Short-term and Long-term Evaluations of Melody Editing Method based on Melodic Outline

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ABSTRACT

In this paper, we describe short-term and long-term evaluations of our melody editing method based on a *melodic outline*. There have been a lot of attempts at automatic music composition, but only few allow musically untrained users to easily edit the melodies automatically composed. This is an important issue because it is difficult for such users to express what kind of melody they want in a machine-readable form and accordingly the generated melodies are often different from what they want. Based on this motivation, we proposed a melody editing method based on a melodic outline in which notewise information is hidden. Although we obtained promising results through a small user test, we did not conduct sufficient experiments. In this paper, we report the results of two experiments: one short-term and one long-term. In the short-term experiment, we compared our method to the pianoroll interface. In the long-term experiment, we followed how users' minds change through continously using our system. The results of both experiments showed the effects of our melody editing method.

1. INTRODUCTION

Automatic music composition is a popular research subject in the sound and music computing field and is hence widely attempted by various researchers [1, 2, 3, 4, 5, 6]. Although there have been a lot of proposals for computational models and methods for automatic music composition, only a few researchers have addressed the issue of how a system allows the user to edit a generated melody when the user is not satisfied with the melody. Typical automatic music composition systems generate melodies based on lyrics and/or style parameters input by the user, but expressing a request to the composition system in the form of lyrics and/or style parameters is not easy, especially for musically untrained users. The generated melodies would therefore sometimes differ from those desired by the user. In this case, the user has to modify the melody, but melody modification methods that are easy to use for musically untrained people have not been sufficiently developed.

Based on this motivation, we proposed a melody editing method for musically untrained users [7]. This method uses a newly developed melody representation called a *melodic outline*. A melodic outline represents the coarse temporal characteristics of a melody; notewise information such as the pitch and duration of each note is hidden. The user is allowed to redraw the melodic outline. Once the user redraws the outline, a new melody is generated based on the redrawn outline. Because it takes only a few seconds to redraw melodic outlines, the user can try a lot of different melodic outlines (and accordingly generated melodies). Through this repeated trial-and-error melody editing, the user can obtain a satisfactory melody.

However, in our previous paper describing the new method, we did not conduct sufficient experiments; we conducted only a small user test [7]. In particular, we did not find answers to the following questions:

1. Can musically untrained people grasp the characteristics of a melody from the melodic outline?
2. Is the pianoroll interface truly difficult for musically untrained people to use?
3. To begin with, do musically untrained people feel satisfaction/dissatisfaction with automatically generated melodies? (in other words, do they want a melody with a specific feature?)
4. Is the abstraction level of melodic outlines appropriate as a melody representation for musically untrained people to edit?
5. Will the answers to these questions change with after continuously using our system for a long term?

To find answers to these questions, we conducted two kinds of experiments. The first was a short-term experiment that compared the usability of our melody editing method with the pianoroll interface. The second was a long-term experiment where we asked the participants to use our system every day for a month. Once a week, we asked the participants to edit a specific melody and interviewed them about the satisfaction of the edited melodies etc. In this paper, we first present an overview of our melody editing method and then report the results of these experiments.

2. MELODY EDITING METHOD BASED ON MELODIC OUTLINE

This section presents an overview of our melody editing method based on melodic outlines. See also [7] for more details.

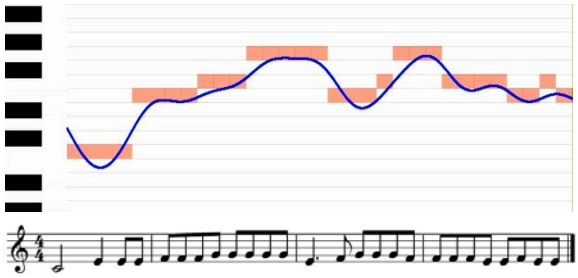

Figure 1. Example of melodic outline.

2.1 What is Melodic Outline

A melodic outline is a melody representation in which the melody is represented as a continuous curve. An example is shown in Figure 1. A melodic outline is mainly used for editing a melody with a three-step process: (1) the target melody represented as a sequence of notes is automatically transformed into a melodic outline, (2) the melodic outline is redrawn by the user, and (3) the redrawn outline is transformed into a sequence of notes. The key technology for achieving this is the mutual transform of a sequence of notes and a melodic outline. We think that this mutual transform should satisfy the following requirements:

1. A melodic outline does not explicitly represent the pitch and note value of each note.
2. When a melodic outline is inversely transformed into a note sequence without any editing, the result should be equivalent to the original melody.
3. When a melodic outline edited by a user is transformed into a note sequence, musically inappropriate notes (e.g., notes causing dissonance) should be avoided.

No previous studies have proposed melody representations satisfying all these requirements. Various methods for transforming a melody to a lower-resolution representation have been proposed such as [8], but these representations are designed for melody matching in query-by-humming music retrieval, so they cannot be inversely transformed into a sequence of notes.

This method supposes that the user composes a melody with an existing automatic music composition system. The melody is transformed into a melodic outline with the method described in Section 2.2. The user can freely redraw the melodic outline. Once the outline is redrawn, a new melody (note sequence) is immediately generated using the method described in Section 2.3. If the user is not satisfied with the result, the user again edits the melodic outline. The user can repeat the editing process until a satisfactory melody is obtained.

2.2 Transform of a Note Sequence into a Melodic Outline

The given MIDI sequence of a melody (Figure 2 (a)) is transformed into a pitch trajectory (Figure 2 (b)). The pitch is represented logarithmically. Regarding the pitch trajectory as a periodic signal, the Fourier transform is applied to this trajectory. Note that the input to the Fourier transform is not an audio signal, so the result does not represent a sound spectrum. Because the Fourier transform is applied to the pitch trajectory of a melody, the result represents the feature of temporal motion in the melody. Low-order Fourier coefficients represent slow motion in the melody while high-order Fourier coefficients represent fast motion. By extracting low-order Fourier coefficients and applying the inverse Fourier transform to them, a rough pitch contour of the melody, i.e., the melodic outline, is obtained (Figure 2 (c)).

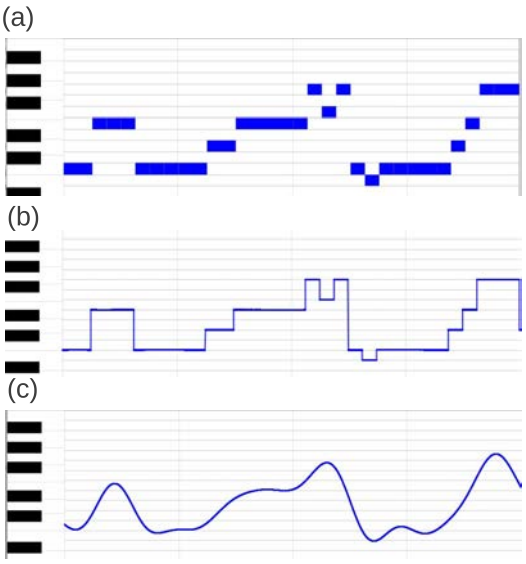

Figure 2. Flow of extracting melodic outline. (a) Note sequence of melody. (b) Pitch trajectory of melody. (c) Melodic outline.

2.3 Inverse Transform of a Melodic Outline into a Note Sequence

Once part of the melodic outline is redrawn, the redrawn outline is transformed into a note sequence.

First, the Fourier transform is applied to the redrawn outline (Figure 3 (a)). Then, the higher-order Fourier coefficients of the original pitch trajectory, which had been removed when the melodic outline is extracted, are added to the Fourier coefficients of the redrawn outline to generate the same pitch trajectory as the original melody from the non-redrawn part of the melodic outline. Next, the inverse Fourier transform is applied, producing the post-edit pitch trajectory (Figure 3 (b)).

Next, the pitch trajectory is transformed into a note sequence. In this process, notes that cause dissonance with the accompaniment are avoided, which is achieved using a hidden Markov model. The HMM used here is shown in Figure 3. This model is formulated based on the idea that the observed pitch trajectory $O = o_1 o_2 \cdots o_N$ is emitted with random deviation from a hidden sequence of note numbers $H = h_1 h_2 \cdots h_N$ that does not cause dissonance.

3. SHORT-TERM EXPERIMENT

The short-term experiment aimed at comparing the usability of our melody editing method with the pianoroll interface. We hypothesized that our melody editing method

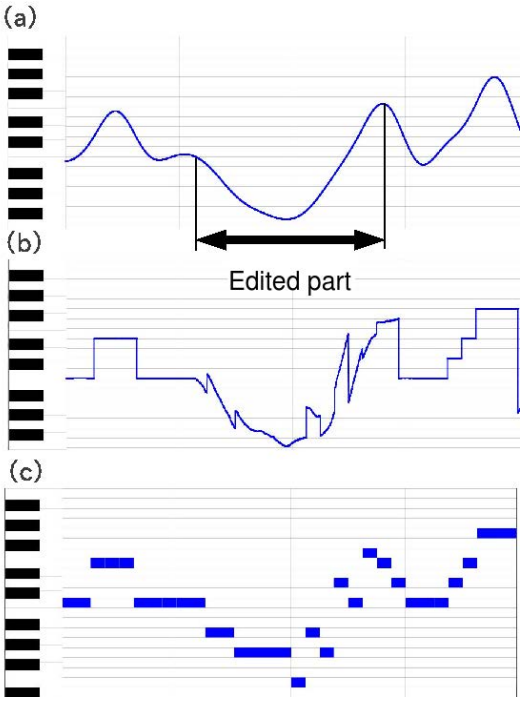

Figure 3. Flow of generating melody from meldic ountline. (a) Redrawn melodic outline. (b) Pitch trajectory obtained with the Fourier transform. (c) Melody generated with the HMM.

would be superior to the pianoroll interface for musically untrained people (such as those who have not composed using a converntional MIDI sequencer) because our method does not require the user to consider consonance with the backing harmony when selecting notes for the melody. On the other hand, we hypothesize that, for users who have composed using a conventional MIDI sequencer, our melody editing method will not be superior because they can manipulate each note directly with the pianoroll interface.

3.1 Experimental Conditions

We asked the participants to edit a melody using both our system and the pianoroll interface. The melody was prepared by providing the lyrics "*Boku ga makura wo shite neru toki mo / Ohisama wa nezu ni guruguru to / Chikyu no mawari wo mawatte wa / Asa mata asa wo koshiraeru*" [1], an excerpt of a poem entitled *Ohisama no tabi* taken from Sekai Doyo Shu[9], set to Orpheus [6], a music composition system based on the prosody of Japanese lyrics. The participants were 12 students (9 males and 3 females). The musical experience of the participants is listed in Table 1. Screenshots of the systems used in this experiment are shown in Figure 5. To allow the participants to rate the generated melodies, we installed a set of buttons labeled 1 to 5. Note that these buttons are used only for recording the pariticipant's ratings and thus have no effect on the melody generation process.

[1] This is a Japanese translation of "The sun is not a-bed, when I / At night upon my Pillow Lie; / Still round the earth his way he takes, / And morning after morning makes" from "The Sun's Travels" written by Robert L. Steveson.

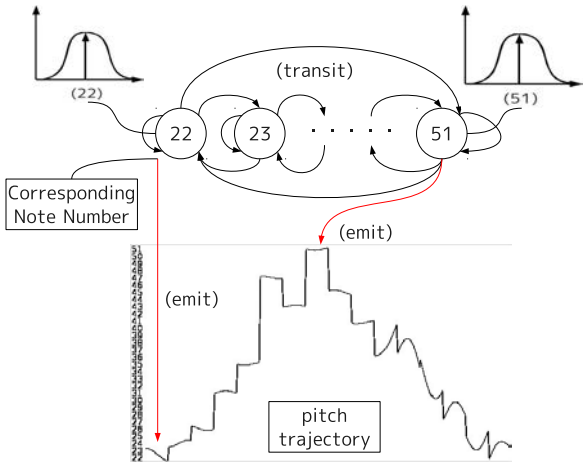

Figure 4. Overview of HMM for estimating note sequence from pose-edit pitch trajectory

Table 1. Musical experience of participants in the short-term experiment

	Performance	Composition	Group
A	Electone, 10 years	Yes	
B	Piano, 16 years	Yes	
C	Piano, 9 years	Yes	Intermediate
D	Piano, 7 years	No	
E	Piano, 7 years	No	
F	Piano, 2 years	No	
G	No	No	
H	No	No	
I	No	No	Novice
J	No	No	
K	No	No	
L	No	No	

A–L represents the label of each participant.

First, the participants practiced with both systems. With the participants who belong to the department of computer science, we spent 10 minutes explaining how to use both systems and then allowed free practice for three minutes. With the remaining participants, we spent 15 minutes explaining how to use both systems and then allowed free practice for five minutes.

In the next phase, we gave the participants instructions on how they should edit a given melody, namely: "make notes from the second to the third measures gradually lower in pitch, then make notes in the third measure gradually raise." The participants used our system to edit the given melody according to these instructions, and then answered the following questions:

- Q1 Were you satisfied with the output melody?
- Q2 Was editing easy?
- Q3 Did the generated melody match what you expected when drawing the outline?
- Q4 Do you think that you were able to draw a melodic outline as instructed?

The answers to these questions were on a scale of one to seven. The time for editing was not limited; participants were allowed to edit the melody until satisfied.

Table 2. Results of short-term experiment (*No answer)

Participants		Our system					Pianoroll		
		Q1	Q2	Q3	Q4	Editing time	Q1	Q2	Editing time
Interm.	A	6	3	2	6	3min 00s	6	6	1min 40s
	B	6	7	7	7	2min 00s	3	1	4min 00s
	C	6	3	5	6	6min 00s	6	2	8min 30s
	D	3	3	5	5	6min 00s	5	6	5min 00s
	E	6	2	5	6	4min 40s	5	5	5min 30s
	Median	6	3	5	6	—	5	5	—
	Mean	5.4	3.6	4.8	6.0	—	5.0	4.0	—
Novice	F	6	7	6	6	3min 50s	6	2	8min 00s
	G	1	2	*	3	8min 10s	7	2	9min 00s
	H	5	5	6	5	10min 45s	2	2	14min 00s
	I	6	6	6	7	4min 50s	6	6	9min 20s
	J	6	3	5	5	10min 30s	5	6	7min 40s
	K	6	6	5	5	4min 10s	6	2	7min 00s
	L	7	7	1	6	5min 30s	3	4	6min 20s
	Median	6	6	6	5	—	6	2	—
	Mean	5.3	5.1	4.8	5.3	—	5.0	3.4	—

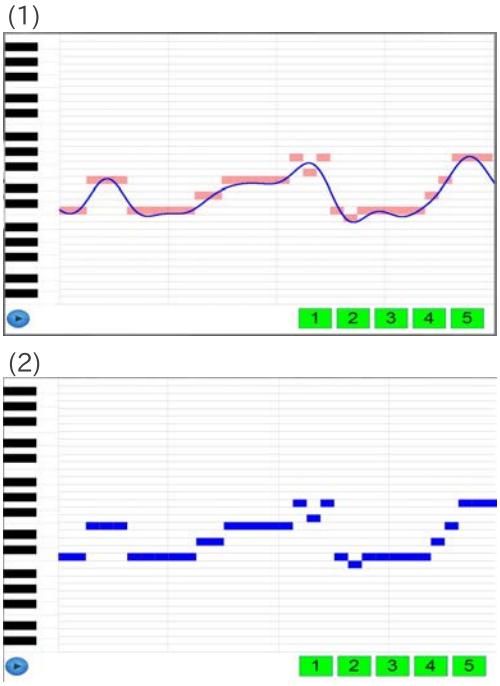

Figure 5. (1) Our system. (2) Pianoroll interface.

In ths final phase, pariticipants used the pianoroll interface to edit the melody according to the same instructions, and then answered Q1 and Q2.

3.2 Experimental Results

The experimental results are listed in Table 2. The results are summarized as follows:

Q1 Most participants in both groups expressed high satisfaction with the generated melodies: on the scale of 1 to 7, the median was 5 or 6 and the mean was between 5.0 and 5.4. Note that Participants A to C, who have experience in composition, also highly rated the generated melodies. While the intermediate group rated this question at 5 or higher for both methods (except for one participant), in the novice group, two participants rated it lower than 5 for the pianoroll interface. This is because it is difficult for novice users to express the given instruction as a sequence of notes. In fact, they commented in the interview that they could not generate a melody as desired and that they could not imagine how to edit it with the pianoroll interface.

Q2 For the novice group, the ease of our system (mean: 5.1) was superior to using the pianoroll interface (mean: 3.4). The intermediate group, on the other hand, rated the ease of using the pianoroll interface (mean: 4.0) superior to our system (mean: 3.6). Participant A rated our system low because this participant had experience using the pianoroll interface built into a commercial MIDI sequencer. Participants D and E rated our system low because they can understand a melody as a note sequence due to their long experience in piano performance and they are comfortable with manipulating notes directly. In contrast, ratings by participants in the novice group were low for the pianoroll interface. This is because it was difficult for them to understand a melody as a sequence of notes.

Q3 The ratings for this question were high (median: 5 or 6, mean: 4.8). This result shows that the process of generating a melody (a note sequence) from a given melodic outline is appropriate.

Q4 The ratings for this question were also high (median: 5 or 6, mean: 5.3–6.0). This result shows that our melodic outline is an appropriate representation for musically untrained users to express their desire for melody generation.

Editing time The editing time was lower with our system in most cases of both groups. This is because (1) they do not have to repeat trial-and-error to avoid musically inappropriate notes since such notes are automatically avoided; and (2) they can edit multi-

ple notes with a single short operation.

3.3 Future Issues Revealed through the Experiment

One of the most important issues to consider in the future is to enable users to adjust the parameters for melody generation. In particular, the degree of appearance of non-diatonic notes, which is defined by the state transition probabilities in the HMM, is an important parameter. An intuitive graphical user interface for controlling such a parameter will widen the variability of generated melodies. In fact, Participant B commented that he did not obtain a desired melody although he tried editing again and again. This comment implies a demand for greater ability to adjust parameters.

Finally, there was a comment that it was not easy to draw a melodic outline with a mouse. This problem can be solved by using a tablet PC.

4. LONG-TERM EXPERIMENT

We conducted a long-term experiment to observe how the opinions of musically untrained people changed during repeated sessions with melody editing. We were particularly interested in changes in participants' the standard of satisfaction with melodies, their desire for melody generation, and their thoughts while editing melodies.

4.1 Experimental Conditions

The experiment was divided into practice and test phases:

Practice: The participant was required to practice melody editing using a tablet PC every day. This practice could be done anywhere and at any time.

Test: Once a week, the participant was required to come to our laboratory and edit a specified melody using the same tablet PC. During editing, the participant's screen was captured and recorded as a video. Afterward, the experimenter interviewed the participant while watching the video together.

The experiment was conducted for one month. Only our system (Figure 5(1)) was used; no comparison with the pianoroll interface was conducted. The participants for this experiment included three students (age: 22–24), none of which had experience playing an instrument or composing.

The instructions of each phase were as follows:

Practice:

1) Listen to three melodies. (The three melodies were prepared in advance using Orpheus [6] with the same lyrics and different parameters (harmony / rhythm). The lyrics were taken from "*Sekai Doyo Shu*"(a collection of Japanese translations of children's songs in the world) [9] at random.)
2) Choose two of the three melodies to edit.
3) Edit each of the chosen melodies as instructed below:
   - 3-1) Launch our system. A text box will appear.
   - 3-2) In the text box, input how you want to edit this melody; use natural language (specifically Japanese). (This input is regarded as a tentative goal of melody editing, but the actual goal can change during the editing.)
   - 3-3) Start editing. (During editing, the participant can play back the current melody anytime. After listening to the current melody, the participant is asked to click one of the rating buttons 1 to 5. These rating buttons are used only to express satisfaction/dissatisfaction with the result of editing, and have no effect on the melody generation process.)
   - 3-4) Finish editing when you are satisfied with the generated melody.

Test:

Procedures during the test phase are same as during the practice phase. In this phase, after completing Steps 1 to 3, the experimenter interviewed each participant while watching video of the screen captured during melody editing. Participants were particularly asked to articulate their thoughts while editing and their feelings when listening to the generated melodies. Participants were also asked the following questions:

- Q1 Were you satisfied with the output melody?
- Q2 Did the generated melody match what you expected when drawing the outline?
- Q3 Was editing easy?

The answers to these questions were on a scale of one to seven.

Table 3. Results of long-term experiment

		Q1	Q2	Q3	Avg. editing time
A	1st week	6	6	6	3min30s
	2nd week	7	7	6	3min20s
	3rd week	5	5	5	3min00s
	4th week	6	6	7	2min40s
B	1st week	5	5	6	6min40s
	2nd week	3	4	3	4min40s
	3rd week	6	5	6	3min40s
	4th week	6	5	7	3min30s
C	1st week	6	5	3	5min30s
	2nd week	5	6	6	7min30s
	3rd week	6	5	5	4min10s
	4th week	7	6	7	4min50s

Participants A–C are different participants from those in the short-term experiment.

4.2 Experimental Results

In the last week of the experiment, all participants rated all questions equal to or higher than in the first week. These findings show that participants became familiar with our system and learned how to achieve melodies they liked with our system.

However, the results in the third week for Participants A and C and in the second week for Participant B were lower than in the previous weeks. This is because they got a stronger sense of what they wanted as they became familiar with melody editing. In fact, the participants often edited specific notes again and again, and said in the interview that they wanted to achieve a particular melody. This implies that the experience of melody editing with our system arouses musically untrained people to explore

melodies that they want and make their desire for certain melodies clearer.

When asked whether anything changed during the one-month period, Participant A answered that he learned to anticipate the melody only by seeing the melodic outline on the screen and to expect what melody would be generated when drawing changes in the outline. These results show that our system is useful in improving the musical ability of untrained people, as well as supporting such people's composition.

4.3 Future Issues Revealed through the Experiment

The most salient comment in the interviews was the demand to be able to edit specific notes. Because such comments were few in the first week, this demand was clearly enhanced by the experience of editing melodies at the outline level. In addition, there was a comment that the outline-level editing was suitable as a first step, but the participant came to want note-level editing as the experiment progressed. These comments show that the best solution will be an integration of outline-level and note-level editing strategies. In fact, we have developed a prototype system where users can seamlessly switch between the two editing strategies. Users can edit a melody first at the outline level and then (after finding note-level demands for the melody) at the note level. We conducted an experiment with this prototype system and obtained promising results, which will be reported in a separate paper.

Sometimes the generated melodies did not match the melodic outlines that participants drew. This is caused by constraints in the Viterbi search of the HMM. In the current settings of the state transition probabilities, the possibility of the appearance of C and G are high. In addition, the probability of transiting from a note to the same note is set low to avoid monotonous melodies. These settings sometimes make the generated melody deviate far from the drawn outline. A mechanism for adjusting such parameter settings will solve this problem.

5. CONCLUSION

In this study, we conducted short-term and long-term evaluations on a melody editing method based on melodic outlines that we proposed in a previous paper [7]. In particular, we focused on the five questions described in the Introduction. Through the experiments, we obtained the following answers to these questions:

1. **Can musically untrained people grasp the characteristics of a melody from the melodic outline?**
   Yes. In particular, they learned to anticipate a melody from the melodic outline after using the system for several weeks.
2. **Is the pianoroll interface truly difficult for musically untrained people to use?**
   Yes. The usability rating of the pianoroll interface by the novice group was low.
3. **To begin with, do musically untrained people feel satisfaction/dissatisfaction with automatically generated melodies? (in other words, do they want a melody with a specific feature?)**
   Yes. They actually felt dissatisfaction with some melodies and tried to edit it to get a satisfactory melody.
4. **Is the abstraction level of melodic outlines appropriate as a melody representation for musically untrained people to edit?**
   Yes. They successfully expressed what melody they wanted at the melodic outline level.
5. **Will the answers to these questions change after continuously using our system for a long term?**
   Yes. As they experienced melody editing with our system for a month, their intention of melody editing became clearer and more specific, and they became interested in more detailed, note-level melody editing.

In the future, we will extend our melody editing method based on discussions described in Sections 3.3 and 4.3.

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A. EXCERPTS OF INTERVIEWS

A.1 Participant A

1st week

——At the beginning of the editing, what kind of melody did you want to make this melody?"

Participant A Because notes in the latter half were a little high, I wanted to make some of them lower.

——What did you think when you listened to the result?

A The melody drastically fell down in pitch at the edited part. So I made also the previous note a little lower.

——You clicked the button of Score 2. Why?

A Because the edited part was strange.

——What was your rating (out of 100) of the melody when you finished editing?

A 70.

2nd week

——You input "stir up" as your tentative goal of editing. What does this mean?

A Going up, going down, going up, going down, ... something like that.

——You made some notes very high.

A Yes, I actually wanted to edit the melody this way. The editing was comfortable.

——After that, you repeatedly edited a note in the last measure.

A While editing a melody, I came to want to move a specific note to a particular position. But I couldn't.

——What is your rating of your melody this week?

A 90.

——What is the reason for the 10 points subtracted?

A Because I wanted to edit the above-mentioned note.

3rd week

——You said you wanted to make notes in the third measure higher. How clear is this desire?

A It succeeded to some extent. I'm interested in further notewise editing, though I'm not sure it will succeed.

——What did you feel when listened to the edited melody?

A It was different from expected.

——What notes ?

A Last three notes in the third measure. I felt they were strange, so I edited them.

——You edited these notes again and again. What melody did you aim for?

A I wanted to make the three notes the same in pitch. But I couldn't.

——What is your rating of your melody this week?

A 100. The final result was very good.

——Do you feel anything different compared to editing at the first week?

A When drawing a melodic outline, I could anticipate the generated result a little.

4th week

——Do you find any changes during this period?

A I learned to imagine the melody only by seeing the screen.

(snip)

——You said that you wanted to make notes in the third measure higher. Did you have a more specific idea?

A I wanted to make some notes at the end the same in pitch. I wanted to edit each note separately.

——What was your impression of the generated melody?

A It would be better if some of the last notes were a little higher.

——So, you edited them in that way. Was the editing easy?

A Yes. But, after that, I repeated the editing to make them same in pitch.

——What is your satisfaction with your melody?

A 90 (out of 100).

A.2 Participant B

1st week

——You wanted to make the notes of the first measure higher. Did you have more specific goal?

Participant B The original melody had a repetition of the same note, so I wanted to make these notes scattered.

——At the beginning, you repeated editing without listening to the results.

B I wanted to edit a specific note. But that note was not edited as intended.

——Indeed, sometimes a melody that is not along the outline was generated.

B I felt it was difficult to edit it.

——What is your satisfaction with the generated melody?

B 3 (out of 5). Because I couldn't edit the notes I wanted to edit.

2nd week

——How was the editing compared to the previous week's editing?

B I easily edited in contrast to the previous week.

——Your goal was to make the melody more bright. You edited the melody so that it rises in pitch. Was it easy?

B Yes, it was.

——You often edited the same part again and again.

B I wanted to change a specific note to a particular pitch, but I couldn't.

——Does your goal become clearer while editing?

B It is difficult. Rather, I wander from melody to melody through repeated editing and listening.

——What is your satisfaction with the generated melody?

B 80 (out of 100).

——Why did you subtract 20 points?

B Because the goal of editing was changed from the original goal. I'm often confused when better melodies are generated than what I originally imaged.

3rd week

——You intended to make the first measure more bright. Was the generated melody as intended?

B Yes. Editing a melodic outline was easy. The output melody was also good.

——Then, you edited the latter half. What did you intend?

B While listening, I came to want to edit also the latter half. I succeeded in making a favorite melody.

——What is your rating of the melody you made?

B 80.

4th week

——You originally intended to make the second measure more bright, but you edited all measures.

B First, I thought it was enough to edit only the second measure. But, I rethought I should edit all measures to get a more favorite melody.

——At the first editing, you made notes higher. What did you think when you listened to the result?

B For the first step, the result was good.

(snip)

——Did you have a clear goal in editing the melody?

B I had a rough idea like going up, going down, and then going up again.

——Did you imagine a more specific goal, like this note should be put here?

B No.

(snip)

——What is your satisfaction (out of 100) of the generated melody?

B 80. Because it was better than expected.

——Did you find any change in how to use the system during the one-month period?

B I learned what response will be returned in editing. Anyway, I enjoyed editing because it was easy and visually manipulatable.

A.3 Participant C

1st week

——Your tentative goal was to make the beginning of the third measure rise up and the following notes fall down. Did you have a more specific thought?

Participant C No.

——When you played back the melody generated by the first editing, you rated it at two (out of five). Why?

C Because some notes in the middle were uneven (went up and down in pitch).

——Did you want to edit such part at the note level?

C Yes. But this system is easy because I can give an instruction like "make it higher" and "make it lower" to the system only by redrawing a curve. It's not easy when I have a specific idea.

——Do you have a particular preference in melodies?

C Melodies often have repetitions of the same note. When I met such a melody, I wanted to make such part uneven. Repetitions of the same note are monotonous.

——At the second listening, you clicked the button of Score 2. Why?

C I wanted a melody suitable for the last measure, but I didn't feel the result was so.

——Do you clearly imagine what kind of melody is suitable for the last?

C No. So, I listen, then decide.

——What is your satisfaction with this melody?

C 70 (out of 100).

——What is the reason of subtracting 30 points?

C Because I'm not completely satisfied with the output.

2nd week

——You intended to make the middle of the first measure lower and the end of the second measure higher. How was your first edit?

C Easy to do it. Because I had only a rough idea about an editing goal at the beginning of the editing, melodic outlines were comfortable.

——How was the result?

C I was not satisfied.

——Why?

C This melody has two long notes. The long notes were not edited as intended. In such a case, it would be better if I could also edit a melody at the note level.

——How was your operational feeling?

C I have become accustomed. But I couldn't find a better melody after I clicked the button of Score 4.

——What is your satisfaction with your melody?

C Between 70 and 80 for the melody I gave Score 4. For the final melody, it's between 40 and 50.

3rd week

——You edited the melody so that the pitch moved up then moved down in the third measure. How was the result?

C The result was as intended. The melody was generated according to the outline I drew. Because I wanted to edit this melody further, I continued editing.

——I thought you sometimes focused on a particular note in editing.

C Yes.

——What is your satisfaction (out of 100) with the result?

C Between 80 and 90.

4th week

——Did you find any changes during this period?

C What I did at the beginning was probably just editing (i.e., changing only unfavorite part). Recently, I use this system as if I use a (semi-)composition system.

——You gave Score 2 to the melody you first played back.

C I drew the outline as intended, but the output was not good.

——You went back to the previous melody using the undo function, and tried to redraw the outline.

C Yes. I recently redraw the outline after undoing when I'm not satisfied with the generated melody.

(snip)

——What is your satisfaction with your final melody?

C Between 90 and 100. I succeeded in making a satisfactory melody.

——Did you get anything like a policy in melody editing?

C Because the melodies used here often have repetitions of the same note, so I tried to break such repetitions.