Sound Characteristics and Sound Prediction of the Traditional Musical Instrument the Three-Rattle Angklung

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The three-rattle *angklung* is a traditional musical instrument made of bamboo. The objective of this research is to observe the unique sound characteristics of the three-rattle *angklung*. The sound characteristics data can be used for defining digital sound of *angklung* to be played in a digital synthesizer. One set of *angklung* from the big size C_5 to the small size C_6 is recorded and analyzed in terms of the frequency contents. The sound characteristics of *angklung* are represented by four dominant frequency contents and the corresponding relative amplitudes of each rattle bamboo tube. This paper also introduces an equation model to predict the sound produced by the bamboo of the three-rattle *angklung*. This research reveals that bamboo rattles 2 and 3 produce the fundamental note, and bamboo rattle 1 generates a higher octave with the same note. Each bamboo rattle produces fundamental frequency note, its harmonics, and overtones. It is also found that three-rattle *angklung* can produce an accurate frequency almost in every note.

1. INTRODUCTION

The *angklung* is a traditional musical instrument that originated from western Java, Indonesia. It is made of bamboo tubes with frames. According to Widjaya,[1] there are only three types of bamboo that can be used for *angklung*: *bambu tutul* or *Bambusa vulgaris Schrad. ex J. C. Wendl. var. maculata Widjaja*; *bambu hitam* or *Gigantochloa atter (Hassk.) Kurz ex Munro*; and *bambu apus* or *Gigantochloa apus Bl. ex Schultes f.* However, the most common used for musical instruments including *angklung* is *bambu hitam*.

There are several types of *angklung* found in certain areas of Indonesia. They are *Angklung Baduy*, *Angklung Dogdog Lojor*, *Angklung Gubrag*, and *Angklung Badeng*. All of them were originally used for ritual activities related to traditional rice harvests. When modern harvesting was introduced, people then used them for entertaining purposes as percussion musical instruments and even played in musical orchestras with modern instruments.[2] The size of *angklung* varies from a small palm size up to $60\,\mathrm{cm}$ tall corresponding to the frequency produced when it is shaken. In general, a small *angklung* generates a higher frequency. The bigger the size of the *angklung*, the lower the frequency it produces.

In Malaysia, *angklung* are used together with hobby-horse dancing and mostly found in the state of Johor, as documented by Matusky,[3] Ang,[4] and also in a government official publication written by Nasuruddin.[5] Some Malaysian schools also have *angklung* orchestras in which each child plays an *angklung* of a different size, in a manner similar to a handbell choir.[6] There are two types of *angklung* in regard to the number of tubes: two tubes (two-rattle) and three tubes (three-rattle). In Johor, Malaysia, the three-rattle *angklung* is the most popular used by the community.[7] A photograph of a three-tube (three-rattle) *angklung* found in Johor is shown in Fig. 1.

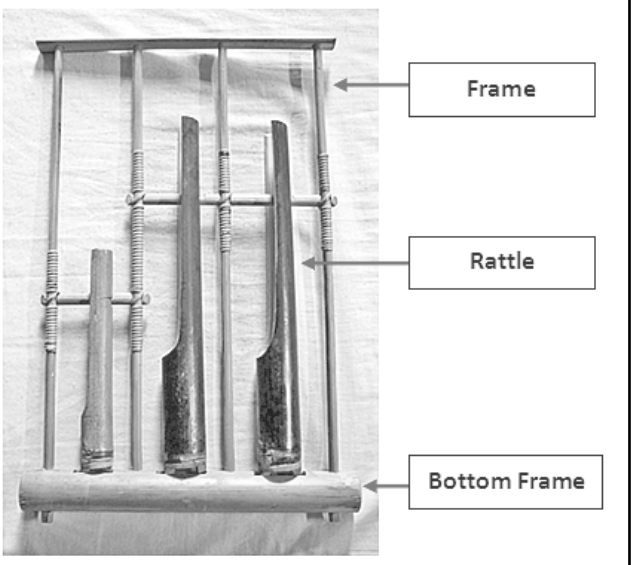

Figure 1. A three-rattle *angklung*.

In general, the *angklung* has two main parts: the frame and the rattle tubes. In three-rattle *angklung*, the first rattle is the shortest tube, and the other two rattle tubes are almost identical. The main function of the frame is to hold the rattle tubes. The *angklung* is played by holding the upper frame and shaking the bottom frame sideways. When the tines hit the slits at the bottom frame, the air wave will transmit through the air resonator of the hollow bamboos to create sound. Each rattle of the *angklung* will produce a different pitch frequency depending on the length of the tube, the tongue, and the diameter of the tube. One set of *angklung* from note C_5 to note C_6 is shown in Fig. 2.

The sound produced by a musical instrument has a typical characteristic identified by four parameters: pitch, duration, quality, and intensity. Apart from the rattling sound mecha-