

frame and the predetermined number of tone data can be completely formed by just tone data forming operations being effected only when the tone generating processing is actually activated by the internal interrupt signal.

5 Figs. 5 and 6 are explanatory of examples of Measure 1, according to which internal interrupt signals activating the tone generator section are generated in a frame of 100 milliseconds at intervals of 10 milliseconds (hence, 10 internal interrupt signals are generated per frame) and one
10 tenth of the predetermined number of tone data is formed each time the tone generator section is activated by the interrupt signal.

 In the example of Fig. 5, all tone data that failed to be formed due to a failure of the internal interrupt signal
15 generation are belatedly formed in response to generation of a next internal interrupt signal. Namely, in the illustrated example, all tone data that failed to be formed due to a failure of the internal interrupt signal generation at the
20 second interrupt or activating time (corresponding to 10th millisecond point in the figure) are formed, in response to the internal interrupt signal generated at the third activating time (corresponding to 20th millisecond point), together with tone data originally allocated to that point (as denoted by "2" and "3" in the figure). Also, all tone data
25 that failed to be formed due to a failure of the internal interrupt signal generation at the sixth and seventh activating times (corresponding to 50th and 60th millisecond points) are formed, in response to the internal interrupt

section;

Triggering factor 3: Detection of a processing request from the output device;

5 Triggering factor 4: Detection of another request such as an input event on the panel screen of the display 9 or a command input event on the keyboard 8 (excluding a main routine ending command); and

Triggering factor 5: Detection of an input event of a main routine ending command on the keyboard 8.

10 After step S3, a determination is made at step S4 as to whether or not any one of the above-mentioned triggering factors has occurred. If answered in the negative at step S4, the main routine reverts to step S3 in order to repeat the operations of steps S3 and S4 until any one of the above-
15 mentioned triggering factors occurs. Once any one of the triggering factors has occurred, an affirmative determination results at step S4 and the main routine moves on to step S5, where a further determination is made as to which of the triggering factors has occurred.

20 If triggering factor 1 (i.e., supply of a MIDI message from the sequencer program) has occurred, predetermined MIDI process is executed at step S6 and a predetermined visual display of the received message, such as data indicating for which of MIDI channels the MIDI message has been supplied, is
25 visually presented at step S7 on the panel screen. After this, the main routine loops back to step S3 in order to repeat the operations at and after step S3.

The MIDI process at step S6 includes note-on event and

C L A I M S

1. A tone generating device comprising:
 a supply unit for supplying performance information;
5 a storage unit for storing therein a plurality of
 programs including a tone generating program; and
 a general-purpose arithmetic processing unit capable of
 concurrently executing the programs stored in said storage
 unit in a parallel manner, said arithmetic processing unit
10 causing a plurality of internal interrupt signals to be
 generated within a predetermined time period and activating
 the tone generating program to generate tone data based on the
 performance information that is supplied by said supply unit
 in response to the internal interrupt signals,
15 wherein the tone generating program activated by said
 arithmetic processing unit includes an adjusting mechanism for
 adjusting an amount of a tone waveform to be generated, in
 such a manner that a predetermined number of samples of tone
 data can be cumulatively formed within the predetermined time
20 period by tone data forming operations being effected only
 when the tone generating program is actually activated by said
 arithmetic processing unit.
2. A tone generating device as claimed in claim 1 wherein
 if the predetermined number of samples of tone data can not
25 be formed, by the tone data forming operations alone effected
 only when the tone generating program is actually activated,
 for every tone generating channel that is designated by the

performance information for tone generation, said adjusting mechanism reduces a specific number of the tone generating channels to be used for forming the tone data so as to secure formation of the predetermined number of samples of tone data.

5 3. A tone generating method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

10 a first step of generating internal interrupt signals to activate tone generating processing a plurality of times within a predetermined time period;

 a second step of designating an amount of a tone waveform to be generated by the tone generating processing,
15 in such a manner that a predetermined number of samples of tone data can be cumulatively formed within the predetermined time period by tone data forming operations being effected only when the tone generating processing is actually activated in response to the internal interrupt signals; and

20 a third step of executing the tone generating processing in response to the internal interrupt signals, so as to form tone data corresponding to the amount of a tone waveform designated by said second step.

4. A tone generating method as claimed in claim 3 wherein
25 if the predetermined number of samples of tone data can not be formed, by the tone data forming operations alone effected

only when the tone generating processing is actually activated, for every tone generating channel assigned to the tone generating processing, said third step reduces a specific number of the tone generating channels to be used for forming the tone data so as to secure formation of the predetermined number of samples of tone data.

5. A tone generating device comprising:
- 10 a supply unit for supplying performance information;

 a first register for, when tone generating processing based on the performance information is assigned to an unused tone generating channel, storing therein a parameter for controlling the tone generating processing;

 a second register for, when new tone generating processing based on other performance information is assigned to the tone generating channel while said channel is not available for the new tone generating processing, storing therein a parameter for controlling the new tone generating processing;
 - 20 a selecting unit for selecting said first register before a predetermined time point to start the new tone generating processing and selecting said second register after the predetermined time point; and

a tone generating unit for generating tone data in the

25 tone generating channel by use of one of said first and second registers selected by said selecting unit.

6. A tone generating method for causing a general-purpose arithmetic processing unit to execute tone generating processing on the basis of supplied performance information, said method comprising:

5 a first step of assigning tone generating processing to an unused tone generating channel and storing a parameter for controlling the tone generating processing into a first register;

10 a second step of assigning new tone generating processing to the tone generating channel while said channel is not available for the new tone generating processing, storing a parameter for controlling the new tone generating processing into a second register;

15 a third step of selecting said first register before a predetermined time point to start the new tone generating processing and selecting said second register after the predetermined time point; and

20 a fourth step of generating tone data in the tone generating channel by use of one of said first and second registers selected by said third step.

7. A tone generating device comprising:

a supply unit for supplying performance information;

a plurality of output buffers for writing therein tone data;

25 a reproducing unit for sequentially reproducing the tone data from one of the output buffers which has been reserved for subsequent tone data reproduction;

a storage unit for storing therein a plurality of programs including a tone generating program; and

5 a general-purpose arithmetic processing unit capable of concurrently executing the programs stored in said storage unit in a parallel manner, said arithmetic processing unit activating the tone generating program in response to internal interrupt signals generated at predetermined time intervals,

wherein said tone generating program contains program code mechanisms to implement a tone generating process for
10 generating tone data on the basis of the performance information that is supplied by said supply unit prior to reproduction timing of said reproducing unit, a writing process for writing the generated tone data into another of said output buffers that is not reserved, and a reserving
15 process for reserving said other output buffer, having the tone data written therein, for subsequent tone data reproduction by said reproducing unit, and

wherein said generating process receives the performance information at timing that precedes the reproduction timing
20 by a time corresponding to a total capacity of said output buffers, and two or more of said output buffers can be simultaneously reserved by said reserving process.

8. A tone generating method for causing a general-purpose
25 arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

a reproduction step of sequentially reproducing tone data from a specific one of a plurality of output buffers which has been reserved for subsequent tone data reproduction; and

5 a generation step of, in response to internal interrupt signals generated at predetermined time intervals, generating tone data on the basis of performance information that is supplied prior to reproduction timing of said reproduction step, writing the generated tone data into another of said
10 output buffers than said specific output buffer, and reserving said other output buffer for subsequent tone data reproduction by the reproduction step,

wherein the generation step receives the performance information at timing that precedes the reproduction timing
15 by a time corresponding to a total capacity of said output buffers, and two or more of said output buffers can be simultaneously reserved.

9. A tone generating device comprising:

20 a supply unit for supplying performance information;
 a plurality of output buffers for writing therein tone data;

a reproducing unit for sequentially reproducing the tone data stored in one of the output buffers which has been
25 reserved for subsequent tone data reproduction;

a storage unit for storing therein a plurality of programs including a tone generating program; and
 a general-purpose arithmetic processing unit capable of

- concurrently executing the programs stored in said storage unit in a parallel manner, said arithmetic processing unit activating the tone generating program in response to internal interrupt signals generated at predetermined time intervals,
- 5 wherein said tone generating program contains program code mechanisms to implement a tone generating process for generating tone data on the basis of the performance information that is supplied by said supply unit prior to reproduction timing of said reproducing unit, a writing
- 10 process for writing the generated tone data into another of said output buffers that is not reserved, and a reserving process for reserving said other output buffer, having the tone data written therein, for subsequent tone data reproduction by said reproducing unit, and
- 15 wherein said generating process is capable of previously generating tone data for writing into two or more of said output buffers, and if tone data for writing into one of said output buffers to be next reserved has not yet been prepared at a time point when said reproducing unit has reproduced all
- 20 the tone data from the reserved output buffer, said generating process discontinues generation of tone data that should have been completed by said time point and then newly starts generation of other tone data to be formed a predetermined time after said time point.
- 25 10. A tone generating method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of

programs which are concurrently executable thereby, said method comprising:

5 a reproduction step of sequentially reproducing tone data stored in a specific one of a plurality of output buffers which has been reserved for subsequent tone data reproduction; and

10 a generation step of, in response to internal interrupt signals generated at predetermined time intervals, generating tone data on the basis of performance information that is supplied prior to reproduction timing of said reproduction step, writing the generated tone data into another of said output buffers than said specific output buffer, and reserving said other output buffer for subsequent tone data reproduction by said reproduction step,

15 wherein said generation step is capable of previously generating tone data for writing into two or more of said output buffers, and if tone data for writing into one of said output buffers to be next reserved has not yet been prepared at a time point when said reproduction step has reproduced all
20 the tone data from the reserved output buffer, said generating process discontinues generation of tone data that should have been completed by said time point and then newly starts generation of other tone data to be formed a predetermined time after said time point.

25 11. A tone generating device comprising:

a supply unit for supplying performance information;

a storage unit for storing therein a plurality of

programs including a tone generating program;

5 a general-purpose arithmetic processing unit capable of
concurrently executing the programs stored in said storage
unit in a parallel manner, said arithmetic processing unit
causing a plurality of internal interrupt signals to be
generated within a predetermined time period and activating
the tone generating program to generate tone data based on the
performance information that is supplied by said supply unit
in response to the internal interrupt signals;

10 wherein said tone generating program contains program
code mechanisms to implement a tone generating process for
generating tone data on the basis of the performance
information that is supplied by said supply unit prior to
reproduction timing of said reproducing unit, a writing
15 process for writing the generated tone data into another of
said output buffers that has not been reserved, and a
reserving process for reserving said other output buffer,
having the tone data written therein, for subsequent tone data
reproduction by said reproducing unit, and

20 wherein said tone generating process is capable of
previously generating tone data for writing into two or more
output buffers, and on the basis of a specific number of
samples of tone data previously generatable at a time of
activation of said tone generating process, determines a total
25 number of samples of tone data to be generated.

12. A tone generating device as claimed in claim 11 wherein
on the basis of the specific number of previously generatable

samples of tone data, said tone generating process determines the total number of samples of tone data to be generated within a range not exceeding a predetermined upper limit.

13. A tone generating method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

10 a reproduction step of sequentially reproducing tone data stored in a specific one of a plurality of output buffers which is reserved for subsequent tone data reproduction; and

15 a generation step of, in response to internal interrupt signals generated at predetermined time intervals, generating tone data on the basis of performance information that is supplied prior to reproduction timing of the reproduction step, writing the generated tone data into another of said output buffers than said specific output buffer, and reserving said other output buffer for subsequent tone data reproduction by said reproduction step,

20 wherein said generation step is capable of previously generating tone data for writing into two or more of said output buffers, and on the basis of a specific number of samples of tone data previously generatable at a time of
25 activation of said tone generating process, determines a total number of samples of tone data to be generated.

14. A tone generating method as claimed in claim 13 wherein
on the basis of the specific number of previously generatable
samples of tone data, said generation step determines the
total number of samples of tone data to be generated within
5 a range not exceeding a predetermined upper limit.

15. A machine readable recording medium containing a group
of instructions to cause said machine to implement a method
for causing a general-purpose arithmetic processing unit to
generate a tone on the basis of performance information by
10 executing one of a plurality of programs which are
concurrently executable thereby, said method comprising:

a first step of generating internal interrupt signals to
activate tone generating processing a plurality of times
within a predetermined time period;

15 a second step of designating an amount of a tone
waveform to be generated by the tone generating processing,
in such a manner that a predetermined number of samples of
tone data can be cumulatively formed within the predetermined
time period by tone data forming operations being effected
20 only when the tone generating processing is actually activated
in response to the internal interrupt signals; and

a third step of executing the tone generating processing
in response to the internal interrupt signals, so as to form
tone data corresponding to the amount of a tone waveform
25 designated by said second step.

16. A machine readable recording medium containing a group of instructions to cause said machine to implement a method for causing a general-purpose arithmetic processing unit to execute tone generating processing on the basis of supplied performance information, said method comprising:

a first step of assigning tone generating processing to an unused tone generating channel and storing a parameter for controlling the tone generating processing into a first register;

10 a second step of assigning new tone generating processing to the tone generating channel while said channel is not available for the new tone generating processing, storing a parameter for controlling the new tone generating processing into a second register;

15 a third step of selecting said first register before a predetermined time point to start the new tone generating processing and selecting said second register after the predetermined time point; and

a fourth step of generating tone data in the tone generating channel by use of one of said first and second registers selected by said third step.

17. A machine readable recording medium containing a group of instructions to cause said machine to implement a method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

a reproduction step of sequentially reproducing tone data from a specific one of a plurality of output buffers which has been reserved for subsequent tone data reproduction; and

5 a generation step of, in response to internal interrupt signals generated at predetermined time intervals, generating tone data on the basis of performance information that is supplied prior to reproduction timing of said reproduction step, writing the generated tone data into another of said
10 output buffers than said specific output buffer, and reserving said other output buffer for subsequent tone data reproduction by the reproduction step,

wherein the generation step receives the performance information at timing that precedes the reproduction timing
15 by a time corresponding to a total capacity of said output buffers, and two or more of said output buffers can be simultaneously reserved.

18. A machine readable recording medium containing a group
20 of instructions to cause said machine to implement a method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

25 a reproduction step of sequentially reproducing tone data stored in a specific one of a plurality of output buffers which has been reserved for subsequent tone data reproduction; and

a generation step of, in response to internal interrupt signals generated at predetermined time intervals, generating tone data on the basis of performance information that is supplied prior to reproduction timing of said reproduction
5 step, writing the generated tone data into another of said output buffers than said specific output buffer, and reserving said other output buffer for subsequent tone data reproduction by said reproduction step,

wherein said generation step is capable of previously
10 generating tone data for writing into two or more of said output buffers, and if tone data for writing into one of said output buffers to be next reserved has not yet been prepared at a time point when said reproduction step has reproduced all the tone data from the reserved output buffer, said generating
15 process discontinues generation of tone data that should have been completed by said time point and then newly starts generation of other tone data to be formed a predetermined time after said time point.

19. A machine readable recording medium containing a group
20 of instructions to cause said machine to implement a method for causing a general-purpose arithmetic processing unit to generate a tone on the basis of performance information by executing one of a plurality of programs which are concurrently executable thereby, said method comprising:

25 a reproduction step of sequentially reproducing tone data stored in a specific one of a plurality of output buffers which is reserved for subsequent tone data

reproduction; and

5 a generation step of, in response to internal interrupt
signals generated at predetermined time intervals, generating
tone data on the basis of performance information that is
supplied prior to reproduction timing of the reproduction
step, writing the generated tone data into another of said
output buffers than said specific output buffer, and reserving
said other output buffer for subsequent tone data reproduction
by said reproduction step,

10 wherein said generation step is capable of previously
generating tone data for writing into two or more of said
output buffers, and on the basis of a specific number of
samples of tone data previously generatable at a time of
activation of said tone generating process, determines a total
15 number of samples of tone data to be generated.

Abstract"Tone Generating Method and Device"

Tone generating processing is activated plural times, i.e., at a plurality of activating times, within each predetermined time period. Thus, even when the tone generating processing fails to be activated at some of the activating times, a predetermined number of samples of tone data can be belatedly formed within the predetermined time period, by tone data forming operations being effected only at the other activating times when the tone generating processing is actually activated. If the predetermined number of samples of tone data can not be formed, just by the tone data forming operations effected only when the tone generating processing is actually activated, for every tone generating channel assigned to the processing, the number of the channels to be used for forming the tone data is reduced so as to secure formation of the predetermined number of samples of tone data.

(Figure 5)