PREFACE

Recently, much progress has been made in time series analysis, and the application field has been remarkably expanded. Especially, estimation of the spectral density has proved very useful. To make it effective, however, choice of a 'lag window' for the smoothing of data is, as is known, very important. This problem was dealt with by several authors. At the Institute of Statistical Mathematics, too, it has been tackled by Dr. H. Akaike and others. Later Dr. Y. Yamanouchi of the Ship Research Institute joined them. Further, in connection with this, the problem of estimating the frequency response function has also been treated here. The problem is to get response characteristics of a system when the system receives vibratory input from the outside. For that, we measure the input and output of the system, usually while it is in normal operation. However, it is not always possible to get the characteristics from the raw material, mainly due to random noises. It is necessary to transform the data, and here also arises the problem to choose a suitable window for the transformation. Now, the problem to estimate the frequency response function is found in many fields as can be seen below, and we took up this problem as a special project in the year April 1963–March 1964. Our purpose was to further develop the method together with suitable windows and to see how far and how effectively the method can be applied to problems in various fields. For this purpose, we set up a committee composed of individuals in related fields who had keen interest in the problem. They are as follows.

H. Akaike, The Institute of Statistical Mathematics,
M. Izumi, Building Research Institute, Ministry of
      Construction,
I. Kaneshige, Isuzu Motor Co., Ltd.,
R. Kawashima, Faculty of Fisheries, Hokkaido University,
T. Kinoshita, Public Works Research Institute, Ministry of
      Construction,
H. Nakamura, Kyushu Electric Power Co., Inc.,
I. Nakamura, The Railway Technical Research Institute,
      Japanese National Railways,
H. Sato, Institute of Industrial Science, Tokyo University,
K. Suhara, Tokyo University of Education,
S. Takeda, National Aerospace Laboratory,
K. Togino, The Government Mechanical Laboratory, The
      Agency of Industrial Science and Technology,

Y. Yamanouchi, Ship Research Institute.

(in alphabetical order)

The committee members proceeded with the study in their own fields, and often gathered to make discussion together. In the following, the results obtained are presented. First, a general method is given, and then, studies on particular problems by the method follow.

Finally, I should like to express my gratitude to all the members of the committee for their co-operation and efforts, to the organizations to which the members belong, for their generosity and interest in the project, and to some people of the Ministry of Education for their aid in obtaining a special fund from the Government for the project. Thanks are also due to Misses T. Naito and I. Soezima for their help in arranging the materials for publication.

K. Matusita
Chairman of the Committee