A sound curation in musical instrument conservation

Gea O.F. Parikesit, Nicole A. Tse, Rong Wei Sim, Margaret Kartomi, Robyn Sloggett

Universitas Gadjah Mada, University of Melbourne, Monash University

14th International Digital Curation Conference
4 - 7 February 2019
Arts West Building, Melbourne, Australia
Faculty of Engineering
Universitas Gadjah Mada
Indonesia

The Grimwade Centre for Cultural Materials Conservation
Faculty of Arts
The University of Melbourne

The Music Archive of Monash University
Faculty of Arts
Monash University
Our collaboration began with the bundengan.
Sound characterization of the bundengan.
Sound characterization of the **bundengan**.
Sound characterization of the bundengan.
Sound characterization of the bundengan.
Next: other instruments also needs to be conserved.
Repair needs to be done with the correct materials and coloring.
This one, called sompoton, has been repaired...

But would it still generate the correct sound?
This one, called *sompoton*, has been repaired...

But would it still generate the correct *sound*?

We cannot play it because it is too *fragile*.

How can we know their sound... *without playing* them?
Here is an idea...

All musical instruments are acoustical resonators, with their own natural frequencies.

We can feed various frequencies and detect which frequencies resonates with that instrument.
How it works:

\[ \text{Input} \times \text{Resonator} = \text{Output} \]
How it works:

\[ \text{Input} \times \text{Resonator} = \text{Output} \]

Input

\( \times \)

Output

Input Frequency

Resonator

Frequency

Output Frequency
How it works:

\[
\text{Input} \times \text{Resonator} = \text{Output}
\]
How it works:

RESONATOR

INPUT → Resonator → OUTPUT

= Input x Resonator
Experimental setup

Laptop  Speaker  Resonator  Recorder
Validation:

We used a 'Helmholtz resonator' to test our method.

Measurement: 430 Hz +/- 40 Hz
Calculation: 408 Hz

\[
f = \frac{c}{2\pi} \sqrt{\frac{S}{VL}}
\]
Experimental result
Experimental result
Experimental result

![Experimental result graph]

**Pélog**

- **panunggul**: \(D_{3}-26\) (1)
- **gula**: \(F_{b}-10\) (2)
- **dhadinu**: \(F_{3}-45\) (3)
- **pélog**: \(G_{3}+24\) (4)
- **lima**: \(G_{#3}+43\) (5)
- **nem**: \(A_{3}+43\) (6)
- **barang**: \(B_{3}+35\) (7)

**Notes:**

- D/Eb
- G
- G#/A
- Eb/E
- F/Gb
- G
- G#
- A/Bb
- Bb/B
Experimental result

Pélog

<table>
<thead>
<tr>
<th>Panunggul</th>
<th>Gula</th>
<th>Dhadira</th>
<th>Pelog</th>
<th>Lima</th>
<th>Nem</th>
<th>Barang</th>
</tr>
</thead>
<tbody>
<tr>
<td>D_3-26</td>
<td>F_{b-10}</td>
<td>F_3-45</td>
<td>G_3+24</td>
<td>G#_3+43</td>
<td>A_3+43</td>
<td>B_3+35</td>
</tr>
<tr>
<td>116</td>
<td>165</td>
<td>269</td>
<td>119</td>
<td>100</td>
<td>192</td>
<td></td>
</tr>
</tbody>
</table>
With this method, we can listen to the instruments without playing them.
With this method, we can listen to the instruments without playing them.

- New digital data
- Better (?) curation of musical instruments
- New challenges
Thank You