

Drawing out the true value of digitized music

Music-understanding technologies will open up a new future for musical experiences



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PRESTO

Researcher: "Information and Knowledge" (2000-2003)

CREST

Creation of Human-Harmonized Information Technology for Convivial Society

Research director: "Building a Similarity-aware Information Environment for a Content-Symbiotic Society" (2011-2016)

ACCEL

Research director: "Building Foundations and Developing Applications for Next-Generation Media Content Ecosystem Technologies" (2016-2020)

ACT-I

Research supervisor: "Information and Future" (2016-)

Dr. Goto and his team have launched a series of new cutting-edge music services that would be impossible without music-understanding technologies

With the digitization of music, people's everyday music-listening environments have been enhanced dramatically. Thanks to the popularization of music streaming and video-sharing services, vast arrays of music can be enjoyed anywhere at any time, making it easier to listen to music than ever before. However, this only represents a quantitative change, in which a large volume of music has been accumulated and made readily available.

Masataka Goto (a Prime Senior Researcher, ACCEL research director, and former CREST research director) and his team thought that the latent potential of digitized music has not yet been exploited and decided to work on bringing about a **future qualitative change with which a variety of different values could be produced based on the content (elements) of music**. To this end, they have taken on the challenge of developing cutting-edge "music-understanding technologies" to **draw out the true value of digitized music** by estimating musical elements from the audio signals of pieces of music and **allowing people to**

enjoy music in more active ways.

In 2012, for example, they, with the aim of opening up a path to the future of musical experience and based on many long years of research and development work into music-understanding technologies, developed and publicly launched an active music listening service called "Songle", which visualizes the musical elements of musical pieces. They then developed and publicly launched a series of other services such as "Songrium", a music browsing assistance service that makes visual representations of large arrays of music content and allows users to take a panoramic view of the music through visual representation, and "TextAlive", a service that allows users to easily create "lyric-based animations" to their own liking. Each of the services can be used by anyone who accesses the websites. The services make it possible to add further value to the vast online collections of music and provide **active musical appreciation/creation experiences that will deepen users' understanding of music.**

Songle, a service that can analyze music on the web and visualize its content while enabling users to jump to the chorus (hook)

Songle is a world-first service that, by utilizing "music-understanding technologies" developed by Dr. Goto and his team, allows people to gain a better understanding of music and makes it possible to control robots, lighting, and various types of computer-graphic animation in synchronization with music.

Songle helps users **deepen their understanding of musical pieces by allowing them to listen to those pieces while looking at "music map" that visualizes the essential musical elements of each piece**, such as the chorus sections, melody, beats, and chord progressions, instead of just listening to the sound in a conventional manner. It also allows users to jump to the chorus (hook) of a song with just a push of a button. This is particularly useful when listening for the first time to songs users are not familiar

with, meaning **they can skim through vast volumes of music to select songs that suit their tastes while appreciating music in a more active manner**. More than 1 million pieces have already been analyzed automatically, and their music maps are made publicly available.

Moreover, a development framework called Songle Widget has been launched, and this allows any user to utilize the music maps to achieve music-synchronized control. The framework has already been used in a wide variety of ways such as making robots automatically dance to music, controlling lighting, and displaying computer graphics that change in coordination with changes in a piece of music.



“Songle” an active music listening service that uses music-understanding technologies

Anyone can use the service simply by accessing the Songle website (<http://songle.jp>).

Songle Title, artist name, or chords (e.g., Am,F,G,C) Search ? How to use Login

Home Artists Songs Ranking Similarity Graph My Page

I think of you by Jeff Manning Tweet 2

Original Site (staff.aist.go.jp) / Edit History / Key Help / Embedded Player 3200 1784 1

Editor / Visualizer

01:18 / 04:49

Chorus sections, Repeated sections, Chords, Melody line, Beat structure

Play Beat Edit Chord Edit Melody Edit Chorus Edit

Volume Playmode Play from chorus Language en © 2011-2014 AIST Songle Project AIST

Songle automatically analyzes pieces of music and visually represents them as “music maps”

The horizontal axis is time. The global display area at the top shows the music structure consisting of chorus sections (the top row) and repeated sections (the five lower rows). In the local display area below, musical beats corresponding to quarter notes are visualized by using small triangles. The top of each triangle indicates its temporal position. Bar lines are marked by larger triangles. The piano roll representation of the melody line is shown above the beat structure. The text above this shows the chord progression of the piece.

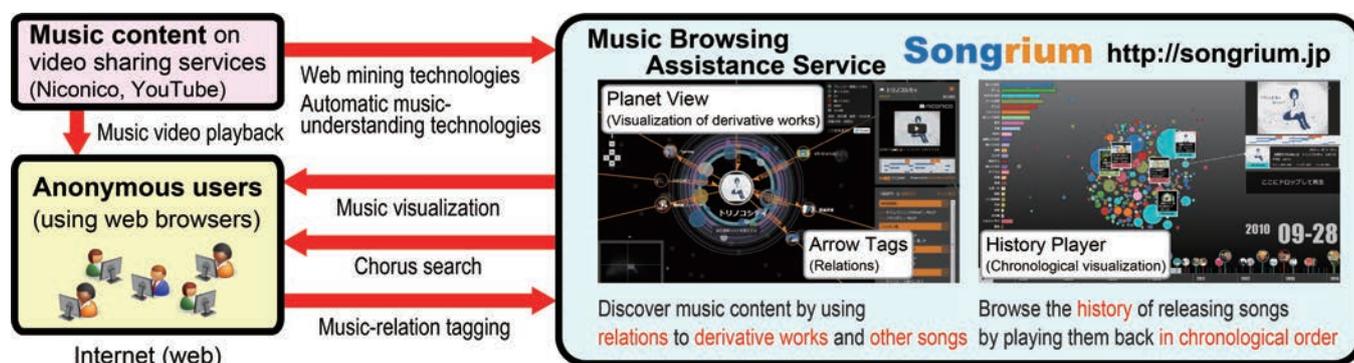
Songrium allows users to take a panoramic view of a vast array of music and discover new songs they like

In recent years, the growing popularity of video-sharing services has meant that vast volumes of music have been uploaded and the amount increases every day, but there are only limited ways for people to discover music they are interested in from within these vast music collections. It has also been difficult to gain an overall picture of these vast arrays of content.

Dr. Goto and his team, therefore, developed a music browsing assistance service called Songrium that visualizes vast music collections in a variety of different ways by using web-mining technologies to automatically collect and categorize music content, and using music-understanding technologies to automatically analyze this content. The service can **visually represent a diverse range of relations among musical pieces**, helping users to discover, for example, that there are more than 140,000 original

songs that have been produced using singing synthesis technologies on the Niconico web service and a further 610,000 derivative works that have been derived from these. It also allows users to discover songs based on similarities between songs.

A series of new functions that allow users to take a panoramic look at the vast arrays of music has also been launched in quick succession, including a "Influence Ranking (Content Generative Power Ranking)" allowing users to discover songs from which the largest number of derivative works have been created, an "Interactive History Player" that automatically displays and plays back the vast array of Niconico content in chronological order, and a "Smart player" that facilitates trial listening by successively playing back the new pieces that are created every day.



"Songrium" a music browsing assistance service that provides a panoramic overview of enormous collections of content

Anyone can use the service simply by accessing the Songrium website (<http://songrium.jp>).

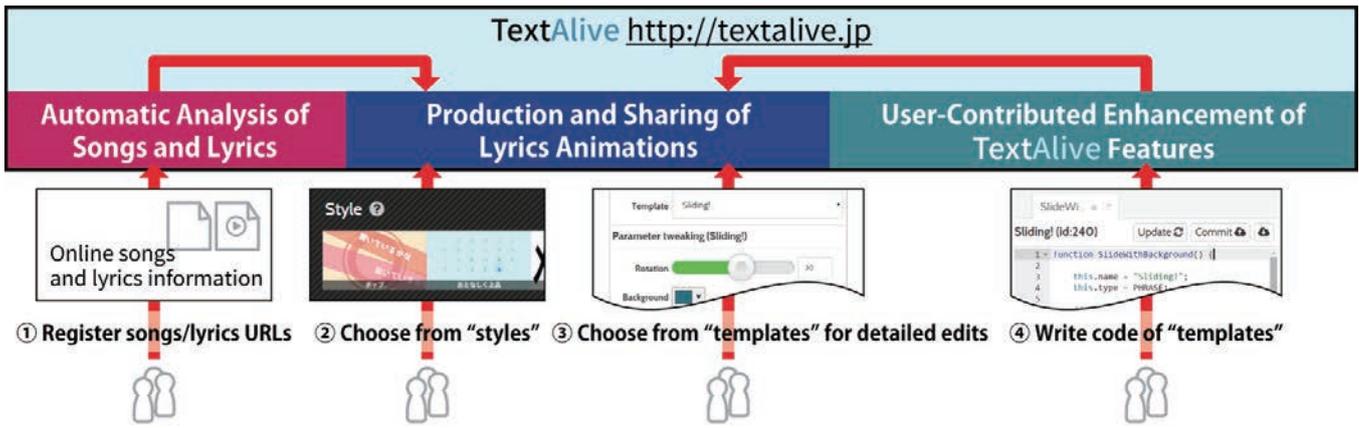
TextAlive allows users to easily create "lyric-based animations"

While the above-mentioned services are all active music-appreciation-assistance technologies, in order to **draw out the true value of digitized music, music-creation-assistance technologies are also crucial**. Dr. Goto and his team focused their attention on "lyric-based animation", which is able to communicate song lyrics in an appealing manner, and developed a lyric animation watching/producing/sharing service called TextAlive.

Lyric-based animation has conventionally required the investment of a huge amount of time spent on coordinating the timing of text and effective movement design. TextAlive, on the other hand, automatically estimates the timing of the utterance of lyrics in songs using music-understanding technologies. With programming environment technologies, TextAlive displays lyric-based animation generated in real time without creating a video file by allowing users to alter and execute their programs in a dynamic manner. Users can also enjoy using the service actively in a wide range of ways including selecting from a variety of

different visual styles and switching between them instantaneously, altering animation to match their preferences, and sharing the resulting animation on the web. Other users can further edit the animation to produce their own derivative works.

Dr. Goto and his team intend to continue with their **research and development work on adding value to the large-scale online music content collections**. Companies have already produced products based on music technologies that the team has developed, including singing synthesis extension software called "VocalListener" and a speaker device called "Lyric Speaker" that displays music-synchronized lyrics. A lyric search tool called "Lyric Jumper" that has been developed with another company is available on the web. The team aims to **contribute to the development of the next-generation media content industry** through further collaboration with the business world.



"TextAlive" a production support service that helps users create lyric-based animation synchronized with music.
 Anyone can use the service simply by accessing the TextAlive website (<http://textalive.jp>)