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ESTIMATION OF SOUND SOURCE DIRECTION USING A BINAURAL MODEL

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Abstract. *The direction of a generated sound source can be estimated by humans using the time difference between both ears and the way the sound changes due to the shape of the head and ears. However, it is very difficult to create an estimation system using a computer and two microphones. In this study, we propose a novel sound source direction estimation method, in which the feature difference between two recorded microphone signals is used. As a result, an average correct estimation rate of 96% was obtained in determining the location of 11 kinds of object sounds.*
Keywords: Sound source localization, Intramural time difference, Microphone, Binaural model

1. **Introduction.** Recently, various robots have made their way into many places such as the industrial world and the home. Previously robots were mainly active only in factories, and their sole requirement was to perform accurately. However, as robots become commonplace outside factories, it is required that they understand their surroundings and make safe, appropriate decisions.

Hence what is essential for such robots is a system that acknowledges the surroundings of the robots. One important function for recognizing the surroundings is a sense of hearing. Hearing makes a lower contribution to recognizing surroundings than vision does. However, sound can be heard even in the dark where vision cannot be used and also can be heard when outside the field of view. As a result, hearing is an important function for the recognition of the surrounding environment [1].

Generally, a generated sound source direction can be estimated by humans using the time difference between both ears and how the sound changes due to the shape of the head and ears [2]. The purpose of this research is to achieve this system technologically. It is believed that such systems can be applied to assist the hearing impaired and humanoid robots to estimate the sound source direction. Research that uses three or more