THE EFFECT OF REVERBERANT SOUND LEVEL ON THE INTELLIGIBILITY OF SPOKEN MALAY WORDS

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Specially dedicated to my beloved parents, brother and sister.

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ABSTRACT

Reverberant sound is known to degrade Speech Intelligibility (SI). For instance, it has been found that amplitude of English speech signal, syllable continuum from “sir” to “stir”, is affected in reverberant condition. However, there are currently no studies on the effect of reverberation on spoken Malay words. The purpose of this research is to investigate the effect of reverberant sound on spoken Malay words. The project started with the development of Malay word list. The list consists of 5924 distinct Malay words and was based on the texts from 52 Friday sermon transcripts that were spoken in Kuala Lumpur mosques. The Malay words spoken in mosques were used because SI in many mosques suffers from reverberant sound. From this, two sets of phonetically balanced word lists were developed with each contain 50 words. These words were then recorded in an audiometry room with the help of two trained speakers, a male and a female. The recorded words were then played back in seven different room samples with different reverberant sound levels. Reverberation time was used as level indicator (in seconds) of reverberant sound. The effect of each room sample on clean recorded words was analysed in terms of fundamental frequency (F_0), first and second formant frequency (F1 and F2), and spectral tilt. The effect of reverberant sound on F_0 for female speaker was more profound and statistically significant. The F1 of both speakers were not affected by reverberant sound. However, only F2 of female speaker was affected by reverberant sound. The value of spectral tilt shows that vowel */a/* is the most susceptible to reverberant sound. In conclusion F_0, F2, and spectral tilt are relevant parameters, and have been able to demonstrate the effect of reverberant sound on spoken Malay words.

ABSTRAK

Gemaan lewat adalah fenomena yang menganggu Kejelasan Percakapan (SI). Contohnya, didapati bahawa amplitud isyarat mempengaruhi kejelasan pertuturan Bahasa Inggeris dalam keadaan bergema pada kontinum suku kata "*sir*" kepada "*stir*". Tetapi tiada kajian dilakukan untuk mengkaji kesan gemaan terhadap perucapan bahasa Melayu. Kajian ini bertujuan mengkaji kesan gemaan terhadap perucapan bahasa Melayu. Projek ini bermula dengan menghasilkan senarai perkataan. Senarai ini terdiri daripada 5924 perkataan yang berbeza dan diambil daripasa 52 teks khutbah Jumaat yang dituturkan di masjid Kuala Lumpur. Ini kerana kebanyakan masjid mempunyai gemaan suara yang menganggu SI. Dua set senarai perkataan yang berseimbang fonetik telah dihasilkan dan setiap set mempunyai 50 patah perkataan. Perkataan-perkataan ini kemudiannya direkodkan dalam bilik audiometri dengan bantuan dua penutur terlatih, seorang lelaki dan seorang perempuan. Perkataan-perkataan yang telah direkodkan didengar kembali di dalam tujuh sampel bilik yang mempunyai tahap gemaan yang berbeza. Tahap gemaan dikuantitikan dalam masa gemaan (dalam saat). Kesan bilik sampel telah dikaji berdasarkan frekuensi asas (F_0), frekuensi forman pertama dan kedua (F1 dan F2) beserta dengan kecondongan spektral. F_0 pada kedua-dua penutur dipengaruhi oleh gemaan, tetapi ia didapati lebih jelas pada penutur perempuan dan lebih signifikan secara ixocalixtic. F1 pada kedua-dua penutur langsung tidak dipengaruhi oleh gemaan suara. F2 pada penutur perempuan sahaja dipengaruhi oleh gemaan. Nilai kecondongan spektral menunjukkan ixocal */a/* adalah senang dipengaruhi oleh gemaan suara. Sebagai kesimpulan, F_0, F2 dan kecondongan spektral adalah parameter yang releven, dan telah menunjukkan kesan gemaan suara terhadap perucapan bahasa Melayu.