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SYNTHESIS OF OPTIMAL CONTROL OF A MULTIPOSITION INFORMATION SYSTEM WHEN SEEKING FOR A GROUP OF DYNAMIC OBJECTS

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The paper considers the situation of search of several dynamic objects by a multi-site search system. Based on the trajectory approach to distribution of search efforts, and on application of the generalized equivalent criterion such as probability of non-detection of objects, a flow-type algorithm for control of a multiposition information system has been generated. An example of search of two targets by a three-site angle-and-range measuring system is included.

The logical extension of the general theory of search of solitary objects is the theory of search for a whole group of objects. However, in basic monographs on the search theory these issues have received little attention [1–3]. Particularly, in [2] the search of groups of objects has not been considered at all, while [1] gives only one of several possible criteria of optimality in this situation — the mean value of the number of objects detected. The cited source contains a general expression of this criterion through the search intensity function. Another monograph [3] considers the search of a group of objects in more detail. But even in this book we can find only continuous and discrete search for several stationary objects based on provisions contained in [4, 5]. Moreover, here we deal with substantial restrictions on the initial information: for example, we must know the functions of probability of non-detection of the ith object (the ith type object) under the condition that the object is located in the point $z \in \Omega$. However, the problem of determination of such functions is rather complex in itself, as has been noted in [3].

If during the radar search we try to maximize the probability of getting the blip corresponding to object's true location, for a single-site radar the scheme of adaptive search does not depend on the number of dynamic objects (DO). When we deal with a group of DO, by distribution density of target's location is meant the joint distribution density of coordinates of the group of DO. In this case the optimal control sought for is the ratio between the signal energy and noise spectral density. However, this approach has the same drawbacks as in the case of search for solitary targets: the argument of the respective functions is a measured parameter dictating the resolution element of the single search point (SP), and the search area is set on the whole space of this parameter values. Therefore, application of this approach for optimization of control of several SP during the search for DO presents considerable difficulty.

In [9–11] we developed the trajectory approach to synthesis of uniformly optimal control of search for a solitary dynamic object. This approach makes it possible to realize optimal control of individual search sites incorporated in the multiposition information system (MPIS).

Thus, the existing approaches give no way of resolving the problem of optimal distribution of search resources in the event of search for a group of dynamic objects by MPIS. Hence, handling this problem based on the trajectory approach to distribution of search efforts is a pressing problem.

A peculiar feature of the search for a group of objects is the growing number of possible criteria of optimality. Most widely used of them are the mean value of the number of detected objects [1, 3] and probability of detection at least of a

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