STUDIES WITH A SMALL GAMELAN GONG

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1 INTRODUCTION

A gamelan is an ensemble of ethnic musical instruments from parts of Indonesia where it is central to musical art and commands huge respect. It is also found in some neighboring countries. While it involves many different types of instruments its backbone consists of metalophones and gongs.

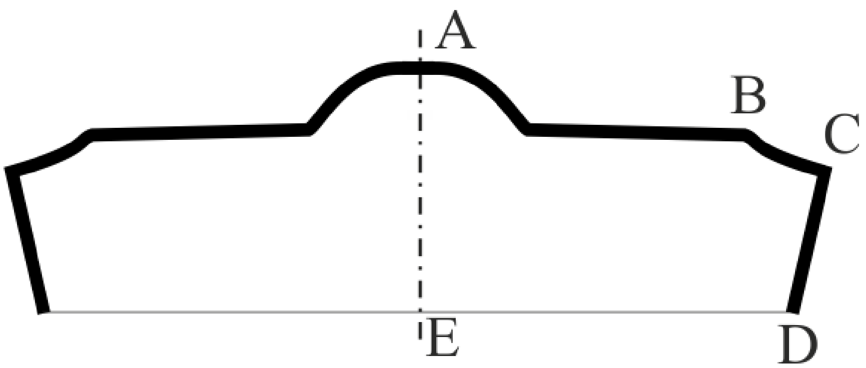

Figure 1. Vertical cross-section through a small gamelan gong

Gamelan gongs come in a wide range of sizes but all are of similar general structure. In Figure 1 we show a vertical cross-section through the centre of a typical small gamelan gong placed on a horizontal surface. It consists of a central dome A on top of a flat plate which is terminated by a shoulder BC and then a deep inward sloping rim CD. The vertical line AE is the axis of symmetry. These gongs are rung by being stuck on the central dome with a mallet. Large gongs are suspended vertically by strings. Smaller ones are mounted horizontally from underneath on parallel strings. Since a “perfect” gong has complete axial symmetry one can conclude[1] that its normal modes have nodal patterns consisting of m equally spaced “diameters” and n circles parallel to the rim’s edge. Modes with $m = 0$ are axisymmetric singlets while those with $m > 0$ occur in degenerate pairs with the diameters of one bisecting those of its partner. Modes can be designated by (m, n) with the addition of a subscript outside the brackets if it is desired to distinguish between a doublet’s components. In practice gamelan gongs are cast, sometimes rather roughly, and so have geometrical and metallurgical imperfections which break the basic axial symmetry. Consequently the doublets split and distortions appear in some nodal patterns. In the present work we are concerned with a small steel gong of 20.7cm diameter originating from Sarawak.

In an earlier study with the same gong[2] we produced an axially symmetric finite-element model (FEM) and compared its predictions with experimental results obtained using Electronic Speckle Pattern Interferometry (ESPI). We now report an extension of this study using Scanning Laser Doppler Vibrometry (SLDV) using a mounting method which better simulates that used in practice.