International Refereed Journal of Engineering and Science (IRJES)
ISSN (Online) 2319-183X, (Print) 2319-1821
Volume 8, Issue 1 Ser I (Jan 2019), PP. 01-04

Remote and Interactive Control System of Moving Object's Location, Position and Speed

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ABSTRACT:*The structural model and general principles of functioning the modified system has been developed to control the position and speed of the object. The proposed model is based on complex investigations to achieve the operational solution of the problems in the remote and ground-based control of the object movement. In the model created by the system, as an autonomous system the object has a flexible architecture that provides the control of the moving object in such extreme conditions as connection or disconnection with the remote and ground-based control systems.*

KEYWORDS: *navigation system, remote control, modification system, static object, dynamic object.*

Date of Submission: 28-01-2019 Date of acceptance: 11-02-2019

I. INTRODUCTION

Problemstatement. Methods and means of determining the location and position of the objects are widely used for such purposes as industrial, military, ecological, social, economic, geological, navigation, etc. For this purpose, ground-based and remote conducting of complex investigations are of great importance to achieve operational solutions of the problems involving above mentioned areas. Especially, in recent years pilot and non-pilot devices give more opportunities to achieve the goal. GIS (geographical information systems) based on the remote measurements data and generated for this purpose are of great importance.

Various methods and means and appropriate software development are available as a matter of urgency to control the position and speed of moving objects in different situations with minimal error.

The analysis of recent researches and publications. The determination of the static objects coordinate and accuracy are higher than that of dynamic (moving) objects [1, 2].

The methods determining the location and speed of moving objects having similar or different features in terms of hardware, software and realization are represented [3].

Thus, the systems widely used for monitoring moving objects are distinguished for their absolute and relative differential impact. Due to the fact that the differential method is usually more sensitive than the relative one, concentration of remote and time-based instant measurement errors is justified by the fact that it is more appropriate to apply it with the absolute method. Another method used in this case is the mapping identification method, which is presented to minimize the error of the data obtained by comparing the given and measured digital (numerical) data-based maps.

In another source [4], the problem of establishing an algorithm for calculating the relative velocity of the object on the base of video-observation data was considered. In this case, the object moving along the straight line evenly across the plane is confirmed. However, according to the straight line, smaller speeds (relative to OMS) and azimuth, the change in the object coordinate based on the presented method are smaller or don't change in N + 1 sequence.

Purposeofthearticle. Developing a structural model of a modified system allowing to control the position and speed of the object in extreme conditions where external connection doesn't exist (or impossible).

II. EXPOSİTİON OF BASİC MATERİAL

It should be noted that, in order to determine the location and speed of the controlled object, the equipment and software are intended to be transfered through the data obtained from external sources and its various processing systems according to the proposed methods (navigation).

Here, the information given by the moving objects is not considered extensively. The effect of the independence rate change of the object movement line on the determination of its location and speed is not taken into account.

In order to determine the speed of the object being monitored, the opto-mechanical system videorizer is received to be performed only by two axes at the azimuth angle and the inner space angle (there is no information about the distance of the object).

Figure 1 represents the structural model of the control system on the location and movement of the object according to different interaction methods.

The object is static (motionless) in which it is possible to define the area where it is located by means of the application of remote and ground-based control methods (Fig. 1).

Here O is an object, RCS is a remote control system, GBCS is a ground-based control system, CIS is a central information system. In this case, the object may be involved as a passive or active information source.

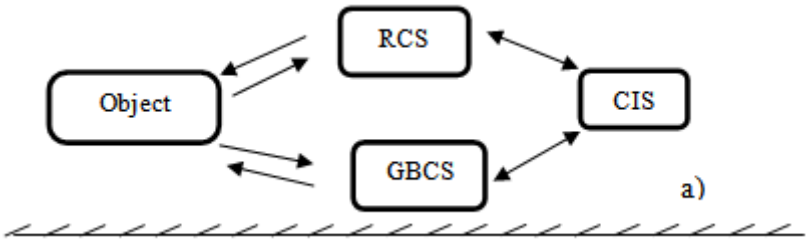

Fig. 1. The object is static

The object is motional (dynamic) (Fig. 2). In this case, the object itself performs its location and movement control. For this purpose, it is equipped with an autonomous information system designed by transmission and acces unit (TAU), processing and decision making unit (PDMU), executive mechanism management unit (EMMU) and databank (DB).

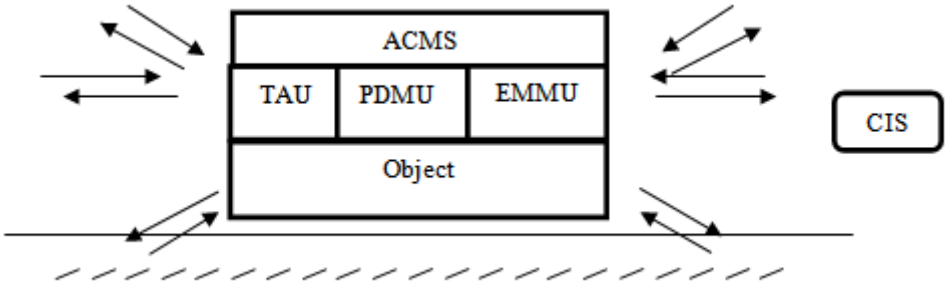

Fig. 2. The object has an autonomous system

The object has an autonomous system and its movement and speed are controlled on the basis of the central management system information through remote and ground-based control systems (RGS) along with this system (Fig. 3).

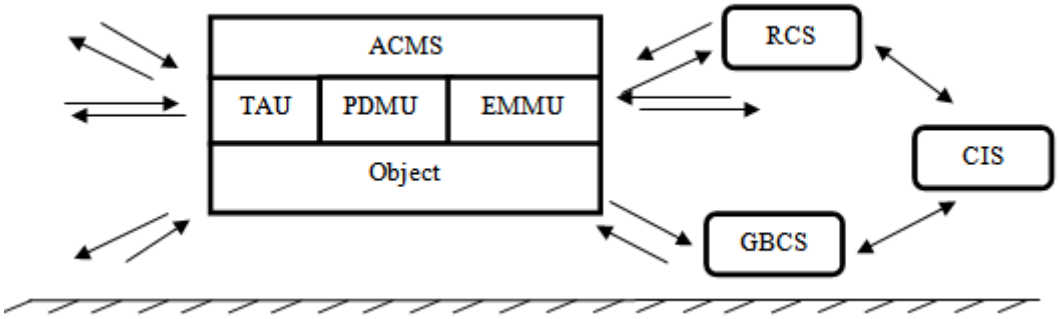

Fig. 3. The object has an autonomous system, as well as is connected with remote, ground-based and central control systems

The object has an autonomous system, apart from remote, ground-based and central control systems (RGCS), it is monitored on the base of other facilities (OF) and the connection with static observation points (SOP). Thus, the position and speed control model of the object (according to algorithm and means) can be evaluated as follows:

1) The position of the object is controlled by another system or operator.
2) Movement and position are controlled by the object's vision, recognition and control system.
3) The position and speed of the object are determined and controlled by the operation of the object itself and other control systems (CCS and GBS).
4) The position of the object is determined by the information obtained from the static observation points placed on certain locations along with the local ($ANIS_O$), external (CCS and GBS) control, as well as other object's autonomous control and management system (ACMS).

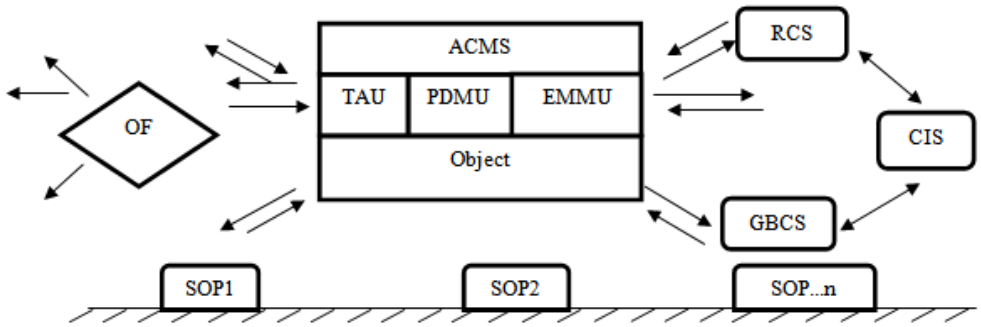

Fig. 4. The object has an autonomous system, apart from remote, ground-based and central control systems, it is monitored on the base of other facilities and the connection with static observation points.

It should be noted that, as the independence rate in the object's movement trajectory increases, it is advisable to use a control and management system having superior features. The presented model allows to achieve a corrected result with superior precision distortion, less error, and superior independence rate in controlling.

III. DİSCUSSİON

Thus, the independence rate of the object motion on the movement line allows remotely to determine its position and speed, as well as to control its remote operativeness. As an information source of the moving object, participation of the control system with the observation system will increase operational efficiency in solving the above-mentioned problems.

The object is motionless or motional, the location, position and speed of the object are controlled by remote and ground-based control systems. Information exchange and navigation do not involve the object.

1) The object operates as an autonomous system and has its own transmitter, receiver, vision and decision-making system (the system is available)

2) Unlike the first and the second situation, the object (autonomous system) is free to participate in information exchange with remote and ground-based controls.

3) In the system the object incorporates a combination of other previous positions, and operates on the principle of non-stationary (stationary) or non-route static signal sources or other moveable autonomous objects.

IV. RESULTS:

The created modified system has a flexible architecture to continue it's movement in extreme conditions, such as the location and speed of the object, as in the case of connection with ground-based and remote control systems, where the connection is interrupted (or impossible).

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UDC [681.51.07:510.644.4]:629.312.072.1-83-52
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Bakirova L.R" Remote and Interactive Control System of Moving Object's Location, Position and Speed" International Refereed Journal of Engineering and Science (IRJES), vol. 08, no. 01, 2019, pp. 01-04