1 What is MusicT\TeX?

MusicT\TeX\ is a set of \TeX\ macros to typeset polyphonic, orchestral or polyphonic music.

Two sizes are available : 16pt and 20pt (standard) staff heights. For that purpose, it uses special fonts: musicn16, slurn16, beamn16 and musicn20, slurn20, beamn20 respectively.

It is to be emphasized that MusicT\TeX\ is not intended to be a compiler which would translate into \TeX\ some standard musical notations, nor to decide by itself about aesthetic problems in music typing. MusicT\TeX\ only typesets staves, notes, chords, beams, slurs and ornaments as requested by the composer. Since it makes very few typesetting decisions, MusicT\TeX\ appears to be a versatile and rather powerful tool. However, due to the important amount of informations to be provided to the typesetting process, coding MusicT\TeX\ might appear to be awfully complicated, just as the real keyboard or orchestral music. It should be interfaced therefore by some pre-compiler in the case of the composer/typesetter wanting aesthetic decisions to be automatically made by somebody (or something) else.

1.1 Music typesetting is two-dimensional

Most of the people who just learnt a bit of music at college probably think that music is a linear sequence of symbols, just as literary texts to be \TeX\-ed. In fact, with the exception of strictly monodic instruments like most orchestral wind instruments, one should be aware that reading music actually is a matricial operation: the musician successively reads columns of simultaneous notes. This is the reason why, in MusicT\TeX\ the fundamental macro is of the form

\verbatim
\notes ... | ... & ... \enotes
\endverbatim

for each column of simultaneous notes.

1.2 The spacing of the notes

It seems that many books have dealt with this problem. Although it can lead to interesting algorithms, we think it is a rather minor one.

In the case of an instrument whose score has to be written with several staffs, these staffs are separated by the character |. Thus, a score written for a keyboard instrument and a monodic instrument (for example piano and violin) will be coded as follows:

\verbatim
\notes ... | ... & ... \enotes
\endverbatim

where it can be clearly seen that the half notes at beats 2 and 3 must be spaced as if they were quarter notes, since they overlap, which is obvious only because of the presence of the indication of the meter 4/4.

Therefore, we prefered to provide the composer/typesetter with a set of macros, the spacing of which increases by a factor of $\sqrt{2}$ (incidentally, this can be adjusted):
The size of the spatial unit (\elemskip) can be freely adjusted. In addition, Music\TeX{} provides a means of adjusting the note spacing according to an average number of elementary spaces within a line (macro \autolines).

1.3 Music tokens, rather than a readymade generator

The tokens provided by Music\TeX{} are:

- the note symbols without stem;
- the note symbols with stems, and hooks for eighth notes and beyond;
- the indications of beam beginnings and beam ends;
- the indications of beginnings and ends of ties and slurs;
- the indications of accidentals;
- the ornaments: arpeggios, trills, mordents, pincés, turns, staccatos and pizzicatos, fermatas;
- the bars, the meter and signature changes, etc.

Thus, \wh g produces an A (445 Hz) whose duration is a whole note. In the same way, \qu c produces a C (250 Hz approx.) whose value is a quarter note with stem up, \cl J produces a C (125 Hz approx.) whose duration is an eighth note with stem down, etc.

To generate quarter, eighth, sixteenth, etc. chords, the macro \zq can be used: it produces a quarter note head whose position is memorized and recalled when another stemmed note (possibly with a hook) is coded; then the stem is adjusted to link all simultaneous notes. Thus, the perfect C-major chord, i.e.

\begin{center}
\begin{tikzpicture}
  \node (g) at (0,0) {G};
  \node (g) at (1,0) {G};
  \node (g) at (2,0) {G};
  \node (g) at (3,0) {G};
  \node (g) at (4,0) {G};
  \node (g) at (5,0) {G};
  \node (g) at (6,0) {G};
\end{tikzpicture}
\end{center}

is coded \zq c\zq e\zq g\qu j or, in a more concise way, \zq{ceg}\qu j (stem up): in fact, single notes are treated... like one-note chords.

Beams are generated using macros which define their beginning (at the current horizontal position), together with their altitude, their sense (upper of lower), their multiplicity, their slope and their reference number. This latter feature – the reference number – appears to be necessary, since one may want to write beams whose horizontal extents overlap: therefore, it is necessary to specify which beam the notes hang on and which beam is terminated at a given position.

Besides, a general macro (\zcharnote) provides a means of putting any sequence of symbols (in fact, some \hbox{...}) at any pitch of any staff of any instrument. Thus, any symbol defined in a font (letters, math symbols, etc.) can be used to typeset music.

Before entering details, we give below an example of the two first bars of the sonata in C-major by MOZART (Mozart, K545):

\begin{center}
\begin{tikzpicture}
  \node (g) at (0,0) {G};
  \node (g) at (1,0) {G};
  \node (g) at (2,0) {G};
  \node (g) at (3,0) {G};
  \node (g) at (4,0) {G};
  \node (g) at (5,0) {G};
  \node (g) at (6,0) {G};
\end{tikzpicture}
\end{center}

The coding is set as follows:

```latex
\def\nbportees{1}\relax % a single instrument
\nbportees{2}\relax % with two staffs
\generalmeter{\meterfrac{4}{4}}\relax % meter is 4/4
\debutmorceau % initiates staffs, clefs, indication of the meter.
\normal % normal spacing (14pt for \Notes)
\temps{\Notes\ibu0f0}\qu0\gh0{cge}\tbu0\gh0g\hl j\enotes % \ibu0f0 begins an upper beam, aligned on the f, reference number 0, slope 0. % \tbu0 terminates this beam before writing the second g by means of \gh0g, % where \gh0 indicates a note hanging on a beam.
\temps{\Notes\ibu0f0}\gh00\tbu0\gh0g\tq1 l\sk\ql n\enotes % \sk sets a space between the two quarters at the right hand, so that % the second is aligned with the third eighth of the left hand.
```

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Dutch \TeX{} Users Group (NTG), P.O. Box 394, 1740 AJ Schagen, The Netherlands
Music\TeX{} is intended to handle up to six instruments, each of which may be typeset on zero to four staves (zero staff is used to record the text of vocal parts).

Signatures are stated either for all instruments, such as: $\generalsignature=-2$ which sets two flats on each staff, but this can be partly overridden by $\signatureii=1$ which puts one sharp on the staffs of instrument number 2 (ii). Of course, signature may change at any time as well as meters and clefs.

Besides, two frequently posed questions deserve an answer. The first one is: "can Music\TeX{} transpose a score?". The answer is now 99.5 % yes. If fact, there is an internal register named $\transpose$ which sets two flats or two sharps on all staves of a score. This is done by $\signatureii=1$ which puts one sharp on the staffs of instrument number 2 (ii). Of course, signature may change at any time as well as meters and clefs.

The second question is: "can I write an orchestral score and extract the separate scores for individual instruments?" The answer is 95 % yes: in fact, you can define your own macros \myNotes...\enotes with as many arguments as there are in the orchestral score (hope this is less or equal to 9, but \TeX{}xpers know how to work around) and change its definition depending on the selected instrument (or insert a test on the value of some selection register). But the limitation is that the numbering of instruments may change, so that $\signatureiiii$ may have to become $\signatureiiii$ if instrument iii is alone. But this is not a serious problem for average \TeX{} wizard apprentices.

1.4 Other highlights

Music\TeX{} is intended to handle up to six instruments, each of which may be typeset on zero to four staves (zero staff is used to record the text of vocal parts).

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1.5 How to get it

The whole distribution fits into a single 1.2Mbyte or 1.44Mbyte diskette. It can also be obtained through an anonymous ftp at rsouvax.ups.circe.fr (130.84.128.100), after selecting the subdirectory [.musictex]. All sources (including fonts) are provided, either separately, or "zipped" or as VMS 'savesets'.

1.6 Implementation and restrictions

The macroinstruction file Music\TeX{} contains approximately 2500 lines of code, that is 80.000 bytes approximately. This requires your score to be compiled by the most extended versions of \TeX{} (65 000 words of working memory). In desperate situations, we recommend using the "Big\TeX{}" processors which, unfortunately, perform a great deal of disk input/outputs (on PCs) which make them awfully slow.

In particular, the number of registers it uses makes it doubly compatible with La\TeX{}.

Ties and slurs have been implemented in a way which may look rather ugly, but we think it is the only way of implementing in one pass ties and slurs which run across glue. The principle is to have tie/slur symbols with a rather long part of horizontal stuff. Then, at each time a glue occurs and at each time a group of notes is coded while a slur or tie is pending, an $\hrule$ is issued which overlaps the preceding tie/slur symbol so that the final output seems to contain a continuous line. Unfortunately, this is possible only in the glue expansion direction, namely in the horizontal direction.

1.7 Acknowledgements

The idea of implementing the present package is due to the previous work (Mu \TeX{}) of Andrea STEINBACH and Angelika SCHOFER\textsuperscript{1}. This work provided the basis of the Metafont codes and some line breaking procedures, which both are still used here... with 99% corrections and updates.

2 Practical use

2.1 Heading statements

Before any reference to Music\TeX{} macros:

\input musicnft
\input musictex

which may be followed by \input musicadd in the case you have more than six instruments (voice is two instruments: one for the music, one for the text) or more than 6 simultaneous beams or ties or slurs.

\textsuperscript{1} Steinbach A. & Schofer A., Theses (1987, 1988), Rheinische Friedrich-Wilhelms Universit"at, Bonn, Germany.
After that, you may write a complete book of \TeX provided that you do not use & as a tabulation character (its \texttt{catcode} has been changed) and that you do not overwrite Music\TeX's definitions. This means that no special macros have been designed to help you write titles, author names, comments, literature excerpts, etc.

2.2 Before you begin to write notes

You should first specify whether you want to typeset music in size 20pt par staff or 16pt. This only optional, the default value being 20pt. If you want the 16pt size, then you have to say:

\begin{verbatim}
\musicsize=16
\end{verbatim}

Then, the first compulsory declaration is:

\begin{verbatim}
def\nbportee=r
\end{verbatim}

where \( n \) is the number of instruments, used by Music\TeX to performs loops building staffs, setting signatures, meters, etc. Therefore, it must be defined before any other statements. An instrument may consist of several staffs, e.g. the piano. The difference between one instrument of several staffs and several instruments is as follows:

- distinct instruments may have distinct signatures, distinct staffs of a unique instrument share the same signature.
- stems may be hung to beams belonging to different staffs of the same instrument.
- chords may extend across several staffs of the same instrument.
- staffs of a unique instrument are tied together with a big brace at the beginning of each line.

If the number of staffs (in french “portées”) is not equal to one, this number must be specified by:

\begin{verbatim}
\nbportee=r\relax
\end{verbatim}

where \( p \) is the number of staffs, and where \( r \) is the roman numeral of the instrument considered (e.g. \texttt{\nbporteeiii} for the 3rd instrument, starting from the bottom).

If the signature is not void, one should code:

\begin{verbatim}
\generalsignature=s\relax
\end{verbatim}

where \( s > 0 \) indicates the number of sharps in the signature and \( s < 0 \) the number of flats\(^2\). If there a meter indication is to be posted, it should be specified using the macro

\begin{verbatim}
\generalmeter{m}\
\end{verbatim}

where \( m \) is the description of the meter indication which should appear on each staff. If it is a fraction (e.g. 3/4), on should code

\begin{verbatim}
\generalmeter{\meterfrac{3}{4}}\
\end{verbatim}

or, in a simpler way (if the numbers are less than 10):

\begin{verbatim}
\generalmeter{\meterfrac 34}\
\end{verbatim}

Special denotations can be used, such as \texttt{\allabreve} to get \( \text{C} \) and \texttt{\meterc} to get \( \text{C} \).

However, not all music scores have the same meter in each staff. Especially, some staffs may have ternary meters while others have binary. This can be specified by using the \texttt{\generalmeter} macro to set the meter for most of the scores and overriding it by means of a more sophisticated command:

\begin{verbatim}
\metertoksii={{\meterfrac{12}{8}}{% \allabreve}{}}{}{}% which sets the meter to 12/8 for the first (lower) staff, and alla breve for the second staff of the instrument number 2 (\textit{ii}). Note that there is room for 4 staffs and that void items must be specified, otherwise \TeX weird errors occur.

If you want the name of the instruments (or the name of the voices) to be displayed in front of their respective staffs at the beginning, you may code:

\begin{verbatim}
def\instrumentr{name of the instrument}\% where \( r \) is the roman numeral of the instrument considered. In this case, you should also adjust the \texttt{\parindent} dimension so that the long name of an instrument does not spill too far into the left margin.

2.3 Starting your masterpiece

Just code

\begin{verbatim}
\debutmorceau
\end{verbatim}

which will initiate (with indentation \texttt{\parindent}) the first set of staffs for all instruments you have previously defined. But that is not sufficient to begin writing notes and silences. In fact, you also must choose the spacing of the notes. This is done by saying

\begin{verbatim}
\normal
\end{verbatim}

if you want a elementary spacing of 10pt. If you say \texttt{\large} the elementary spacing \texttt{\elemskip} is set to 12pt. Once this is done, you can select \( \sqrt{2} \) multiples of this spacing by initiating your column with \texttt{\notes} (spacing \texttt{\elemskip}), \texttt{\Notes} (spacing 1.4\texttt{\elemskip}), etc. If these values of \texttt{\elemskip} are not fit to your needs, you can also say

\begin{verbatim}
\normal\elemskip=15pt
\end{verbatim}

Of course, if your are sufficiently skilled with \TeX, you can also compute \texttt{\elemskip} according to the number of bars you want in a line and the number of notes in each bar. Incidentally, this is done by the \texttt{\autolines} macro which will be introduced later.

\footnote{We have seen once a score in G-minor where the signature consisted in two flats (B and E) plus one sharp (F). This is not supported by Music\TeX.}
In practice, the choice of the macro \notes, \Notes, \Notes, etc., to initiate of column of notes sets an internal dimension register, named \noteskip to the given multiple of \elemskip. The text of the macros \normal, \large and \etroit is thus rather simple:

\def\normal{\ifdim\Interligne<0.1pt
 \computewidths\fi % (ignore this safety)
 \elemskip=2\Interligne\relax %
 \% (i.e. 10 points)
 \def\notes{\vnotes 1.0\elemskip} %
 \def\Notes{\vnotes 1.4\elemskip} %
 \def\NOTes{\vnotes 2.0\elemskip} %
 \def\NOTEs{\vnotes 2.8\elemskip} %
 \def\NOTEs{\vnotes 4.0\elemskip} %
 \def\NOTEs{\vnotes 5.6\elemskip} %
 \def\NOTEs{\vnotes 3.6\elemskip} %
 \def\NOTEs{\vnotes 5.6\elemskip} %
 \def\NOTEs{\vnotes 4.0\elemskip} %
 \def\NOTEs{\vnotes 2.8\elemskip} %
 \def\NOTEs{\vnotes 2.0\elemskip} %
 \def\NOTEs{\vnotes 2.0\elemskip} %
 \def\NOTEs{\vnotes 1.4\elemskip} %
 \def\Notes{\vnotes 1.0\elemskip} %
 \def\notes{\vnotes 1.0\elemskip} %
 \def\notes{\vnotes 1.0\elemskip} %
 \def\notes{\vnotes 1.0\elemskip} %
 \def\notes{\vnotes 1.0\elemskip} %

As seen above, if these standard spacings do not meet your requirements, you are welcome to define other spacings, using the more basic macro \notes.

However, you may also prefer to ask Music\TeX{} to compute the size of \elemskip from the page width (\hsize) after assuming a constant number of bars of a constant number of beats within each line\textsuperscript{4}. In this case, you have better use the \autolines macro, which is described below (see: “Line and page breaking”).

### 2.4 Note pitch specification

Note pitches are usually specified by letters ranging from a to z for those which are usually written under the G-clef (a corresponds to the A of frequency 222.5 Hz; the G of the G-clef is denoted g). Lower pitch notes are specified using uppercase letters ranging from A to N (the F of the F-clef is denoted M, and F is one octave below).

If necessary, a numeric symbol can be used to place a symbol independently of the active clef.

Besides, notes below A (i.e. the A of frequency 55.625 Hz), namely the lowest octave of the modern pianos can only be coded using the transposition features (see below: transposition and octaviation) or in absolute vertical position using numbers.

#### 2.5 Writing notes

There are two major kinds of note macros:

1. those which terminate a note/chord stem and cause horizontal spacing,
2. those which initiate or extend a note/chord stem and do not cause horizontal spacing.

The first kind is used to type a melody, the second kind is used to type chords.

##### 2.5.1 Single (spacing) notes

\wh p: whole note at pitch p.
\hu p: half note at pitch p with stem up.
\hi p: half note at pitch p with stem down.
\qu p: quarter note at pitch p with stem up.
\ql p: quarter note at pitch p with stem down.
\cu p: eighth note\textsuperscript{5} at pitch p with stem up.
\cl p: eighth note at pitch p with stem down.
\ccu p: sixteenth note at pitch p with stem up.
\ccl p: sixteenth note at pitch p with stem down.
\cccu p: 32-th note at pitch p with stem up.
\cccl p: 32-th note at pitch p with stem down.
\ccccu p: 64-th note at pitch p with stem up.
\cccccl p: 64-th note at pitch p with stem down.

As an example, the sequence:

\begin{music}
\notes \ccccu \temps \ccl \j \notes \barre
\notes \cccu \temps \cccl \j \notes \barre
\notes \ccccu \temps \cccccl \j \notes
\end{music}

was coded as:

\begin{music}
\notes \cu \c \temps \cl \j \notes \barre
\notes \cu \c \temps \cl \j \notes \barre
\notes \cccu \c \temps \cccl \j \notes \barre
\notes \ccccu \c \temps \cccccl \j \notes
\end{music}

If these notes are preceeded by non-spacing notes (i.e. macros \zq or \zh) their stem is extended up or down so as to join all notes into a single chord.

\textsuperscript{2}To avoid problems with the \LaTeX{} macro of the same name, this macros is only activated under \LaTeX{} when \begin{music} is invoked.

\textsuperscript{4}This does not meet the requirements of contemporaneous music, but fits very well to baroque and romantic music.

\textsuperscript{5}The \cc of this macro name is taken from the french word “croche” which is by the way one half of the english “crotchet”; \ccc... \cccc... are standing for “double croche”, “triple croche”, etc.
2.5.2 Non-spacing (chord) notes
\zq p: quarter (or shorter) note head at pitch p with no spacing after.
\zh p: half note head at pitch p with no spacing after.

It must be pointed out that the pitch p of these notes is memorized so that the stem of the further spacing note will join them into a chord. This stem top and bottom pitch is reset at each spacing note.

REMARK: Notes of duration longer than whole notes are always non-spacing. This saves one useless definition, since this notes are always longer than other simultaneous ones. If needed they can be followed by \sk to force spacing.

2.5.3 Shifted non-spacing (chord) heads

These symbols are used mainly in chords where second intervals are present. It is the responsibility of the typist to choose which heads should be shifted left or right.

\rw p: whole note head shifted right by one note width (ca. 6pt), no spacing.
\lw p: whole note head shifted left by one note width (ca. 6pt), no spacing.
\rh p: half note head shifted right by one note width (ca. 6pt), no spacing.
\lh p: half note head shifted left by one note width (ca. 6pt), no spacing.
\rz p: quarter note head shifted right by one note width (ca. 6pt), no spacing.
\lq p: quarter note head shifted left by one note width (ca. 6pt), no spacing.

Except that they are shifted left of right, these macros act like \z... macros for stem building.

2.5.4 Shifted notes
\rqu: acts like \qu but the note head is shifted one note width. This is used for chords whose upper note has to be on the right side of the stem.
\rhu: same as above for a half note.

2.5.5 Non-spacing single notes
\zhu: half note with stem up but no spacing. It acts like \hu for stem building.
\zh1: half note with stem down but no spacing. It acts like \h1 for stem building.
\zqu: quarter note with stem up but no spacing. It acts like \qu for stem building.
\zql: quarter note with stem down but no spacing. It acts like \ql for stem building.
\lhu, \l1h1, \lqu, \lql: same as above, but the whole of the note is shifted one note width on the left.
\zw p: whole note at pitch p with no spacing after.
\zwq p: arbitrary duration note \(\bullet\) at pitch p with no spacing after.
\zpv p: breve note \(\dot{\bullet}\) at pitch p with no spacing after.
\zsb p: semi-breve note \(\ddot{\bullet}\) at pitch p with no spacing after.

2.5.6 Pointed notes

One simple way of doing consists in putting \pt p to get a dot after the normal notehead at pitch p. Thus a quarter note with a point can be coded \pt h\qu h.

A simpler way of doing consists in using compact macros, namely: \qu, \qqu, \qquu, \zq, \zh, \qw (these three \z... are useful in chords), \hqu, \whp, \qhp, \qh, \qlp, \qlpp, etc.

You may also introduce pointed notes, especially in groups by coding: \qu{.a.¢b.c} which is equivalent to:
\pt{a}\qu{a}\pt{b}\sh{b}\qu{b}\%\pt{c}\qu{c}

2.6 Beams

Beams are not automatically handled, but they must be declared explicitly, before the first spacing note involving them is coded. Two kinds of macros are provided:

1. fixed slope beams have an arbitrary slope choosen by the user in the range -45 % to +45% (by multiples of 5 %);
2. semi-automatic beams have their slope computed knowing the number of \noteskip over which they are supposed to extend, and knowing the initial and final pitch of the notes they are supposed to link.

2.6.1 Fixed slope beams
\ib nps: initiates an upper beam 3 horizontal line spacings above the pitch p. m is its reference number, which must be in the range [0-6] ([0-9] if musicadd file has been \input).

\ib s is the slope of the beam. It is an integer in the range [-9,9]. \(s = 1\) means a slope of 5%, \(s = 9\) means a slope of 45% (the maximum with the beamn20 or beamn16 fonts), \(s = -3\) means a slope of -15%, etc. With usual spacings a slope of 2 or 3 is fit for ascending scales. A slope of 6 to 9 is fit for ascending arpeggios.

\ibl nps: initiates a lower beam 3 horizontal line spacings below the pitch p. Other parameters as above.
\iblu nps: initiates a double upper beam (same parameter meaning).
\ibbl nps: initiates a double lower beam (same parameter meaning).
\ibbbu nps: initiates a triple upper beam (same parameter meaning).
\ibbbl nps: initiates a triple lower beam (same parameter meaning).
\ibbbbu nps: initiates a quadruple upper beam (same parameter meaning).
\ibbbbl nps: initiates a quadruple lower beam (same parameter meaning).

Beam termination is also not automatic. The termination of a given beam must be explicitly declared before coding the last spacing note connected to that beam.
\tbu n: terminates upper beam number n at current position.
\tbl n: terminates lower beam number n at current position.
\tbu and \tbl terminate beams of any multiplicity.

Notes hanging or standing on beams are coded in the form \qh np and \qb np where n is the beam number and p the pitch of the note head. Music\TeX\ adjusts the length of the note stem to link the bottom of the chord to an upper beam (normally with \qh) and the top of the chord to a lower beam (normally with \qb).

Note that the difference between upper and lower beams does not mainly consist in the beam being above or below the note heads; rather, it specifies whether the abscissa of the beginning and the end of this beam is aligned on the right (upper beam) or on the left (lower) beam. Thus, the sequence:

\begin{verbatim}
\notes\ibu0e0\qh0e\ibbu0%\qh0e\enotes
\end{verbatim}

has been coded as:
\begin{verbatim}
\Notes\ibu0e0\qh0e\ibbu0%\qh0e\enotes
\end{verbatim}

It is quite possible to terminate with \tbu a beam initiated with \ibl. This may give:

\begin{verbatim}
\notes\ibu0e0\qh0e\iblu0\qh0e\enotes
\end{verbatim}

which has been coded as

\begin{verbatim}
\iblu00\qn0e\noteskip\enotes
\end{verbatim}

Partial termination of beams is also possible, by using \tbbu or \tbbbl: these macros terminate the current beam except that of order 1 (eights). \tbbbu or \tbbbl terminate the current beam except those of order 1 and 2, etc.

The macros \tbbu and \tbbbl may also be invoked when only a single beam is active. Then, a second beam (upper or lower according the initiating procedure) is opened one note width before the current position, and closed immediately. Thus the following sequence

\begin{verbatim}
\notes\ibbl0j0\rlap{\qsk\tbbl0}\qb0j\tbl0\qb0j\enotes
\end{verbatim}

is coded:

\begin{verbatim}
\Notes\ibbl0j0\rlap{\qsk\tbbbl0}\qb0j\tbbbl0\qb0j\enotes
\end{verbatim}

The same behaviour occurs in the case of \tbbbu, \tbbbl, \tbbbu and \tbbbl.

The symmetrical pattern is also possible. For example:

\begin{verbatim}
\Notes\ibbbl0j0\enotes
\end{verbatim}

has been coded as:

\begin{verbatim}
\Notes\ibbbl0j0\enotes
\end{verbatim}

\begin{verbatim}
\Notes\ibbbl0j0\enotes
\end{verbatim}

REMARK: these codings may seem complicated. In fact, it is the responsibility of the user to define macros which perform the most common sequences in his masterpiece. For example, one could define sets of four sixteenths by the macro:
\begin{verbatim}
\def\qgh#1#2#3#4#5{%\ibbbl0#1\#2\#3\#4\#5\tbbbl0\qh #2\qh #3\tbbbl0\qh #4}
\end{verbatim}

where the first argument is the slope and the other four arguments are the pitches of the four consecutive sixteenths wanted.

2.6.2 Semi-automatic beams

In order to avoid tedious checks to adjust the slope (and even the starting pitch) of beams in music with a lot of steep beams, a set of automatically slope computing has recently been implemented (file musicvbm.tex). If you say \Ibu2gj3 Music\TeX\ will understand that you want to build an upper beam (beam number 2) horizontally extending 3\noteskip and whose first
2.9 Accidents

Accidentals can be introduced in two ways.

The first way, the manual way of coding them, consists for example in coding \flat a to put a flat at the pitch a, supposedly before the further note of that pitch. There is no control upon the fact that a note will be put at this position and at this pitch. Naturals, sharps, double flats and double sharps are coded \natural p, \sharp p, \flat p and \sharpir p respectively.

Alternate procedures \flp, \lnp, \lsp, \ldp and \ldsp place the same accidentals, but their abcissa is shifted one note head width on the left. The purpose of this is to avoid collision of accidentals in a chord with narrow intervals.

The second way of coding accidentals consists in putting the symbol ^ (sharp), the symbol _ (flat), the symbol - (natural), the symbol << (double sharp), or the symbol <= (double flat) within the coding of the note, e.g.: \sharp{d} yields a D#. This may very well be combined with collective coding, e.g.: \qu{ac^d}.

Two sizes are available for accidentals. They revert to the small version when notes are supposed to be too close to each other. These two sizes can be forces by coding \bigfl, \bigsh, etc., or \smallfl, \smallsh, etc. If one does not want to have any small accidentals, then one can declare \bigaccid (conversely \smallaccid or \varaccid – the latter restoring variable sizes).

It is also possible to put (small) accidentals above the note heads. This is done using \uppersh p, \upperlnp or \upperflp.

2.10 Transposition and octaviation

An important feature is the existence of a special register \transpose whose normal value if 0. If you say \transpose=3 all subsequent pitches specified by upper or lower case letters will be transposed 3 positions. If you set \transpose to 7 you may write your music one octave below its final pitch. Thus, you can define octaviation macros like \def\sou#1{\zq{#1}{\transpose=7\relax \qu{#1}}} to build quarternote octaves in a single call. Note that the octaviated note is coded within braces so that the transposition is only local.

Octaviation can also be performed in is another way, namely unsing special codes to transpose by multiples of 7 intervals. For example \qu(ab) is equivalent to \qu(hi) and \qu(kl) is equivalent to \qu(de). It should be emphasized here that the ‘ (acute accent) and the ‘ (grave accent) have cumulative ef-

---

Do not use \kern nor \hskip: in fact \sk not only causes a space but also records that space for correct handling of beams.
effects, so that $\text{\texttt{\textbackslash qu\{'A'A'\}}}$ is equivalent to $\text{\texttt{\textbackslash qu\{ah\}}}$ and that the $\texttt{\textbackslash transpose}$ parameter is only reset to its initial value (not necessarily zero) when changing staff or instrument (i.e. $|\rule{0pt}{1em}$ or $\&$) or at $\texttt{\textbackslash notes}$. Since this may be confusing, it is useful to use the ! prefix to reset the $\texttt{\textbackslash transpose}$ register explicitly to the value it had when entering $\texttt{\textbackslash notes}$. Thus $\texttt{\textbackslash qu\{!\textquoteright a'\textquoteright\}}$ always gives the note a and its upper octave h shifted by the value of $\texttt{\textbackslash transpose}$ at the beginning of the current $\texttt{\textbackslash notes}$...$\texttt{\textbackslash notes}$ group (or $\texttt{\textbackslash Notes}...\texttt{\textbackslash enotes}$, etc.) whatever the number of previous grave and acute accents occurring in-between.

The above processes indeed change the vertical position of the note heads and associated symbols (note stems, accents and beams) but they do not take care of the necessary changes of accidentals when transposing, i.e. the fact that an $F^\#_2$ occurring with a zero signature should become a $B^\#_2$ when transposing from the tonality of C major to F major where the normal B is the $B^\flat_2$. Since the intent of the composer is not obvious – he may want to shift a group of notes within the same tonality or conversely to transpose it in another tonality – this is not done automatically. Thus the $\texttt{\textbackslash sh}$, $\texttt{\textbackslash f1}$, $\texttt{\textbackslash na}$, $\texttt{\textbackslash sh}$ and $\texttt{\textbackslash df1}$ symbols are not affected by a change of the $\texttt{\textbackslash transpose}$ register.

But the composer/typesetter may ask Music\TeX{} to do that work. In this case, he should code $\texttt{\textbackslash Sh}$, $\texttt{\textbackslash F1}$, $\texttt{\textbackslash Na}$, $\texttt{\textbackslash dSh}$ and $\texttt{\textbackslash df1}$ (or $\texttt{\textbackslash bigSh}$, $\texttt{\textbackslash bigF1}$, $\texttt{\textbackslash bigNa}$, $\texttt{\textbackslash bigdSh}$ and $\texttt{\textbackslash bigdf1}$ or $\texttt{\textbackslash smallSh}$, $\texttt{\textbackslash smallF1}$, $\texttt{\textbackslash smallNa}$, $\texttt{\textbackslash smalldSh}$ and $\texttt{\textbackslash smalldf1}$) instead of the usual lower case accidental symbols. The symbol $\texttt{\textbackslash Sh}$ (resp. $\texttt{\textbackslash bigSh}$ and $\texttt{\textbackslash smallSh}$) means that the corresponding pitch has to be raised by one half pitch with respect to its normal value according to the current signature. Thus $\texttt{\textbackslash Sh}$ b means a $B^\flat_2$ if the signature is zero or positive, and a $B^\sharp_2$ if it is negative. The same logic applies for all accidentals having an upper case forelast letter.

Obviously, the computation is done after taking account of the value of the $\textbackslash transpose$ register.

The compact codes $\texttt{\textbackslash relativeaccidentals}$ and $\texttt{\textbackslash absoluteaccidentals}$ (the default situation).

Although relative accidental coding is an easy and safe way of coding transposable scores, care should be exercised in getting rid of the habit of saying $\texttt{\textbackslash na}$ b to rise the pitch of a B when the tonality is F major (i.e. with $\texttt{\textbackslash signature=-1}$ or $\texttt{\textbackslash generalsignature\{-1\}}$). An example of sophisticated transposition is given in the score souvenir.tex (which \inputs souvenir.tex).

Besides, the typical piano octave transposition 8----- can be obtained by coding:

\texttt{\textbackslash octfin\ p \ n}

which puts the 8 and dotted line symbols at the pitch p (usually p to r). The length is n\textbackslash noteskip. This obviously fit for short octaviation denotations. To transpose a whole line, use $\texttt{\textbackslash octline\ p}$. Since $\texttt{\textbackslash octfin}$ terminates with a small hook down, to indicate clearly where octaviation stops, you may also like to use $\texttt{\textbackslash octsup}$ which behaves like $\texttt{\textbackslash octfin}$ without the final hook. All this supposes you have an idea of the actual line breaking of your score in that section, and this is admittedly difficult to handle when octave transposition is supposed to long a large number of lines. In that latter case, you can use the $\texttt{\textbackslash def\ everyline{...}}$ to insert whatever code you like at each new line of score. This has been used to set octaviation in the score of the Toccata in F by Charles-Marie Widor\footnote{A French organist (1844-1937) and composer who was in charge of the organ of St-Sulpice in Paris, from 1864 to 1934.}. At each bar (or virtual bar, namely $\texttt{\textbackslash zbarre}$), the \everystaff procedure is updated to produce the convenient code, in case of the line breaking happening before the next definition.

### 2.11 Ties and slurs

They have been implemented in a way which may look rather ugly, but we think it is the only way of implementing \textit{in one pass} ties and slurs which run across glue.

Slurs and ties must be initiated within the pair $\texttt{\textbackslash notes}...\texttt{\textbackslash notes}$ before the spacing note is coded. They must be terminated also before the last note is coded.

\begin{verbatim}
\itenu\ p
\end{verbatim}

(ten stands for the italian word \textit{tenuto}) initiates an upper tie (convex) at pitch p. Just like beams, ties have a reference number n, from 0 to 6 (or 9 if musicaddi is included. \itenu\ p\ n\ initiates a lower tie (concave). The tie of reference number n is terminated by $\texttt{\textbackslash tten\ n}$. Slurs are initiated with $\texttt{\textbackslash ilegu\ p}$ and $\texttt{\textbackslash ilegl\ p}$, where leg stands for the italian word \textit{legato}, and they are terminated with $\texttt{\textbackslash tleg\ n}$. Except that slurs start before the note position and stop after, ties and slurs work the same way with the same syntax. They also share the same registers so that slurs nesting tied notes should have numbers n distinct from each other. A French organist (1844-1937) and composer who was in charge of the organ of St-Sulpice in Paris, from 1864 to 1934.

### 2.12 Bars and spacing

Ordinary bars a coded using the macro $\texttt{\textbackslash barre}$ (this is a french word\footnote{Whose advantage is that it differs from $\texttt{\textbackslash bar}$ which is already defined in \TeX{}}). This macro provides an optional (dis-
criterionary) line or page break. It also provides some glue in order to expand the text over an evenly filled line. However, since the number of bars in a score line is generally small, it may be convenient to allow glue not only on each sides of bars. This can be done using the macro \temps (the French word for beat). This macro has two effects:
1. it inserts some glue but prevents line breaking, 2. if some ties or slurs are pending it expands them across the glue by writing an \hrule which overlaps the unfinished tie and makes it look prolonged.

Whatever the care you exercise in adjusting the size of the \elegant you are still likely to find some broken ties (which indicate excessive glue disassembling the gliding tie \hrules) or some unexpected (and unwanted) line breaks or some Over\hfill full \boxes. A useful means of estimating the remaining space to be filled with glue consists in declaring \raggedlinestrue: after that, an \hfil will be inserted by Music\TeX before each computed (when using \autolines) or forced line break. Thus, all the musical text will be packed on the left of the line and you will clearly see the amount of remaining space. Then, it will be up to you do decide changing some spacing parameters.

Important: do not use \temps when beams are pending, otherwise their spatial synchronization would fail. In other words, ties and slurs can jump over glue (because horizontal rules may overlap and thus have some elasticity) but beams (as well as any oblique lines) cannot.

Unless otherwise specified, bars are numbered. This is a good means of finding errors provided that the Music\TeX user has put comments in his source text recording the (expected) bar number. However, this can look unpleasant for final outputs, since the habit is to number bars only each other five or ten bars. This is not a serious problem since the frequency of bar numbering is defined as:
\freqbarno{1}
If you replace the 1 by 5, bar numbering will occur each other five bars. Conversely, whenever you want to put the bar number, you just say \barreno. You can also inhibit any bar number printing by telling \def\barreno{.}
The bar counter is also accessible, its name is \barno. This has nothing to do with the bar counting invoked by \autolines, so you can change it without any dramatic consequence.

2.13 Line and page breaking
Bars provide a line breaking mechanism which is supposed to enable \TeX to break a full score into lines and pages, with an optimal distribution of the text into lines and pages. Unfortunately, this does not work correctly for scores of more that approximately one page. The reason is that \TeX must compile the entire contents of a paragraph, before it tries to break it into lines and pages. Therefore, one cannot rely on \TeX to make that work which automatically results in the diagnostic Te\X capacity exceeded, memory...

To circumvent this dramatically restrictive capacity unless you use some Big\TeX another mechanism must be invoked to break lines.

The first one is the manual one: you replace some of the \barre macro calls by either \alaligne (equivalent to \break within text (in fact it contains a \break plus some (many) other things. In the same way, you can code \alapage to force an \eject with proper reinitialization of staffs, clefs and signatures.

The second one is fit for scores whose bars are of regular length: after \debutmorceau, you code the following macro:
\autolines tml
where t is the number of elementary spacings (the length of \notes...\enotes) in an average bar, n is the number of bars you wish in a line and l is the number of lines you wish in a page.

This sets some parameters, namely \maxbarnoline and \maxlinesinpage which are simply used to count the bars, optionally perform \alaligne or \alapage instead of the normal \barre. You may freely alter the values of these parameters, once they have been established by \autolines. Moreover, you can still force line breaking of page ejection using \alaligne or \alapage without problem since these macros actually reset the bar counters appropriately.

On the other hand, you may want to forbid line breaking at a bar, then you replace \barre by \xbarre. Conversely, you may want to break a line not at a bar. This is allowed by \zbarre (optional line break) or forced by \zalaligne or \zalapage.

The final heavy double bar of a piece is provided by \finmorceau. If you just want to terminate

\footnote{Unless it is triggered according to bar counting when \autolines has been invoked.}
\footnote{This could unpleasantly occur if you insert a space...}
\footnote{\TeX has been designed to type text, not music.}
\footnote{Whose drawback is that it is very slow on ordinary PCs.}
\footnote{After having coded nearly one hundred of pages of music, I strongly recommend the use of \autolines except when inserting short excerpts of less than one line, such as in musicographic books.}
\footnote{For example, you may prefer to turn the page at a place where the pianist has one hand free.}
the text with a simple bar, you say \suspmorceau. If you want to terminate it without a bar, you code \zsuspmorceau. Once you have stopped the score by any of these means, you can restart it using \repmorceau.

If you want the next vertical bar to be a double bar, you have to declare \setdoublebar before the \barre (or the \suspmorceau or \alaligne or \salapage) to be marked with a double thin bar.

2.14 Changing score attributes

As seen before, you can change the signature of the whole set of instruments by \generalsignature n where \( n \geq 0 \) means a number of sharps, \( n < 0 \) means a number of flats. Or, you may prefer to change the signature of only one or two instruments by the statement:

\[ \signature = r, s \]

where \( r \) is the roman numeral of the instrument considered, and \( s \) its specific signature. Since you may change simultaneously (with respect to the score) but consecutively (with respect to your code) the signatures of several instruments, this change takes place only when you say \changesignature (within a bar) or \changecontext (after a single vertical rule) or \Changecontext (after a double vertical rule). In the same way, you may want to change the active clefs. This is done by:

\[ \cleftoks = \{s1\} \} \{s2\} \} \{s3\} \} \{s4\} \%

where \( r \) is the roman numeral of the instrument, \( s1 \) specifies the clef of the lower staff, \( s2 \) the clef of the second staff, etc. One must always give four values with the above syntax, otherwise... \( s1 = 0 \) means the bass clef (\clef de fa in French), \( s1 = 0 \) means the violin clef (\clef de sol in French), \( s1 = 1 \) through \( s1 = 5 \) mean the alto clef set on first (lower) through fifth (upper line of the staff). As seen above in the case of signatures, several clefs may be changed at the same time; thus all the clef changes become operational only when the macro \changeclefs is coded. Normal usage consists in issuing this command before the bar, not after (this helps the music player when the change happens across a line break).

\textbf{Meter} changes are implemented the same way:

\[ \metertoks = \{m1\} \} \{m2\} \} \{m3\} \} \{m4\} \%

where \( r \) is the roman numeral of the instrument, \( m1 \) specifies the meter of the lower staff, \( m2 \) the meter of the second staff, etc. One must always give four values with the above syntax, otherwise... Since meter changes are meaningful only across bars, they are actually taken in account with \changecontext or \Changecontext or \alaligne or \salapage.

2.15 Repeats

To insert a repeat bar you can use several sets of procedures. The simplest consists in using the commands \leftrepeatsymbol, \rightrepeatsymbol and \leftrightrepeatsymbol — coded outside the \notes...\enotes pairs — which will simply insert these colon adorned double bars at the requested place. For example:

\begin{center}
\begin{tabular}{c}
\includegraphics[width=0.1\textwidth]{repeat_bar.png}
\end{tabular}
\end{center}

has been coded as:

\begin{verbatim}
\notes\hu g\enotes
\leftrepeatsymbol
\notes\hu h\enotes
\leftrepeatsymbol
\rightrepeatsymbol
\Notes\wh j\enotes
\suspmorceau
\end{verbatim}

However, the previous way of coding does not provide for line breaking at repeat bars, nor does it advance the bar numbering. In fact, this way of coding if only fit for repeats occurring in the middle of a bar.

A second way of coding consists in saying \setleftrepeat, \setrightrepeat or \setleftrightrepeat before a bar (\barre), \suspmorceau or \changecontext). In this case, the next next vertical bar will be replaced with the selected repeat bar. This meets the traditional music typesetting conventions in the only case of the right repeat but, unfortunately, left and left/right repeats use to behave in a different manner when in the middle of a line and at a line break.

The third coding, namely the correct coding — i.e. transforming in the correct manner when occurring at a line break — is obtained by substituting the \barre command with \leftrepeat, \rightrepeat and \leftrightrepeat.

Now, if you want to force a new line at a repeat, you should code respectively:

\begin{verbatim}
\setleftrepeat\alaligne
\setrightrepeat\suspmorceau
\alaligne\leftrepeatsymbol
\repmorceau\leftrepeatsymbol
\debutmorceau\leftrepeatsymbol
\end{verbatim}

or the combination of two of these in the case of a left/right repeat.

2.16 Miscellaneous

Special macros are provided to help the composer to set any \TeX text on the staffs. The macro

\begin{verbatim}
\charnote[p]{text}
\end{verbatim}

sets the given text with its base line at pitch \( p \) of the current staff (this means it must be coded inside \notes...\enotes. Whatever the length of the
text, the spacing is \noteskip. If you do not want it to cause spacing, you code \zcharnote. If you want the possible spilling text to expand on the left rather than on the right, then you can use \lcharnote.

To place some text at the mid-position between the two staffs of a keyboard instrument, you may code:
\midtwotext{ text } % (spacing)
\zmidtwotext{ text } % (non spacing)

being however careful, a) to put it inside \notes...\enotes, b) to code it in the text of the lower staff.

A text to be put above the current staff is introduced by \uptext{...}. This may however cause some collision with bar numbering or notes above the staff; it is then wise to use \Uptext{...} which puts the text two pitches higher (recommended to post the tempo).

Metronomic indication deserves a special macro. The mention:
\bezier{5}{8}{10}{12}{15}{20}
\hline
\hup
\endgraf
\bezier{5}{8}{10}{12}{15}{20}
\hline
= 60

is coded by \metron{\hup}{60} (normally embedded in \Uptext which is in turn embedded within \notes...\enotes).

The macro \zcharnote is fit for coding special notations like accents above or below the notes. It behaves like \charnote but causes no spacing.

Arpeggios (i.e. \{) can be coded with the macro
\arpeggio p m

where p is the pitch of the base of the arpeggio symbol and m is its multiplicity (one period is equal to one space between staff lines, i.e. 5 points). This macro causes a space of one note head width. If should be issued before the concerned chords. Its variant \larpeggio sets the arpeggio symbol slightly more on the left, in order to avoid collision with accidentals in front of the chords.

Trills can be coded in several ways. \trille l (where l is a \TeX{} dimension) yields  tr, while \Trille l (where l is a \TeX{} dimension) yields \textit{tr}  tr. To put these patterns at a given pitch, one may use \xtrille pl or \xTrille pl.

On the other hand \trille p n is equivalent to \xtrille p{n\noteskip} and \Trille p n is equivalent to \xTrille p{n\noteskip}

Other ornaments are available:
- \mordant p for \textit{apostrophe below a note head at pitch p},
- \lpz p (lower pizzicato) to put a dot below a note head at pitch p,
- \usf p (upper storzando) to put a > accent above a note head at pitch p,
- \lsf p (lower pizzicato) to put a > accent below a note head at pitch p,
- \ust p (upper staccato or portato) to put a hyphen above a note head at pitch p,
- \lst p (lower staccato or portato) to put a hyphen below a note head at pitch p,
- \Upz p (upper strong pizzicato) to put an apostrophe above a note head at pitch p,
- \Lpz p (lower strong pizzicato) to put a reversed apostrophe below a note head at pitch p.

The procedure named \everystaff is executed each time a new system is typed. It is normally void, but it can be defined (simply by \def{\everystaff{...}}) to tell \MusicTeX{} to post anything reasonable at the beginning of each system.

The procedure named \atnextline, normally void, is executed at the next computed (through \autolines) or forced line break (using \alaligne or \alapage). More precisely, it is executed after the break and before the next system is typed. Thus it is fit for posting new definitions of layout parameters, when no system is pending.

2.17 Staff size

You may also want to write some parts of your score in 20pt staff size and in 16pt staff size. This cannot be done – at least presently – in the same system, but only for distinct parts of pieces. Changing the size is done by saying:
\musicsize=16\computespecifics or
\musicsize=20\computespecifics respectively.

2.18 Small and tiny notes

Ornaments and cadenzas usually need to be written using smaller notes. This can be done everywhere by stating \smallnotesize or \tinynotesize. Normal note size is restored by \normalnotesize.

These macros only have a local scope. Thus, if these macros are invoked outside the \notes...\enotes pair, the change is valid for the rest of the piece unless explicitly modified but, if they are invoked inside, their effect is local to the current staff of the current \notes...\enotes pair. As an example, the following excerpt (beginning of the Aria of the Creation by Joseph HAYDN)

\begin{music}
\begin{footnotesize}
\begin{tabular}{ll}
\textbf{Reprint MAPS#8 (92.1); May 1992} & Dutch \TeX Users Group (NTG), P.O. Box 394, & 1740 AJ Schagen, The Netherlands
\end{footnotesize}
\end{music}
can be coded as:

\def\DS\{\hbox\{ds\}\}
\def\FS\{\hbox\{kern 0.3\noteskip\soupir\}\kern -0.3\noteskip\}
\def\qbl#1#2#3\{\ibl{#1}{#2}{#3}\qb{#1}{#2}\}
\def\qbu#1#2#3\{\ibu{#1}{#2}{#3}\qh{#1}{#2}\}
\def\binstruments{2}\%
\generalmeter\{\meterfrac{4}{4}\}\%
\signaturegenerale{0}\%
\nbporteessi=1\relax
\nbporteessi=2\relax
\cleftoksii=(6\{0\}\{0\}\{0\})
\cleftoksii=(6\{0\}\{0\}\{0\})
\etroit
\%
% end of preliminary definitions
%
\debutextrait
\NOTes\soupir&\soupir|\qu\enotes
% mesure 1
%\advance\barno by -1\relax
\barre\NOTes\itenu2\{\wh J&\zw N\ibl0c0\qb0e\}|\qu \enotes
\notes\qb1c0\{\noteskip=0.6\elemskip\}
\ibb1k2\qh1\{kj\}\|\qh1i\qsks\enotes
\NOTess\qb0e\{\btl0\qb0c\}|\qu \enotes
\temps\NOTess\bib1c0\{\qb0e\{ece\}\btl0\qb0c\}|\ql l\sk\ql \enotes
% mesure 2
\barre\NOTess\itenu2\{\wh J&\ql \jvsk\ql \l|\ppt g\rlap\{\qu g\}\qb1le0\relax
\quad \zq c\qble\zq c\qble\relax
\quad \zq c\qble\rlap\{\qble\} \ \ \| \ccu h\enotes
\temps\NOTess\ql N\sk\pt \{\ib10L\{-4\}\qb0L|\ib1le0\zq c\rlap\{\qble\}\cu g\relax
\quad \zq c\rlap\{\qble\}\raise\Interligne\DS \rllap\{\qu g\}\qb1g\enotes
\NOTess\sk\ttbl10\btl10\qb0J|\btl1z \zq c\qble\enotes
\finextrait

2.19 Layout parameters

Most layout parameters are set by MusicT\TeX{} to reasonable default values. However, sophisticated scores\textsuperscript{18} may need more place below the lowest staff, between staves, etc.

\interligne: vertical interval between lines

\nullthick: reserved height above base line for zero staff lines (text of songs)

\bottommargin: margin below the first staff of the lowest instrument. If not assigned a non zero dimension, it is set to \bottomfacteur\Interligne at the next system.

\topmargin: margin above the upper staff of the upper instrument

\internote: the half of \Interligne

\interbeam: vertical distance between beams

\Interligne: vertical distance between the base of staff lines. \Interligne is the size of the blank space between lines. The difference is the line thickness \lthick.

\textsuperscript{18}To our knowledge, the most complicated scores are those written for the piano, during the romantic and post-romantic periods.
\interportee: the distance between the top of one staff and the bottom of the next one. If not assigned a non zero value, it is set to \interfacteur\Interligne at the next system.

\interinstrument: the additional vertical distance between two different instruments. This means that the distance between the upper staff of the previous instrument and the lowest staff of the current instrument is equal to \interportee+\interinstrument. This value is normally zero, but it helps putting additional space between distinct instruments for the sake of clarity. This is a general dimension which holds for each of the vertical spaces between instruments, except the upper one, in which case this interval is irrelevant. However, this parameter can be overriden for the space above a specific instrument. For example (see the example angescao.tex) one can state:

\def\interinstrumenti{5pt}

to force an additional spacing of 5 points above instrument \textit{i}, whatever the value of \interinstrument.

\systemheight: the distance from the bottom of the lowest staff to the top of the highest staff of the upper instrument. This is the height of the vertical bars (single, double, repeats, etc.).

In addition, when handling notes of a given staff of a given instrument, the following dimensions are available (note these are not true registers, but equivalenced symbols through a \def):

- \altitude: the altitude of the lowest line of the lowest staff of the current instrument.
- \altportee: the altitude of the lowest line of the current staff.

Most of these values can be changed, but only between the end of the previous system and the beginning of the next one. This can be inserted between a \suspmorceau and a \repmorceau, but it is wiser to say, for example:

\def\atnextline{\global % \bottommargin=5\Interligne}

When doing so, the Music\TeX user should be aware that this could disturb pending slurs or ties, since the altitude of these is stored in an absolute way, starting from the baseline of the systems. Therefore, changing the \bottommargin dimension can also be made by means of \advancebottom{< dimension >} which updates all pending slur and tie altitudes by the given dimension. This has been used in pacifign and pacifiqb.

2.20 MusicLa\TeX

As said before, the amount of memory used by Music\TeX makes it hardly compatible with La\TeX. However, Nicolas BROIARD succeeded in building a musictex.sty which is now included in the distribution. This is not recommended to make separate music scores. Its purpose is rather to provide a means of inserting short musical excerpts in books or articles written with latex. Then, the \documentstyle command should include musictex in the options.

The La\TeX style file musictex.sty is the simple concatenation of the following files:

- musicpre.tex
- musicnft.tex
- musictex.tex
- musicvbm.tex
- musicpos.tex

In the case of a La\TeX user wanting to use accidental transposition facilities, he should invoke musictrp in the options of the \documentstyle command. The musicpos.tex file merely overrides the \catcodes of the | and & symbols which are modified by Music\TeX. To have access to these symbols when coding music, on should then enclose the scores or excerpts within \begin{music} and \end{music}. But there is also another possibility, i.e. to say \nextinstrument instead of \& and \nextstaff instead of \|. And in case of TeX capacity exceeded..., use a "BigLa\TeX" (after checking there is no visible error in the source code).

2.21 Implementation and restrictions

The macroinstruction file Music\TeX contains approximately 2500 lines of code, that is 80 000 bytes approximately. This requires your score to be compiled by the most extended versions of \TeX (65 000 words of working memory). It is therefore wise to set \tracingsstats to 2 in order to have an information about the memory used in each page. In desperate situations, we recommend using the "Big\TeX" processors which, unfortunately, perform a great deal of disk input/outputs (on PCs) which make them awfully slow.

In particular, the number of registers it uses and the amount of memory used by La\TeX macros makes it doubtfully compatible with La\TeX, unless using BigLa\TeX.

Other precautions are necessary : beware of end-of-line spaces ; they corrupt layout and may cause unwanted line breakings after which music symbols seem to \textit{float} in the air without staffs. To avoid that, it is recommended to use \relax rather than \% at the end of source lines, since it allows indentation at the following source line.
3 Installation

As seen before, all the files are available at anonymous ftp rssox.ups.circe.fr (130.84.128.100) in the directory

[anonymous.musictex].

This directory normally contains musictex.zip which contains all the distribution for PC (MS-DOS) computers. This is only for ftp-ing convenience since all source files are directly available in the same directory.

The VMS files are also packed into musictex.bck. Notwithstanding the fact that files are packed together or not, the files provided are of two kinds:
1. the basic files;
2. the example files.

All basic files are either of the form music*.* (excluding of course *.zip and *.bck) and beamn*.*. Other files (*.tex or *.dvi) are example files.

Fonts are provided as *.mf files but also as *.tfm and *.pk files for 300 dpi printers or previewers. Additional values of the dpi parameter are provided in musicpk.zip.

REMARK: introducing these files in a format (with INITEX) is a means of saving computer time.

4 Examples

Three examples are displayed in the following pages, namely a transcription for organ and song of the beginning of the Aria of The Creation by Joseph Haydn, a motet for Christmas by Praetorius – in the original pitch and transposed down by one pitch in smaller size – and a transcription of a concerto for oboe by Benedetto Marcello.

REMARK: the examples are given at the end of the document because their require a BigLaTeX to be produced. Thus a trial LaTeX-ing with standard LaTeX can produce anything but the large examples (they can be more easily produced using plain LaTeX rather than LaTeX).

People who want to produce some of the given examples should take care of the fact that many given files are supposed to be included (by means of \input) in other files. Thus the good files to be directly LaTeX-ed are those which begin with \input musicntex.

Suggested tests are:
- PACIFIQN for a long original piano work (11 pages);
- HADAGIM for a typical organ score;
- CARILLON for a sophisticated piano score (use BigLaTeX!);
- PRAETORI to get an ancient polyphonic song with three transpositions;
- ANGESCAM if you like Christmas carols with four voices, a three-staff organ score and the same transposed to meet ordinary singer’s limitations;
- HPRELFUG if you like imitations of J.-S. Bach...
- MARCELLO if you like pre-baroque music;
- RECUEIL if you want to get all the organ works of the author in a single book (43 pages);
- HCREATIM to get an unfinished transcription of the Creation by J. HAYDN.
- HWIDOR and NWIDOR to get the Toccata by Charles-Marie WIDOR in two different sizes.
\input musicnft
\input musictex
\input musicsty
\def\nbinstruments{2}\%\n\generalmeter{\meterfrac{4}{4}}\%
\signaturegenerale{0}\%
\hsizel 190\,mm \vsizel 275\,mm
\hoffset -10\,mm \voffset -10\,mm
\centerline{\enorme Aria No. 24}
\medskip\centerline{\moyen (La Création)}
\medskip\centerline{\moyen Joseph HAYDN}\%
\rightline{Transcription pour Orgue et Ténor, D. Taupin (1990)}
\medskip\nbporteesi=1\relax\nbporteesii=2\relax
\def\qbl#1#2#3{\ibl{#1}{#2}{#3}\qb{#1}{#2}}\%
\def\qbu#1#2#3{\ibu{#1}{#2}{#3}\qh{#1}{#2}}\%
\etroit
\def\DS{\hbox{\ds}}\def\FS{\hbox{\kern 0.3\noteskip\soupir}\kern -0.3\noteskip}
\cleftoksi={{6}{0}{0}{0}}\%
\cleftoksii={{6}{0}{0}{0}}\%
\debutmorceau
\NOTes\soupir&\rlap{\rmidtwotext{\bf II}}\soupir|\qu g\enotes\%\measure{1}
\advance\barno by -1\relax\barre\NOTes\itenl2J\wh J\&\zw N\ibl10c0\qb0e|\itenl10j\ibu110\qh1j\enotes
\NOTes\qb10c0|\nbbu1\nten0\qh1j\kjk|\tbu1\qh1i\enotes\NOTes\qb0e\tb10\qb0c|\qu j\enotes\NOTes\ibl10c0\qb0{ece}\tb10\qb0c|\ql 1\sk\ql j\enotes\%\measure{2}
\barre\NOTes\iten2w\wh J\&\ql J\sk\ql L|\ppt g\rlap(\qu g)|\qb1le0\relax
\NOTes\qb c\qb1le\qb c|\qb1le\qb c|\qb1le\qb c\relax
\NOTes\qb c\tb11\rlap(\qb1le)\%\cCU h\enotes\NOTes\ql N\sk\pt L\ibl10{|-4}\qb0L|\ibl10e0\锌 \ql c\rlap(\qb1le)\cu g\enotes\NOTes\qb c\rlap(\qb1le)\%\debutinterligne\DS\rlap(\qu g)|\qb1g\enotes\NOTes\sk\tb1b0\tb10\qb0j\tb1l1\qb1c\enotes\%\measure{3}
\barre\NOTes\itenl2G\wh G\&\zw N\raise 3.5\Interligne\DS\\rlap(\cl f)|\itenl10k\ibu1m0\qh1k\enotes\NOTes\qb10b0|\nbbu1\nten0\qh1j\kjk|\tbu1\qh1{\j}\enotes\NOTes\qb d\qb0f\tb10\qb0b|\qu k\enotes\NOTes\ib10d0\qw d\qb0f\qb0f|\qw d\qb0f|\qu m\sk\pt k\qb1{~4}\enotes\NOTes\tb10\qb0b|\sk\tbu1\qh1l1\enotes\%\measure{4}
\barre\NOTes\iten2W\wh G\&\ql G\sk\ql I|\rlap(\qupp g)|\ibl1c0\qb1g\relax
\NOTes\qb c\qb1le\qb c|\qb1le\qb c|\qb1le\qb c\relax
\NOTes\qb c\tb11\rlap(\qb1le)\%\cCU h\enotes\%\measure{5}
\barre\NOTes\iten12K\wh G\&\zw N\raise 3.5\Interligne\DS\\rlap(\cl f)|\itenl10k\ibu1m0\qh1k\enotes\NOTes\qb10b0|\nbbu1\nten0\qh1j\kjk|\tbu1\qh1{j}\enotes\NOTes\qb d\qb0f\tb10\qb0b|\qu k\enotes\NOTes\ib10d0\qw d\qb0f\qb0f|\qw d\qb0f|\qu m\sk\pt k\qb1{~4}\enotes\NOTes\tb10\qb0b|\sk\tbu1\qh1l1\enotes\%\measure{6}
\barre\NOTes\wh L\&\zw N\raise 3.5\Interligne\DS\qb10c0\qb0e\relax
\NOTes\tb10\qb0c|\sk\cCU l\enotes\NOTes\ib10c0\qb0{ece}\\rlap(\\hl g)|\qu n\sk\raise 2\Interligne\DS\enotes\NOTes\tb10\qb0c|\ibu1m{-3}\qh1l1\enotes
music example
Aria No. 24

(La Création)

Joseph HAYDN

Transcription pour Orgue et Ténor, D. Taupin (1990)

Mit Würd und Hoheit angetan, mit Schönheit, Stark und

20 avril 1994