobals](#)  
*Global defines and class interfaces.*

### Enumerations

- enum [KortGlobals::PitchClass](#) {  
[KortGlobals::noPitch](#) = -1, [KortGlobals::C](#), [KortGlobals::CSharp](#), [KortGlobals::D](#),  
[KortGlobals::DSharp](#), [KortGlobals::E](#), [KortGlobals::F](#), [KortGlobals::FSharp](#),  
[KortGlobals::G](#), [KortGlobals::GSharp](#), [KortGlobals::A](#), [KortGlobals::ASharp](#),  
[KortGlobals::B](#) }
- enum [KortGlobals::ChordType](#) {  
[KortGlobals::noChord](#), [KortGlobals::major](#), [KortGlobals::minor](#), [KortGlobals::diminished](#),  
[KortGlobals::augmented](#), [KortGlobals::majorSeventh](#), [KortGlobals::minorSeventh](#),  
[KortGlobals::seventh](#),  
[KortGlobals::diminishedSeventh](#), [KortGlobals::halfDiminishedSeventh](#), [KortGlobals::majorSixth](#),  
[KortGlobals::minorSixth](#),  
[KortGlobals::numChordTypes](#) }
- enum [KortGlobals::KeyType](#) { [KortGlobals::majorKey](#), [KortGlobals::minorKey](#)  
}

### Variables

- static const int [KortGlobals::numPitchClasses](#) = 12

#### 7.3.1 Detailed Description

:

## 7.4 KortIf.h File Reference

interface of the [KortIf](#) class.

```
#include "KortGlobalsIf.h"
```

Include dependency graph for KortIf.h:

## Classes

- class [KortIf](#)

*Interface class for the Kort SDK.*

### 7.4.1 Detailed Description

:

## 7.5 KortResultIf.h File Reference

interface of the [KortResultIf](#) class.

```
#include "KortGlobalsIf.h"
```

Include dependency graph for KortResultIf.h:

## Classes

- class [KortResultIf](#)

*Interface class for the resulting chord sequence.*

- class [KortResultIf::ChordSequenceElement](#)

*Class representing an element of a resulting chord sequence.*

### 7.5.1 Detailed Description

: