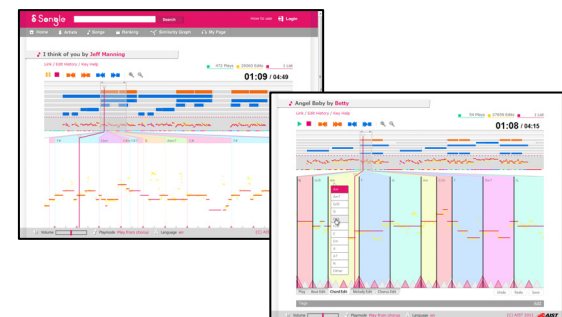
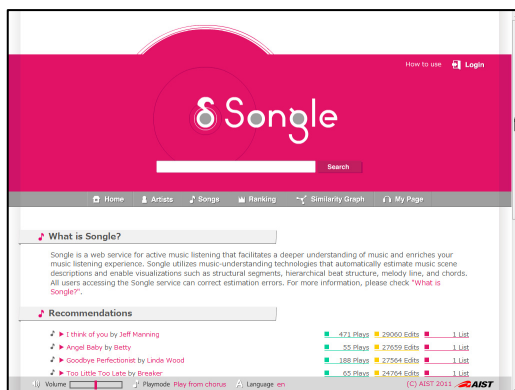


# Songle: A Web Service for Active Music Listening Improved by User Contributions

AIST (National Institute of Advanced Industrial Science and Technology)

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## Our Goal



- ❑ Enrich **music listening experiences**  
by **music-understanding technologies**  
based on **signal processing**
- ❑ Toward this goal, we have already developed

### Active Music Listening Interfaces

[Goto, 2003-]

- ❑ **Active music listening**
  - A way of listening to music through **active** interactions
  - You can take control of **your own listening experience**

# Active Music Listening Interface

## ❑ SmartMusicKIOSK (chorus-section detection)

- Access directly your favorite part of a song [Goto, 2003-06]
- View a **visual representation** of its **music structure**

The image displays the SmartMusicKIOSK interface, designed by Masataka Goto. The main screen features a 'Music map' visualization of a song's structure, with sections color-coded: blue for verses, green for choruses, and orange for repeated sections. A yellow vertical line indicates the current playback position. Red arrows highlight 'Similar (repeated) sections' and 'Chorus sections'. Below the map is a playback control panel with buttons for STOP, PAUSE, PLAY, PREV SECTION, NEXT SECTION, NEXT CHORUS, PREV TRACK, REW, FF, and NEXT TRACK. A 'Jump to chorus' button is also shown. The interface is titled 'SmartMusicKIOSK by Masataka Goto' and displays the song 'True Heart' by Tomomi Ogata (RWC-MDB-P-2001 No. 18). To the left of the main screen are two smaller screens showing a camera icon.

SmartMusicKIOSK by Masataka Goto

Music map

Similar (repeated) sections

Chorus sections

Repeated sections

Jump to chorus button

00:02:31

PREV SECTION NEXT SECTION NEXT CHORUS

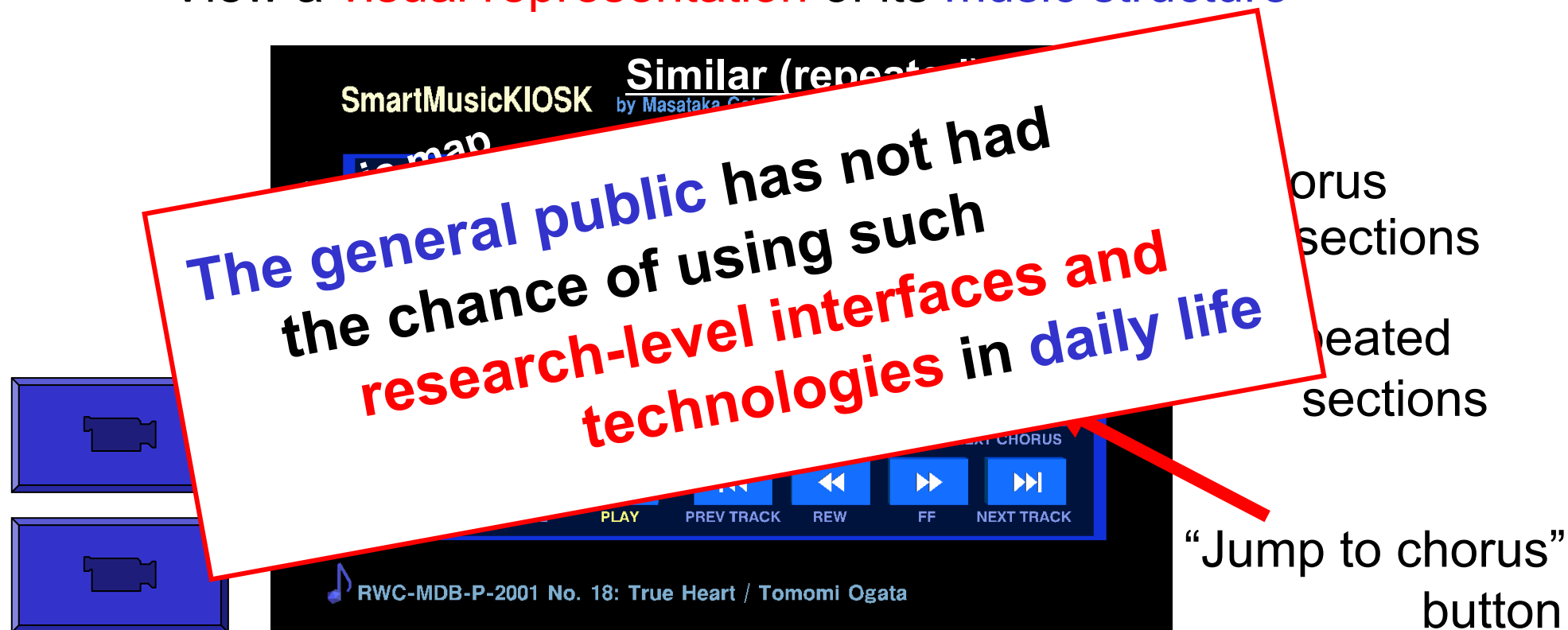
STOP PAUSE PLAY PREV TRACK REW FF NEXT TRACK

RWC-MDB-P-2001 No. 18: True Heart / Tomomi Ogata

# Active Music Listening Interface

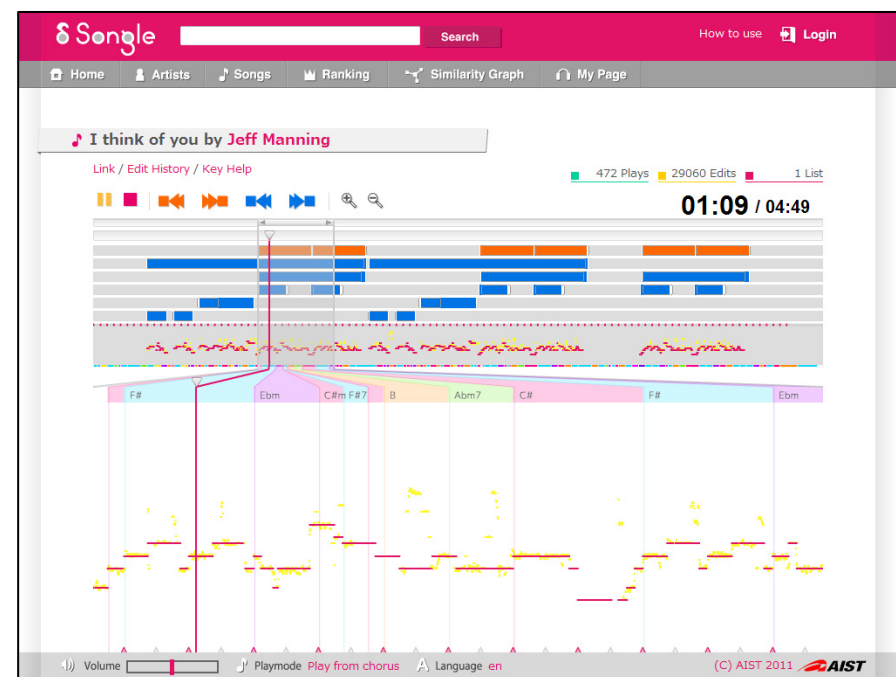
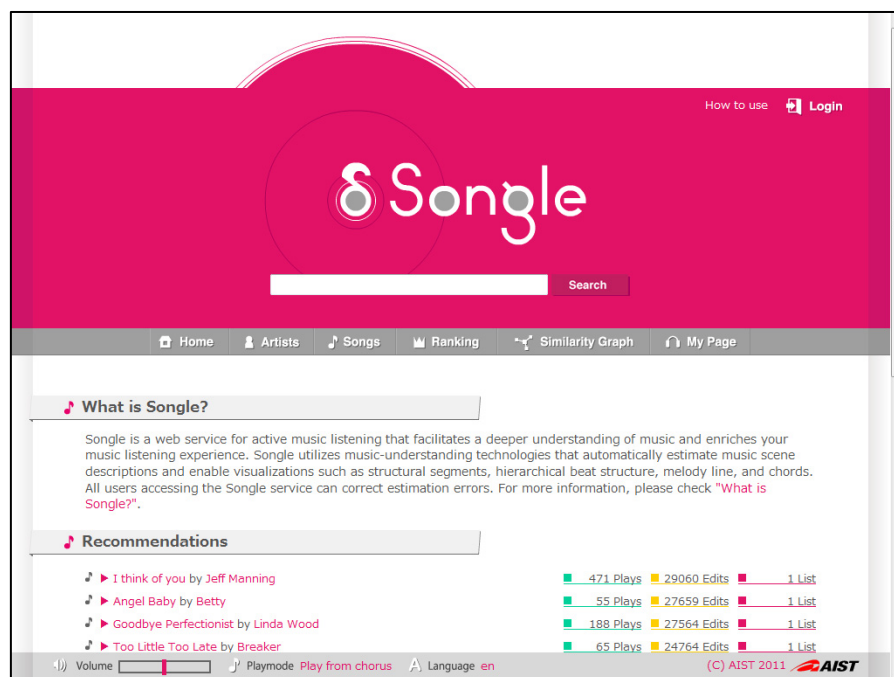
## ❑ SmartMusicKIOSK (chorus-section detection)

- Access directly your favorite part of a song [Goto, 2003-06]
- View a **visual representation** of its **music structure**



# Songle (http://songle.jp)

- ❑ Web service for **active music listening**
  - Allow **anonymous users** to enjoy **any songs (MP3 files) available on the web** by using **active music listening interfaces**

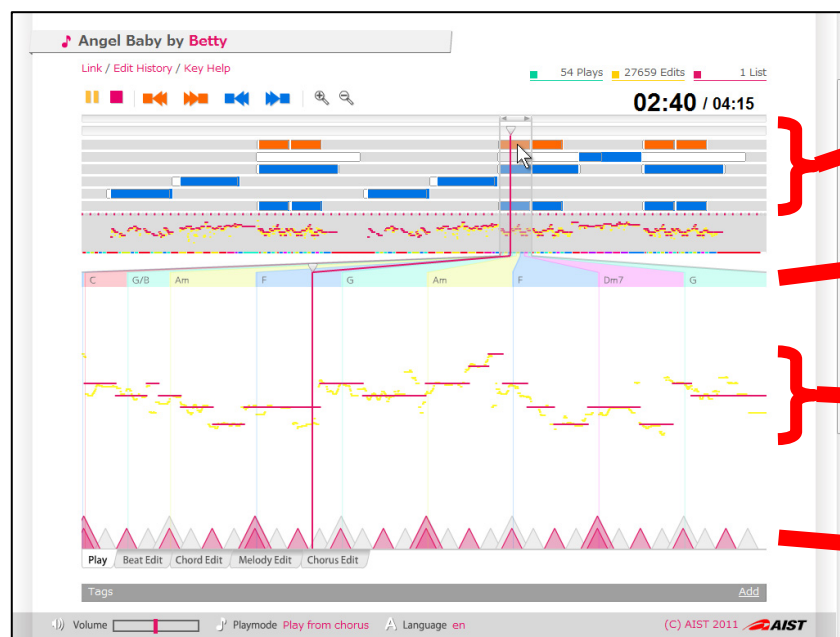


# Demonstration (Web Service)



# Songle (<http://songle.jp>)

- ❑ Use **automatic music-understanding technologies**
  - Estimate four major types of **music scene descriptions**



## Music structure

(chorus / repeated sections)

## Chords

(root note and chord type)

## Melody line

(F0 of the vocal melody)

## Beat structure

(musical beats and bar lines)

- ❑ A user can enjoy playing back a song while seeing the **visualization** of the **estimated descriptions**

# Demonstration (Visualization)

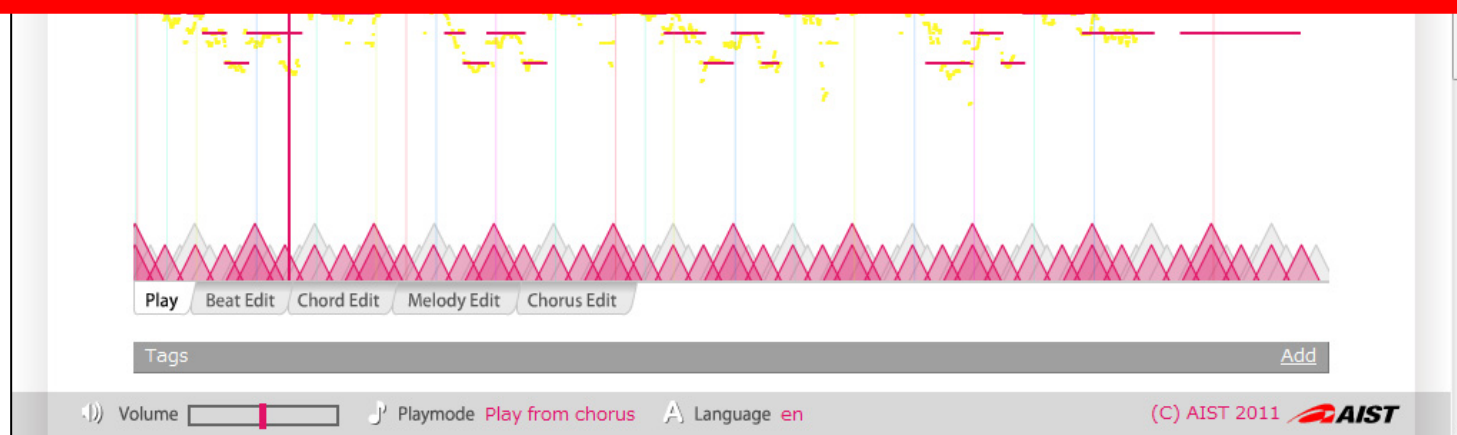




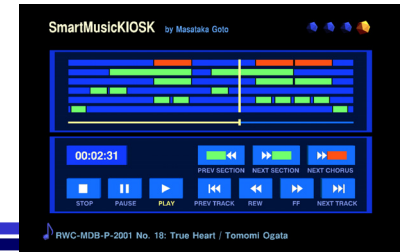
# Demonstration (Visualization)



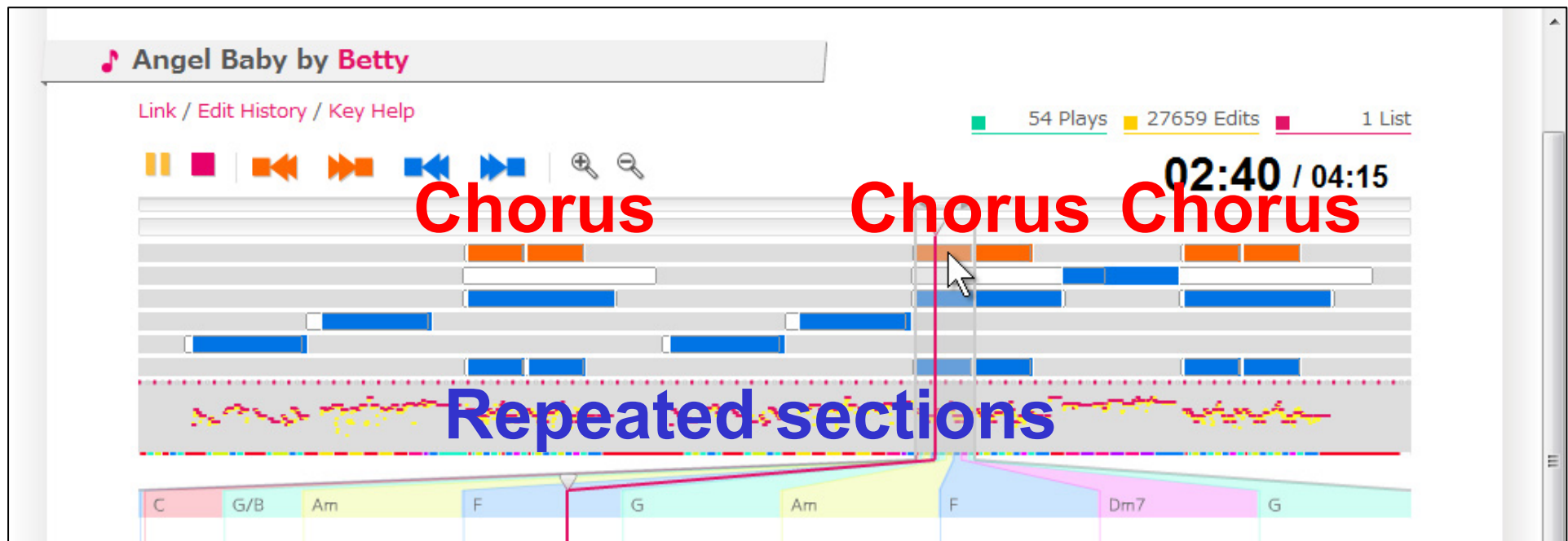
**Songle facilitates deeper understanding of music  
by visualizing music scene descriptions**



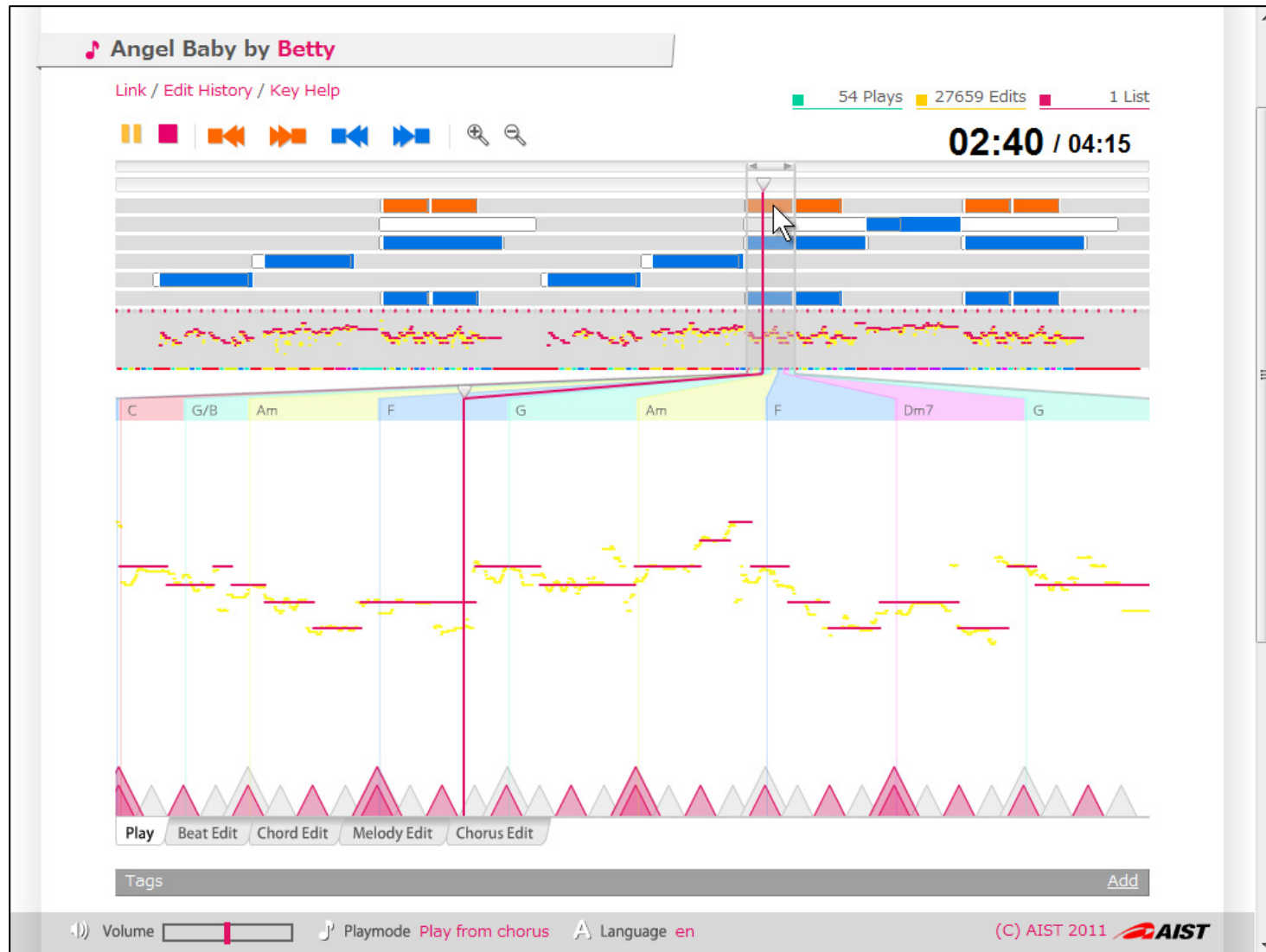
# Songle with SmartMusicKIOSK



- ❑ Implement all functions of **SmartMusicKIOSK**
  - Jump and listen to the **chorus** with just a push of a button



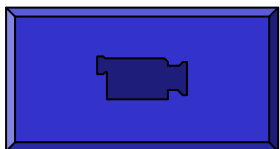
# Demonstration (Active Music Listening)



# Demonstration (Active Music Listening)

The screenshot shows the Songle web application interface for editing the song "Angel Baby by Betty". At the top, it displays the song title and navigation links: "Link / Edit History / Key Help". Statistics show "54 Plays", "27659 Edits", and "1 List". Playback controls include a play button, stop button, previous button, next button, and a search icon. The current time is 02:40 out of 04:15. The main area features a piano roll with multiple staves, where a mouse cursor is positioned over a blue bar. Below the piano roll, there are tabs for "Play", "Beat Edit", "Chord Edit", "Melody Edit", and "Chorus Edit". At the bottom, there is a "Tags" input field with an "Add" button, a volume slider, and a "Playmode" dropdown set to "Play from chorus". The footer includes the copyright notice "(C) AIST 2011" and the AIST logo.

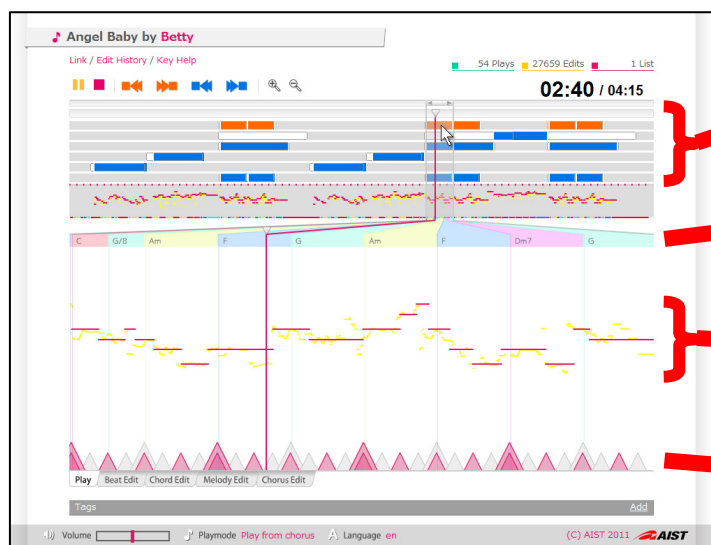
**Songle** makes it **easier** for a user to find  
desired parts of a piece



# Estimation Errors

## ❑ Automatic music-understanding technologies

- **Estimation errors** are inevitable
- Given the variety of musical pieces on the web



**Music structure**

**Chords**

**Melody line**

**Beat structure**

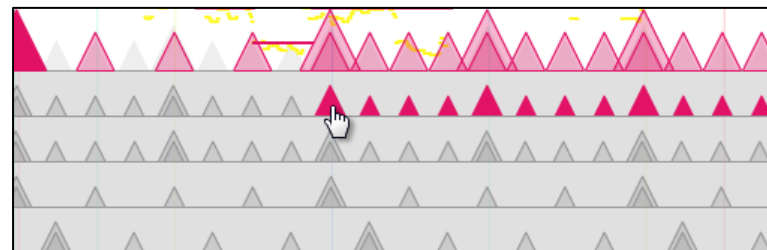
❑ Users of **Songle** might be disappointed  
by its performance

# Let's Overcome Estimation Errors Together

- ❑ **Songle** enables **anonymous users** to **contribute** by **correcting** estimation errors to improve the web service

- ❑ **Efficient error correction interface (editor)**

- If a user finds an error while listening, the user can **easily correct** the error by selecting from **a list of candidates** or



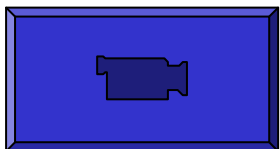
Am
Am7
G/B
G
G/A
F/A

by providing an alternative description

# Demonstration (Error Correction)

## ❏ Music structure

The screenshot displays the AIST music editing software interface for the song "Angel Baby by Betty". The main window shows a multi-track timeline with various colored blocks representing musical elements. A vertical red line indicates the current playback position. The interface includes a top menu bar, a toolbar with playback controls, and a bottom status bar with volume, playmode, and language settings. An inset window in the top right corner provides a zoomed-in view of the timeline.



# Demonstration (Error Correction)

## Beat structure

The screenshot displays the AIST software interface for the song "Angel Baby by Betty". The main window shows a timeline with various musical elements. At the top, there's a header with the song title and a link to edit history. Below this, a toolbar contains icons for play, stop, and other functions. The main area features a piano roll with a grid of notes and a waveform. A vertical line indicates the current position in the song, which is at 01:13 / 04:15. The bottom of the interface includes a volume slider, a playmode selector (set to "Play from chorus"), a language dropdown (set to "en"), and a copyright notice for AIST 2011. A smaller inset window in the top right corner provides a more detailed view of the piano roll and waveform, showing individual notes and their corresponding waveforms. The interface is designed for editing and analyzing musical data, with a focus on beat structure and error correction.



# Demonstration (Error Correction)

## ■ Melody line

The screenshot displays the AIST software interface for editing the song "Angel Baby by Betty". The main window is in "Melody Edit" mode, showing a piano roll with a red melody line and a chord progression (G/B, Am, F, G, Am, C/G, F, Dm7, G). A mouse cursor is positioned over a red bar in the melody line. The top right shows "54 Plays" and "27659 Edits". The bottom right shows "Playmode: Play from chorus" and "Language: en". A smaller inset window shows a detailed view of the melody line.

# Demonstration (Error Correction)

## Chords

The screenshot displays the AIST software interface for editing the song "Angel Baby by Betty". The main window shows a timeline with various musical elements. A chord correction menu is open, listing options: Am, Am7, G/B, G, G/A, F/A, C, Em, A, A7, N, and Other. The menu is currently highlighting "Am". The interface includes a "Play" button, a "Beat Edit" button, a "Chord Edit" button (which is active), a "Melody Edit" button, and a "Chorus Edit" button. The bottom status bar shows "Volume", "Playmode: Play from chorus", "Language: en", and the copyright notice "(C) AIST 2011 AIST".

Angel Baby by Betty

Link / Edit History / Key Help

54 Plays 276

01:09 / 04:15

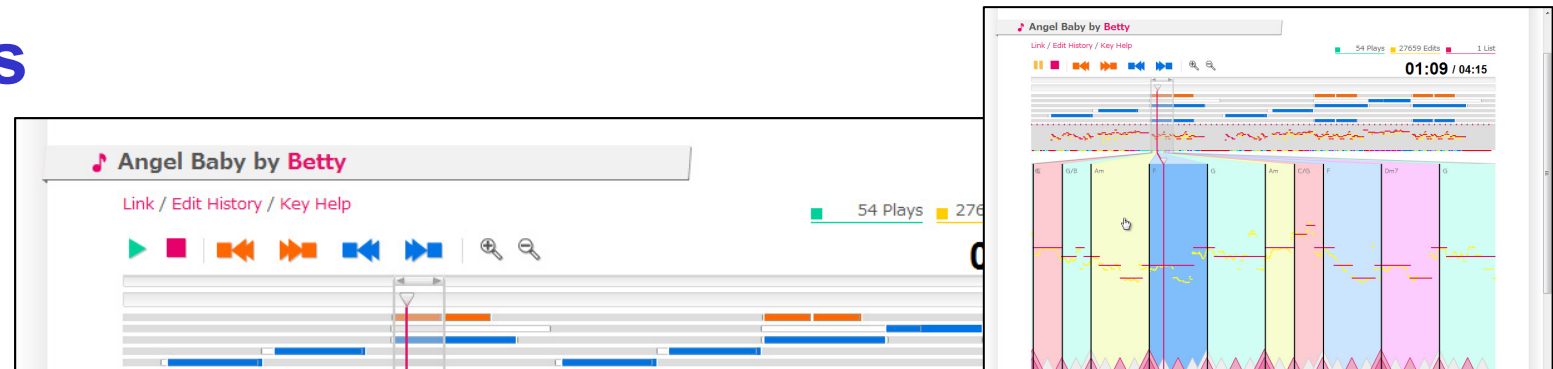
Play Beat Edit Chord Edit Melody Edit Chorus Edit

Tags Add

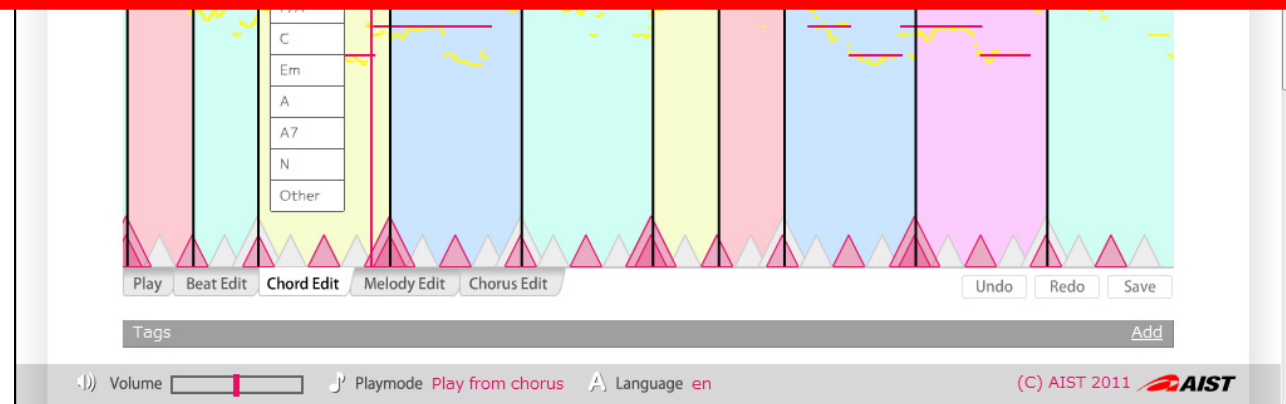
Volume Playmode: Play from chorus Language: en (C) AIST 2011 AIST

# Demonstration (Error Correction)

## Chords



The resulting **corrections** are then **shared** and **used** to **immediately improve** the **user experience**





# Let's Enrich Music Listening Experiences

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- ❑ **Songle** is not just for collecting annotations,  
but for **better user experiences**
  - Users can simply enjoy **active music listening**  
without **correcting** any errors!
  - We understand that it is too difficult for some users to **correct**
  
- ❑ Users are not expected to **correct** all errors,  
**only some** according to each user's interests

# Songle as a Showcase

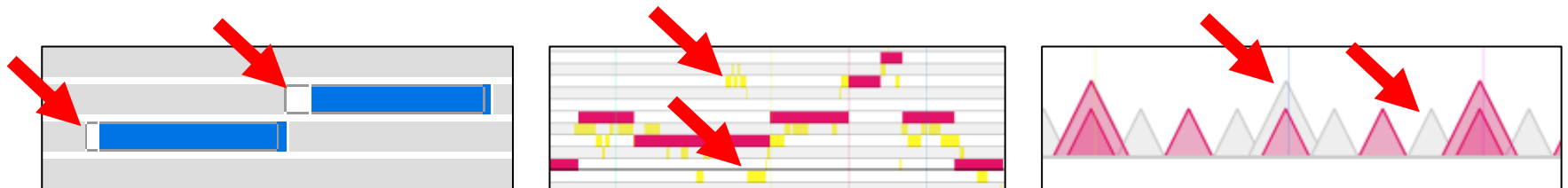
## ❑ Songle serves as a *showcase*

- Demonstrate how people can **benefit** from music-understanding technologies
- Understand their **nature** through **user experiences**

*“What kinds of sound mixture are difficult to handle?”*

## ❑ Prevent **overestimation** of the **technologies** behind

- The **originally estimated values** are visualized as **trails** with different colors after **user corrections**



- **All correction histories** are recorded and can be compared



## Songle as a Research Platform

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- ❑ We hope **Songle** will serve as a *research platform*
  - Other researchers could exhibit results of their own music-understanding modules to jointly promote the popularization of our research field
  - The modules can be executed anywhere in the world without sharing source and binary codes  
Receive an audio file and send back the results via HTTP
  - Interesting to visualize/compare/integrate differences of music-understanding results
  - Let's add other types of music scene descriptions



# Implementation

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## ❑ Web server

- Ruby on Rails, MySQL, Passenger, Apache

## ❑ Client user interface

- ActionScript 3, Adobe Flex Compiler, JavaScript

## ❑ Music-understanding modules

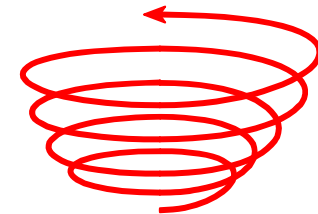
- **Music structure**: RefraiD [Goto, 2003-06]
- **Beat structure**: HMM-based method [Mauch, 2010-11]  
Supporting tempo changes, and 3/4, 4/4, and 6/8 meters
- **Melody line**: PreFEst [Goto, 1998-2004] + VAD [Fujihara, 2006-10]
- **Chords**: HMM-based method [Mauch, 2010-11]  
14 types x 12 root notes, encouraging chord changes at bar lines

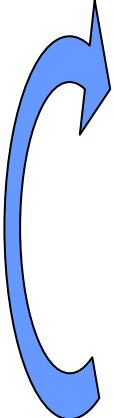


## Conclusion

### ❑ **Songle: Web service for active music listening**

- 2009/06 Started the project and development
- **2011/10/20** Launched the beta version
- Designed to set into motion a *positive spiral*



- 
- (1) Enable users to **experience**  
a service based on **music understanding**  
to let them **better understand its performance**
  - (2) Users **contribute** to **improved performance**
  - (3) The **improved performance** leads to a **better user experience**, **encouraging further use** of the service at step (1)

Game-based or crowdsourcing approaches often lack step (3)  
and depend on the **feeling of fun** or **money**

[Turnbull *et al.*, '07] [Mandel *et al.*, '07] [Law *et al.*, '07][Lee, '10][Mandel *et al.*, '10]

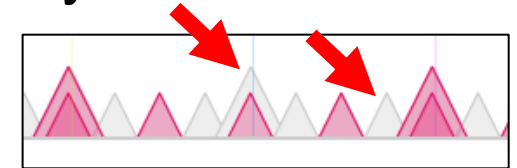




# Conclusion

## ❑ Songle as a *social correction framework*

- Users gain a real sense of **contributing** for **their own benefit** and **that of others**
- Users can be further motivated to **contribute** by seeing **corrections** made by other users



## ❑ Future work

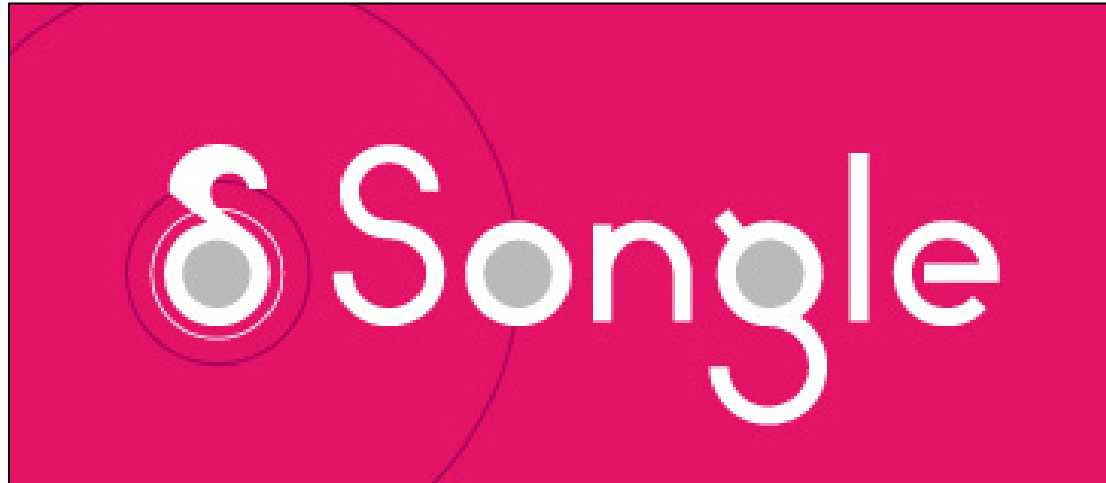
- Use **corrected errors** and **machine learning techniques** to gradually improve **music-understanding technologies**





Let's Enjoy and Collaborate!

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<http://songle.jp>

English and Japanese versions are available.

You can register any song (MP3 file) on the web!