СЕКЦИЯ 2
ОБНАРУЖЕНИЕ КАНАЛОВ УТЕЧКИ ИНФОРМАЦИИ

STUDY OF THE RELATIONSHIP OF SIGNAL / NOISE RATIO AND SPEECH INTELLIGIBILITY IN POSSIBLE POINTS OF INFORMATION LEAKAGE

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Currently, various technical devices are used to intercept speech information: directional and laser microphones, dictaphones, etc. The main channels of the leakage are direct acoustic and vibration [1]. The work is devoted to the estimation of the effect of the type of interference signal and the signal-to-noise ratio on the security of speech information. The expert methods were selected as evaluation methods. During the experiment, speech intelligibility was assessed when various types of noise signals were exposed to it at different signal-to-noise ratios. Such interferences as white noise, a voice chorus (the voices of several speakers), as well as a speech-like signal formed directly from the speaker's speech were investigated. For the experiment, the following equipment was used: the Edifier R1900 T3 speaker system for playing test and interference signals, the sound spectrum analyzer MANOM-4/2, the Behringer C-1 microphone, two laptops with the Cool Edit Pro2 software installed for playing test signals and recording sound. The test signals were recorded in an acoustically muffled room. The vibration channel was studied by recording and listening to a mixture of useful and interference signals passing through the elements of enclosing structures (double-glazed windows, doors). As the sources of vibration interference, acoustic transducers included in the delivery of the device for protecting voice information "Priboi" were used. The direct acoustic channel was studied by recording and listening to a mixture of useful and interference signals at various points in the space of the room. The choice of such points is due, first, to the proximity to the elements of building structures with minimal values of their own sound insulation, and secondly, to the geometry of the room. Standing waves create a series of peaks and dips in the room, while in certain areas, the volume levels can be higher than those reproduced by the source. Accordingly, points were selected near the walls, in zones of dihedral angles (wall / ceiling joints, wall / floor, etc.), and in triangular angles (wall / wall / ceiling joints). The acoustic noise analyzer was used for the initial estimation of signal levels and noise. The phonograms containing noisy test signals were listened to by 10 auditors (5 women and 5 men) at signal-to-noise ratios of 10, 0, –5 and –10 dB. The conclusions drawn on the basis of these results indicate that the speech-like interference formed directly from the masking speech seems to be the most effective for protecting speech information, since it makes it possible to provide the required speech intelligibility value at a noise level by 5–10 dB lower than in the case of white noise application.

Literature

1. Active and passive methods and means of information protection against leakage via technical channels: monograph. / Ed. L.M. Lynkov. – Minsk: Bestprint, 2011. – 275 p.

ПРИМЕНЕНИЕ КОМПЛЕКСНОГО ВЕЙВЛЕТА МОРЛЕ ДЛЯ ОЧИСТКИ РЕЧЕВОГО СИГНАЛА ОТ ШУМОВ В ТЕХНИЧЕСКИХ КАНАЛАХ УТЕЧКИ

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В настоящее время развитие информационных технологий позволяет реализовывать сложные алгоритмы обработки сигналов с использованием цифровых методов и средств. Существенную роль среди таких алгоритмов играют линейные интегральные преобразования, которые являются особенно эффективными для обработки полезных сигналов, в нашем случае принятых измерительных сигналов (ИС) на выходе технического канала утечки информации (КУИ) в условиях наличия шумов и помех. Одним из таких преобразований является вейвлет-преобразование, позволяющее путем трансформации выходного ИС провести его детальный частотно-временной анализ. Значительный вклад в теорию вейвлет-преобразования, в частности, вейвлет-фильтрации, внесли зарубежные ученые: И. Добеши, Д. Донохо, С. Малла, И. Мейер, а также российские, украинские и белорусские ученые, среди которых следует отметить работы Н. М. Астафьевой, А. П. Петухова, О. В. Рыбальского.