ABSTRACT
Music notation is a set of symbols for representing music composition in a written form. In South East Asia, the most popular music notation is chipper notation (not angka). This paper introduces a new text based music notation that can be easily typed on a computer, yet powerful enough for writing multiple instruments and multiple voices compositions. It has been successfully implemented for writing complex compositions, to be played by an angklung robot.

KEYWORDS
chipper music notation, text, angklung, robot.

1 INTRODUCTION
Angklung is a bamboo musical instrument that is widely played in South East Asia, especially in West Java Indonesia [1]. Since 2011, an angklung robot system has been developed (Figure 1). It can play the real angklung along with MIDI synthesized instruments. A special MIDI sound font has been made to add other Indonesian traditional instruments such as carumba, gendang, kecapi, suling, as well as bass-betot. Therefore, the system is capable to play the most complex angklung compositions.

In this regard, Angklung Web Institute has built a database of more than 1,500 angklung songs [01]. All of the songs, however, were written using the chipper music notation. This notation uses the numerical symbols (1-7) to represent the notes on the diatonic scale, similar to the movable-do solfege system [2][3].

Bagimu Negri

<table>
<thead>
<tr>
<th>1=C 4/4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Padamu negeri kami berjanji</td>
</tr>
</tbody>
</table>

Figure 2. Example of the chipper music notation

Figure 2 is an example of a typical chipper music notation, representing an Indonesian song entitled “Bagimu Negri”, composed by Kusbini. The body section consists of 3 lines. The main melody of the song is written in the second line using the numeric symbols to represent the notes. The pitch of the notes depends on the key of the song, which is written in the header. In this case, the key is “1=C”, meaning that the numerical '1' symbol must be played as the C3 pitch according to the diatonic scale. Respectively, number '2' is mapped to D3, and so on up to number 7 which is mapped to B3. Moreover, a dot can be written above the number to raise the pitch to one octave higher. Conversely, a dot below the number lowers the pitch for an octave.

The next phrase in the header, “4/4”, is the meter of the song. It means that each number has a value of a quarter note, while each bar consists of
4 quarter notes. To shorten the length of the note, the numbers are over-lined. Each over-line divides the note length by 2. On the other hand, to prolong a note, one or more dotes are added after the note. The length of each dot is a quarter, and it can be over-lined too like a normal number.

The first line of the body is the accompaniment line, that contains the chords sequence in alphabetical symbols. For example, “C” means to play the C-major chord at the same time as the melody note below. Meanwhile, the third line is the song’s lyric.

Due to the some symbols such as the over-line or the dot above or below the note, the chipper notation is not easy to type on the computer using the ordinary text processing software. But an idea popped out after consulting the ABC music notation [02]. This notation uses a pure ASCII text symbols to represents the music, where the notes are written as a letter (A-G, a-g). Inspired by this, a new text based numeric music notation has been built. It is intended to be more user-friendly for seasoned angklung composers, and at the same time can be easily parsed and played to the computer audio system and the angklung robot.

2 REQUIREMENT ANALYSIS

Requirement analysis has been conducted by surveying hundreds of angklung arrangements from the ancient [1] to the modern era [01]. Five angklung arrangements styles have been identified as listed in Table 1. As an example, the classic arrangement is given in Appendix-A, while the choir style is given in Appendix-B.

To support these various styles, a new notation should be designed to be able to:

1. Able to contains the common information such as the title, composer(s), genre(s), etc.
2. Defines the song parameter including the key, meter, beat, etc.
3. Represents the melody part using numeric music notation, and support some accents especially staccato.
4. Represents the accompaniment part using chords and simile (repetition) for rhythmic interlocking playing style.
5. Supports multiple voices, which is heavily used in angklung compositions.
6. Allows multiple instruments, especially the accompaniment angklung, bass, carumba and gendang.
7. Writes the lyrics line.

These requirements must be meet while using only the standard ASCII characters.

Table 1. The styles of angklung arrangements

<table>
<thead>
<tr>
<th>Style</th>
<th>Characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legacy</td>
<td>A set of pentatonic angklung and percussion, played in interlocking pattern.</td>
</tr>
<tr>
<td></td>
<td>Examples: dog-dog lojor, badud.</td>
</tr>
<tr>
<td>Classic</td>
<td>Melodic angklung plays up to 3 voices while the accompaniment angklung plays</td>
</tr>
<tr>
<td></td>
<td>the rhythm. Added instrument: Acoustic bass. Well-known composers: Daeng</td>
</tr>
<tr>
<td></td>
<td>Soetigna, Eddy Permadi</td>
</tr>
<tr>
<td>Arumba</td>
<td>Melodic angklung plays up to 2 voices, accompaniment angklung is replaced by</td>
</tr>
<tr>
<td></td>
<td>carumba. Added instruments: bass lodong, carumba, gendang. Well-known</td>
</tr>
<tr>
<td></td>
<td>composers: Muhammad Burhan</td>
</tr>
<tr>
<td>Choir</td>
<td>Melodic angklung plays up to 10 voices, while the accompaniment angklung is</td>
</tr>
<tr>
<td></td>
<td>used sparingly. Added instruments: Acoustic bass, cymbal. Well-known</td>
</tr>
<tr>
<td></td>
<td>composers: Joko S, Asep Suhada</td>
</tr>
<tr>
<td>Orchestra</td>
<td>Melodic angklung plays up to 12 voices, arranged into SATB parts (Soprano,</td>
</tr>
<tr>
<td></td>
<td>Alto, Tenor, Bass). Accompaniment angklung is used for accent. Added</td>
</tr>
<tr>
<td></td>
<td>instruments: Acoustic bass, cymbal, piano, orchestra drum. Well-known</td>
</tr>
<tr>
<td></td>
<td>composers: Budi Supardiman, Irvan Christiawan.</td>
</tr>
</tbody>
</table>
3 DOREMI NOTATION
A text based numeric music notation, called the
doremi notation, has been designed [4] with the
following features.

3.1 Overall Structure
The basic structure of doremi notation was
initially derived from the ABC music notation, but
then some improvements were made to enable
multiple instruments, and then multiple voices for
each instrument. To describe such structure, an
element is given in Text 1. The complete example
can be consulted in Appendix-C.

Text 1. Example of the structure of doremi notation

```
# Line starts with # is a comment
# Header section
T: Padamu Negeri
C: Kusbini
M: 4/4
Q: 60
K: G

# Body section
# Paragraph 1
V1: | 5 1'- 6= 5 3 |
V2: | 3 4= 4= 3 1 |
VA: |@1 @4 @1 |
W: Pa-da-mu ne-gri

# Paragraph 2
V1: | 5- =5= 1'-2'- 3 |
V2: | 3- =3= 4- =5= 5 |
VA: |@1 |
W: ka-mi ber-jan-ji
```

Doremi sheet begins with several lines of
header section. Each line starts with a letter that
specifies a certain record as listed in Table 2.
Some records are common information such as the
title, author, and composer. Some others are music
parameters that affect the interpretation of the
body section, most notably the meter and the key.

The body section contains the music, written in
several paragraphs. As shown in the example,
there are 2 paragraphs. Each paragraph comprises
of several music lines that start with the 'V' letter,
and word lines that starts with the 'W' letter. The
music lines represent several tracks, where each
track can be associated to an instrument. The track
name and it's default instrument are given in
Table-6. Furthermore, each track can be divided
into several voices by concatenating a number to
the track name. Text 1 shows that the “Padamu
Negri” song has been arranged into 2 melody
voices (V1 and V2), and 1 accompaniment (VA).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Record</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Song’s Title</td>
<td>Any text</td>
</tr>
<tr>
<td>C</td>
<td>Composer</td>
<td>Person name</td>
</tr>
<tr>
<td>A</td>
<td>Arranger</td>
<td>Person name</td>
</tr>
<tr>
<td>E</td>
<td>Editor</td>
<td>Person name</td>
</tr>
<tr>
<td>O</td>
<td>Origin</td>
<td>Place name</td>
</tr>
<tr>
<td>G</td>
<td>Genre</td>
<td>Pop, rock, jazz, etc.</td>
</tr>
<tr>
<td>R</td>
<td>Rhythm</td>
<td>Tango, waltz, swing, etc</td>
</tr>
<tr>
<td>S</td>
<td>Scale</td>
<td>Major, minor</td>
</tr>
<tr>
<td>F</td>
<td>Forte</td>
<td>0 – 100 %</td>
</tr>
<tr>
<td>M</td>
<td>Meter</td>
<td>2/4, 3/4, 4/4, 6/8, ...</td>
</tr>
<tr>
<td>Q</td>
<td>Beat</td>
<td>40 – 220 bpm</td>
</tr>
<tr>
<td>K</td>
<td>Key</td>
<td>G, G#, A, ..., C, .., F, F#</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Track</th>
<th>Default instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Main melody</td>
<td>Angklung</td>
</tr>
<tr>
<td>VA</td>
<td>Accompaniment</td>
<td>Angklung (centok)</td>
</tr>
<tr>
<td>VB</td>
<td>Bass</td>
<td>Acoustic Bass</td>
</tr>
<tr>
<td>VC</td>
<td>Cadence</td>
<td>Carumba</td>
</tr>
<tr>
<td>VD</td>
<td>Drum</td>
<td>Gendang</td>
</tr>
<tr>
<td>VE</td>
<td>...</td>
<td>More tracks are available</td>
</tr>
</tbody>
</table>

3.2. Notes Elements
The melody is written as notes sequence using the
symbols defined on Table 4. Obviously, the notes
are represented as numbers (1 to 7). Meanwhile,
the length and pitch modifier symbols have been
carefully chosen from the ASCII characters that
are similar to the original chipper notation. Notice that there is also a staccato symbol that is often used in angklung arrangement as a special playing technique called *centok* (snapping).

All modifiers are written as suffix. Several modifiers can be applied to a note. The following Text 2 gives some examples.

**Text 2. Example of note elements**

<table>
<thead>
<tr>
<th># Complete diatonic notes in C mayor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C C# D D# E F F# G G# A A# B</td>
</tr>
<tr>
<td>1 1/ 2 2/ 3 4 4/ 5 5/ 6 6/ 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># 7 octaves of DO (C1 – C7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1;, 1; 1, 1' 1&quot; 1'''</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># DO with various length</th>
</tr>
</thead>
<tbody>
<tr>
<td># 1/32 1/16 1/8 1/4 1/2 2/3 1/3</td>
</tr>
<tr>
<td>l'=' l= 1- 1 1. 1+ 1+-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># Pitch, length and accent Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/- 1/=' 1/='=^</td>
</tr>
</tbody>
</table>

**Table 4. Note and modifier symbols**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 7</td>
<td>Notes</td>
</tr>
<tr>
<td>0</td>
<td>Rest</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>/</td>
<td>Raise the pitch by (\frac{1}{2}).</td>
</tr>
<tr>
<td>\</td>
<td>Lower the pitch by (\frac{1}{2}).</td>
</tr>
<tr>
<td>'</td>
<td>Raise the pitch by 1 octave.</td>
</tr>
<tr>
<td>,</td>
<td>Lower the pitch by 1 octave.</td>
</tr>
<tr>
<td>&quot;</td>
<td>Raise the pitch by 2 octaves.</td>
</tr>
<tr>
<td>;</td>
<td>Lower the pitch by 2 octaves.</td>
</tr>
<tr>
<td>.</td>
<td>Add the note's length by 1 unit.</td>
</tr>
<tr>
<td>-</td>
<td>Shorten the length by (\frac{1}{2}).</td>
</tr>
<tr>
<td>=</td>
<td>Shorten the length by (\frac{1}{4}).</td>
</tr>
<tr>
<td>+</td>
<td>Shorten the length by 2/3.</td>
</tr>
<tr>
<td>^</td>
<td>Play the note as staccato.</td>
</tr>
</tbody>
</table>

**3.3 Chord Elements**

The accompaniment part of the song is exemplified by the VA line on Text 1. It shows that the doremi notation uses numerical chord, instead of the alphabetical chord just like the standard chipper notation. The reasons are:

1. It is easier to relate the numerical chord to the corresponding numerical notes.
2. Just like the notes, the chord is also movable. Thus, if the key of the song is changed, then the chords will be transposed along with the notes.

For representing the numerical chord, the @ symbol is used as a prefix, followed by a number that defines the root note and the chord name. Some of the chord names are listed on Table-4. Meanwhile, the length and pitch modifiers can also be applied to the chord. Some examples are given in Text 3.

**Text 3. Example of chord elements**

<table>
<thead>
<tr>
<th># complete major chords</th>
</tr>
</thead>
<tbody>
<tr>
<td>@1 @1/ @2 @2/ @3 @4/ @4/ @5 @5/ @6 @6/ @7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># types of chord</th>
</tr>
</thead>
<tbody>
<tr>
<td>@1 @1M @1m @1M7 @1m7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th># chord with modifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>@1^ @1' @1- @1'-'</td>
</tr>
</tbody>
</table>

**Table 5. Chord names**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>Mayor chord (default)</td>
</tr>
<tr>
<td>m</td>
<td>Minor chord</td>
</tr>
<tr>
<td>M7</td>
<td>Major septime</td>
</tr>
<tr>
<td>m7</td>
<td>Minor septime</td>
</tr>
<tr>
<td>a</td>
<td>Augmented</td>
</tr>
<tr>
<td>d</td>
<td>Diminished</td>
</tr>
</tbody>
</table>

**3.3 Simile and Rhythm Elements**

Doremi notation has some features that do not normally found in the original chipper notation. The first is simile, written using the '%' symbol, for repeating the content of the previous bar. It was intended to support the interlocking patterns commonly occur in the legacy compositions.
Exclusively for doremi notation, the simile also supports transposing the pattern by specifying a new first note. Text 4 gives some examples.

### Text 3. Example of simile

<table>
<thead>
<tr>
<th>Original line without simile</th>
<th>3 4 5</th>
<th>3 4 5</th>
<th>5 6 7</th>
<th>1 2 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The same line with simile</td>
<td>3 4 5</td>
<td>%</td>
<td>%5</td>
<td>%1</td>
</tr>
<tr>
<td>The 2nd bar repeat the 1st bar as it is</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The 3rd repeats the 2nd and transposes it up 2 notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The 4th repeats the 3rd and transposes it down 5 notes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Moreover, doremi notation also defines a feature to support standard rhythms (also known as styles). Given a chord, that has a set of notes, a standard rhythm defines how to play the notes sequentially in a bar. Tables 6 gives some examples of rhythms. To use the rhythms, it must be defined in the header, then in the music lines, use the simile symbol followed by the chord. Text 4 gives the example.

### Text 4. Example of the structure of doremi notation

```
# Header section, set the rhythm (R)
T: Padamu Negeri
R: swing
M: 4/4
Q: 60
K: G

# Body section, VA uses the rhythm
V1: |5 1'- .=6= 5 3|5- .=5= 1'-2'- 3 . |
VA: | %@1 | %@5 |
```

### Table 6. Some rhythm names

<table>
<thead>
<tr>
<th>Rhythm</th>
<th>Meter</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>tango</td>
<td>2/4</td>
<td>x- y- x- y-</td>
</tr>
<tr>
<td>waltz</td>
<td>3/4</td>
<td>x y y</td>
</tr>
<tr>
<td>swing</td>
<td>4/4</td>
<td>x y y</td>
</tr>
<tr>
<td>march</td>
<td>4/4</td>
<td>x y- y- x y</td>
</tr>
</tbody>
</table>

Note: x = 1st note, y = 2nd note and the rest

### 4 DOREMI FONT

As close as it get, the raw doremi notation is still not similar to the original chipper notation. To overcome that, a special true type font has been created [o3]. This way, the original text of doremi notation can be visualized differently just by changing the font as demonstrated in Text 5.

```
# doremi notation using courier font
|5 1'- .=6= 5 3|5- .=5= 1'-2'- 3 . |
```

### 5 IMPLEMENTATION

The doremi notation has been implemented in a software called the Klungbot Maestro [o3]. The architecture of the software is given in Figure-3.

A composer may write the doremi sheet using an editor. Since the doremi notation is a pure ASCII document, the editor can be implemented using a simple text editor (Figure 4). For clarity, a syntax highlighter helps to differentiate the various elements such as the notes, modifiers, or chords. Moreover, the view of editor can be switched easily between the raw text view (using courier font) or the chipper notation view (using doremi font). Being a pure text, the document then can be stored as it is into a text file. It can also embedded easily in a web page, because it does not include the HTML marker at all ('<' and '>').
During the playing time, a doremi file is loaded and parsed into a doremi sequence. It contains the timed notes sequence of every track and voices. Using the time information, the sequencer mixes the voices of each track, then sends the events to the controller in real-time manner. According to the track, the controller routes the event into the respective devices. Normally, the main melody track (V) is played into the angklung robot device, while the other tracks (VA, VB, ...) are played into various MIDI synthesized instruments. In the future, more robotic instruments will be available for the other tracks.

The angklung robot system has been performed in real concert. The audiences were really impressed because the robot can play relatively complex song in various genres, for example:

- Einekleinnacht (classic, by Mozart)
- Winter Games (orchestra, by David Foster)
- Bohemian Rhapsody (rock, by Queen)
- Bengawan Solo (keroncong, by Gesang)
- Cari Jodoh (dangdut, by Wali Band)

Behind the scene, the arrangements were written by Asep Suhada and Budi Supardiman, two of the most productive angklung arrangers. It is a testament that doremi notation is powerful enough for writing serious compositions.

### 6 RELATED WORKS

#### 6.1. ABC Music Notation

Doremi notation is a text based chipper notation, which was inspired by the ABC notation [o2]. Of course, significant improvements have been made. Thus, with high appreciation to the ABC notation, some comparisons are described below.

Text-6 and Text-7 show the basic syntax of ABC notation and doremi notation respectively. It can be seen that the header part of both notation...
are similar, though some symbols might have different meanings. The big differences start on the body part.

**Text 6. ABC Notation**

```
T: Bagimu NegRI
C: Kusbini
M: 4/4
K: C

| "C"g "F"c'3/4 a/4 "C"g e |
| g>>g c'd' "Cm7"e'2 |
```

**Text 7. Doremi Notation**

```
T: Bagimu Neg'RI
C: Kusbini
M: 4/4
K: C

V: | 5 1'-.=6= 5 3 |
VA: | @1 @4 @1 . |
V: | 5- .5= 1'-2'- 3 . |
VA: | . . . @1M7 |
```

Most of all, the ABC notation expresses the musical notes using the alphabets (C-G,A-B,c-g, a-b) while the doremi notation uses the numbers (1-7). A direct consequence of these systems is that the alphabetical notes on the ABC notation is fixedly mapped into the actual pitches. In this case the symbol 'C' is always mapped into the C3 pitch, while the symbol 'c' is to the C4 (middle-C). On the contrary, the numerical notes is mapped into the actual pitches according to the key (K: setting on the header). For example, the symbol “1” will be mapped into C4 when the key is K:C, while it will be mapped into G3 when the key is K:G. The similar treat happens on the chord symbols. The ABC notation uses a double quoted letter(s) to express the chord, for example "Cm7". On the other hand, doremi notation uses a prefixed number, for example @1m7. Therefore, it is easier to transpose the entire song in the doremi notation, just by changing the key.

The octave modifier symbols of the doremi notation are quite similar to the ABC notation. However, the length modifier symbols are so different. There are four ways to modify the note length in the ABC notation:

1. By adding a numeric fraction after the note to multiply the note length, for example c3/2 is one and half note.
2. By using the '>' or '<' symbols between two notes, mean mean to take away half of one note's length and give it to the other. For example “c>d” is the same as “c3/2 d1/2”, while “c>>d” means “c3/4 d1/4”.
3. By writing the notes as a beam, and optionally as a tuplet. For example “cd” is equal to “c/2 a/2”.
4. By adding a dot following a note to prolong the note half of it's length.

Going into the structure, doremi notation supports multiple instruments and multiple voices. The earlier ABC notation only supports single voice. In fact, as seen in the Text-5, the chords are written in the same line as the notes. The recent ABC notation (version 2.1) allows multiple instruments, but still there is no support for multiple voices. A way around is using a unison (several notes played together), but it has to be written in one line, thus it is not as convenient as the doremi multiple voices structure.

Visually, a quick reading will find that the doremi notation is more readable than the ABC notation. This is because the doremi notation uses the symbols that are similar to the original chipper notation. The modifier symbols are consistently applied as a suffix, while the chord symbols as a prefix. On the other hand, the ABC notation contains elements that are written as prefix, suffix, as well as infix. More distraction then come from the chords, which are written on the same line as the notes.

To formally compare the syntax complexity, we have re-engineered the EBNF (Extended Backus-Naur Form) of both systems as given in the appendix D and E. The summary is given in
It can be seen that the doremi notation has fewer and simpler rules compared to the ABC notation. The doremi notation also has fewer terminal terms. Therefore, doremi notation is more understandable for human, and should be quicker to be parsed by a computer software.

### Table 7. EBNF Comparison

<table>
<thead>
<tr>
<th>Rule</th>
<th>Form</th>
<th>ABC</th>
<th>Doremi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non terminal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prefix</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Suffix</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Infix</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Circumfix</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Terminal term</td>
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</tr>
<tr>
<td>Note and rest</td>
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<td>8</td>
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<tr>
<td>Chord</td>
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<td>4</td>
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</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>17</td>
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</tbody>
</table>

#### 6.2. Fonts for Chipper Notation

There were several true type fonts for writing the chipper notation. The first one was the Kepatihan font [o4] for writing the music notation of the Javanese and Balinese gamelan. The Kepatihan notation is basically a pentatonic scale. Therefore, it has been derived to diatonic scale, such as the NotAngka [o5] and the Parnumation [o6] fonts.

### Text 8. Parnumation font

```
# raw text using courier font
| 5 jalk.6 5 3 | j5k.5 jala2 3 . |

# same text using parnumation font
| 5 1.6 5 3 | 5.5 12 3 . |
```

However, those fonts were apparently designed for easy typing and correct presentation. The symbols are chosen by its location on the computer keyboard, rather than to imply the chipper notation. As an example, Text 8 shows how to write the “Bagimu Negri” song using the parnumation font. It can be seen that the above dot is typed as 'a', the single over-line is 'j', while the double over-line is 'k'. Compared to the doremi font at Text 5, the visualization are quite similar, yet the raw texts are differ significantly.

Nevertheless, some developers have been using these fonts for various projects. Lukas Christanto built a program that able to converts the staff based notation, written in music-XML format, into the NotAngka font [5]. Other work by Selvira Afiffa, then converts the NotAngka text file into the midi sequence that can be played by a MIDI player [6]. More advanced work by Eko Sediyo intelligently generates the accompaniment chords, given the melody written in NotAngka font [7]. So far, doremi notation has covered the works of [5] and [6] more seamlessly.

### 7 CONCLUSION

A text based chipper notation has been developed, to cater the most well-known music notation in South East Asia. The notation is simple to type, yet quite pleasing to be read. In its raw form, doremi notation is more readable than the ABC notation, not to mention other format such as the music-XML. A true type font has also been created to directly render the notation as close as possible the original chipper notation.

For play back feature, the doremi notation has a well defined EBNF form. Therefore, a parser can be easily generated. A doremi file can be directly parsed into a sequence that can be played by a MIDI system. Although it was specially designed for angklung, doremi notation is also aplicable for composing any other instrumental music.

Accomplished angklung arrangers have used the doremi notation to write some quite complex compositions. On the other hand, it also simple enough to be used as a tool for teaching music to primary school students.

### 8 REFERENCES


Appendix A – Example of classic arrangement

AN DER SCHÖNEN BLAUNEN DONAU
(LE BEAU DANUBE BLEU – BLUE DANUBE)
Do = C (no.6) * 3/4 *

- Intro:  

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rit…

Cipt : Johann Strauss
Arr : Daeng Soetigna

G7 5 0 1 3 5 0 1 3 5 0 1 3 5
D    d  d  d  d  d  d  d  d  d

17 4 6 7 7 2 6 e 1 2 3 5 e 2 3 5 e

5 0 1 3 5 0 1 3 5

mf
Appendix B – Example of angklung choir arrangement
Appendix C – A complete angklung composition using doremi notation

T: Padamu Negeri
C: Kusbini
A: Asep Suhada
M: 4/8
Q: 110
K: G

V1: | 5 . 1' .-6- | 5 . 3 . | 5 .-5- 1' .-2'- | 3' . . . |
V2: | 3 . 4 .-4- | 3 . 1 . | 3 .-3- 4 .-5- | 5 . . . |
VA: |@1 @1 @4 @4 |@1 @1 @1 @1 |@1 @1 @4 @4 | @1 @1 @1 @1 |
VB: | 1, . 4, . | 1, . . . | 1, . 4, . | 1, 1, 2, 3, |
W: Pa-da-mu ne-gri ka-mi ber-jan-jì

V1: | 4' . 5' .-5'- | 3' . 1' . | 1' .-1'- 2' .-3'- | 2' . . . |
V2: | 6 . 7 .-7- | 5 . 3 . | 4 .-4- 6 .-6- | 5 . . . |
VA: |@4 @4 @5 @5 |@1 @1 @6m @6m |@2m @2m @2 @2 | @5 @5 @5 @5 |
VB: | 4, . 5; . | 1, 7; 6; . | 2, . 2, . | 5, 4, 3, 2, |
W: Pa-da-mu ne-gri ka-mi ber-bak-tì

V1: | 5 . 1' .-6- | 5 . 3 . | 5 .-5- 1' .-2'- | 3' . . . |
V2: | 3 . 4 .-4- | 3 . 1 . | 3 .-3- 4 .-5- | 7 . . . |
VA: |@1 @1 @4 @4 |@1 @1 @1 @1 |@1 @1 @4 @4 | @3 @3 @3 @3 |
VB: | 1, . 4, . | 1, . . . | 1, . 4, . | 3, 3, 2, 3, |
W: Pa-da-mu ne-gri ka-mi meng-ab-di

V1: | 4' . 5' .-5'- | 3' . 1' . | 2'+ 3'+ 4'+ 3' . 2' | . 1'. . |
V2: | 6 . 7 .-7- | 5 . 6 . | 7+ 1'+ 2'+ 1' . 7 | . 3 . |
V3: | 1 . 2 . | 3 . 3 . | 2 . 1 . 2 | . 1 . |
VA: |@4 @4 @5 @5 |@1 @1 @6m @6m |@5+ @5+ @5+ @1 | @5 | . @1 . |
VB: | 4, . 5; . | 1, 7; 6; . | 2,+ 3,+ 4,+ 1, . 5; | . 1,. |
W: Ba-gi-mu ne-gri ji-wa ra-ga ka-mi
Appendix D – E-BNF of ABC Notation

# EBNF of ABC Notation
# Music content only
# Non exhaustively re-engineered from
# http://abcnotation.com/wiki/abc:standard:v2.1
# By Eko M. Budi, 2013
# Checked using http://www.icosaedro.it/bnf_chk/bnf_chk-on-line.html

line_content = [bar] bar_content {bar bar_content} [bar];
bar_content = [space] element { space element };
      element = [chord_syllable] note_syllable;

      note_syllable = (full_note | long_note | broken_note | beam_note |
      tuplet_note | rest_note);
      chord_syllable = dquote note [chord_name] dquote;

      long_note = full_note length;
      broken_note = full_note broken {broken};
      tuplet_note = tuplet beam_note;
      beam_note = note note {note};
      rest_note = rest length;
      full_note = [accent] note {octave};
      length = [numerator] [div [denumerator] ];
      note = (wnote | sharp_note | flat_note);
      sharp_note = sharp snote;
      flat_note = flat fnote;

# terminals
      wnote = "A" .. "G" | "a" .. "g";
      snote = "C" | "D" | "F" | "G" | "A" | "c" | "d" | "f" | "g" | "a";
      fnote = "D" | "E" | "G" | "A" | "B" | "D" | "E" | "G" | "A" | "B";
      chord_name = ("m" | "7" | "m7" );

      numerator = "2" .. "99";
      denominator = "2" .. "99";
      tuplet = "2" .. "99";
      broken = ("<" | ">" );
      octave = ("'" | "," );
      accent = ("." | "~" );
      rest = "z";
      sharp = "^";
      flat = "_";
      div = "/";
      dquote = "\"";
      bar = "|";
      space = " ";
Appendix E – EBNF of Doremi Partition

# EBNF of Doremi Notation
# Music line content only, no simile
# By Eko M. Budi, 2013
# Checked using http://www.icosaedro.it/bnf_chk/bnf_chk-on-line.html

line_content = [bar] bar_content {bar bar_content} [bar];

bar_content = [space] element { space element };
element = (rest_syllable | note_syllable | dot_syllable | chord_syllable);

rest_syllable = rest {length};
note_syllable = note {(octave | length | accent)};
dot_syllable = dot {length};
chord_syllable = chord note [chord_name] {(length | accent)};

note = (wnote | sharp_note | flat_note);
sharp_note = snote sharp;
flat_note = fnote flat;

# Terminal symbols
wnote = "1" .. "7";
snote = "1" | "2" | "4" | "5" | "6";
fnote = "2" | "3" | "5" | "6" | "7";

chord_name = ("M" | "m" | "M7" | "m7");
rest = "0";
dot = ".";
bar = "|";
chord = "@";
octave = ( "'" | "\" | "," | ";" );
sharp = "/";
flat = "\";
length = ("+" | "-" | "=" );
accent = ("^" | "~");
space = " ";