

Intisari

Penelitian ini berfokus untuk mengukur seberapa besar pengaruh elemen ruang terhadap kualitas akustik auditorium multifungsi Grha Sabha Pramana Universitas Gadjah Mada (GSP UGM). Kualitas akustik ruang diukur dengan berpedoman ISO 3382-1:2009. Penelitian melibatkan pengukuran lapangan sebagai salah satu prosedur dalam validasi model di dalam simulasi komputer. Geometri model 3D yang dibuat dalam penelitian ini disesuaikan dengan mengubah-ubah koefisien serap dari material elemen ruang melalui proses iterasi terhadap perbandingan nilai T30 lapangan dan simulasi di setiap frekuensi oktaf sehingga di bawah 5%.

Hasil penelitian menunjukkan bahwa auditorium GSP UGM ini memiliki kondisi akustik ruang yang cukup baik untuk fungsi musik yaitu dengan rata rata nilai EDT = 1,81 detik, $G = -0,6\text{dB}$, $C80 = 1,34\text{dB}$, $T_s = 107,2$ milidetik, dan $LF = 16,95\%$. Sedangkan untuk fungsi pidato (*speech*), kondisi akustik ruang kurang baik dengan nilai rata-rata T30 = 2,05 detik, $D50 = 45,8\%$, dan $STI = 46,17\%$. Berdasarkan analisis tersebut, maka eksperimen terhadap variasi elemen dinding dan langit-langit dengan menggunakan dinding partisi, panel *abflector*, dan panel pemantul ditujukan untuk mengatasi permasalahan untuk fungsi pidato (*speech*).

Hasil eksperimen terhadap variasi elemen dinding (dinding partisi) menunjukkan penurunan T30 sebesar rata-rata 0,28 detik, D50 dan STI meningkat sebesar rata-rata 9,81% dan 3,74%. Variasi elemen langit-langit audiens (panel *abflector*) menunjukkan penurunan T30 sebesar rata-rata 0,29 detik, D50 dan STI meningkat sebesar rata-rata 8,48% dan 3,42%. Variasi elemen langit-langit panggung (panel pemantul) menunjukkan peningkatan G *strength* dan STI sebesar rata-rata 0,87dB dan 4%. Kombinasi dari semua variasi elemen yang diujikan dalam kondisi kosong (*unoccupied*) dan terisi penuh (*occupied*) menunjukkan rentang penurunan T30 sebesar rata-rata 0,65-1,08 detik, rentang peningkatan D50 sebesar rata-rata 22,5-31,42%, dan rentang peningkatan STI sebesar rata-rata 9,22-15,32%. Penggunaan setiap variasi elemen ruang cenderung meningkatkan kualitas akustik ruang untuk fungsi pidato (*speech*).

Kata Kunci: Elemen ruang, kualitas akustik, GSP UGM, musik, pidato (*speech*), auditorium multifungsi

Abstract

This research focuses on measuring the influence of room elements to the acoustic quality in multifunction auditorium of Grha Sabha Pramana University of Gadjah Mada (GSP UGM). Acoustic quality measure is based on ISO 3382-1:2009. This research involves field measure in order to fulfill the computer simulation validation procedure. 3d geometrical model created for this research is tuned by adjusting the absorption coefficients of the material in room elements through iterative process aimed at rendering differences between simulated and field measure values of T30 in each octave frequency band lower than 5%.

The results showed that this auditorium has a quite good acoustic condition for music, with the average values of EDT = 1,81 s, G = -0,6dB, C80 = 1,34dB, Ts = 107,2ms, and LF = 16,95%. While for speech, bad acoustic condition occurs with the average values of T30 = 2,05s, D50 = 45,8%, and STI = 46,17%. Based on those analysis, experiment of variable wall and ceiling elements such as wall partition, abflector panels, and reflector panels, are proposed to overcome the problem for speech function.

The results of experiment on variable wall elements (partition wall) showed a reduction of T30 with an average of 0,28s, while D50 and STI increased with an average of 9,81% and 3,74%. Variable audience ceiling elements (abflectors) showed a reduction of T30 with an average of 0,29s, while D50 and STI increased with an average of 8,48% and 3,42%. Variable stage ceiling elements (reflectors) showed an increased in G strength and STI with an average of 0,87dB and 4%. Combination of all variable elements in unoccupied and occupied condition showed a reduction of T30 with an average range of 0,65-1,08s, D50 increased with an average range of 22,55-31,42% and STI increased with an average range of 9,22-15,32%. The use of those variations on room elements are tend to increase the acoustic quality for speech function.

Keywords: Room elements, acoustic quality, GSP UGM, music, speech, multifunction auditorium