Міністерство освіти і науки України

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ АВТОМОБІЛЬНО-ДОРОЖНІЙ
УНІВЕРСИТЕТ

СТУДЕНТСТВО. НАУКА.
ІНОЗЕМНА МОВА

Збірник наукових праць

Випуск 12
Частина 3

ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ
ТРАНСПОРТНІ ТЕХНОЛОГІЇ
ПРИРОДНИЧІ НАУКИ

Харків
ХНАДУ
2020

УДК 33+621+004+009+620.9+5+61+34
ББК 65

Студентство. Наука. Іноземна мова : збірник наукових праць студентів, аспірантів та молодих науковців. – Харків : ХНАДУ, 2020. – Вип. 12. – Частина 3. – 225 с.

У збірнику подано іноземними мовами результати наукових досліджень студентів, аспірантів та молодих науковців у різних галузях економіки, що можуть зацікавити світову наукову спільноту. Регулярні публікації робіт допоможуть виявити талановиту студентську молодь, здатну брати участь у міжнародному професійному, науковому та освітньому обміні та втілювати одержаний досвід у розвиток передових технологій.

Усі матеріали публікуються в авторській редакції.

Зміст

- communication and navigation by rail, increasing the intensity of train traffic without the safety threat, monitoring the location of the wagon fleet;

- navigation and communication for small vessels, fishing and water recreation;

- provision of activities of various emergency services (rescue services, ambulance services, police, fire service) [2].

Studying the degree of scientific development of this issue has led to the conclusion that the development of the navigation industry in our country is being at a stop. Neighboring countries and some European countries are actively developing this industry. Another example is that the German company Wirtgen Group is actively involved in the creation of new GPS devices used on road vehicles.

References

1. Бонч-Бруевич А. М. Системы спутниковой связи. Санкт-Петербург, 1992. 224 с.
2. Мазур И. И. Управление проектами. Москва, 2010. 571 с.
3. Мищенко И. Н. Глобальная навигационная система «NAVSTAR». Санкт-Петербург, 1980. С. 52-83.
4. Шебшаевич В. С. Сетевые спутниковые радионавигационные системы. Москва, 1982. 272 с.

Mnushka O. V.

SIMULATION MODEL OF ANTENNA AZIMUTH POSITION CONTROL SYSTEM

Language Advisor – Asst. Prof. Chevychelova O. O.

Kharkiv National Automobile and Highway University

To install a satellite antenna on the vehicle the problem of the antenna accurate positioning in the direction to the satellite must be solved. Satellite antenna orientation errors, which occur during the vehicle movement, cause a substantial reduction of the received signal level [1]. Setting up the angular position of the antenna for both azimuth and elevation is made by means of equipment, which uses control systems with similar parameters.

In general, the closed control system (Fig. 1) consists of a generalized controlled object (“Plant”), a controller (“Controller”) and a sensor (“Sensor”) to measure the current level of output signal (y(k)). The error signal (e(k)) as the difference between required (r(k)) and current (y(k)) states of the controlled object is the input signal of the controller. The control signal (u(k)), according to which the state of the controlled object is changed, is the output signal of the controller.

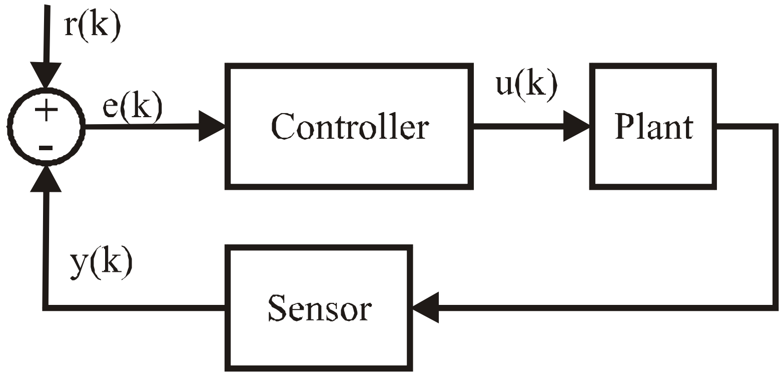

Fig. 1. Generalized model of a closed loop control system

Considering the above notation, the link between input and output variables is given in Eq. (1):

$$e(k) = r(k) - y(k)$$
$$\Delta e(k) = e(k) - e(k-1)' \quad (1)$$

where $\Delta e(k)$ – change of error; k – iteration number.

The simulation model of the control system (Fig. 2) was developed and implemented in Matlab/Simulink and it consists of sources of signal and perturbations, controllers, controlled object, sensors and an oscilloscope (in Fig. 2 the fragment of the model is shown).

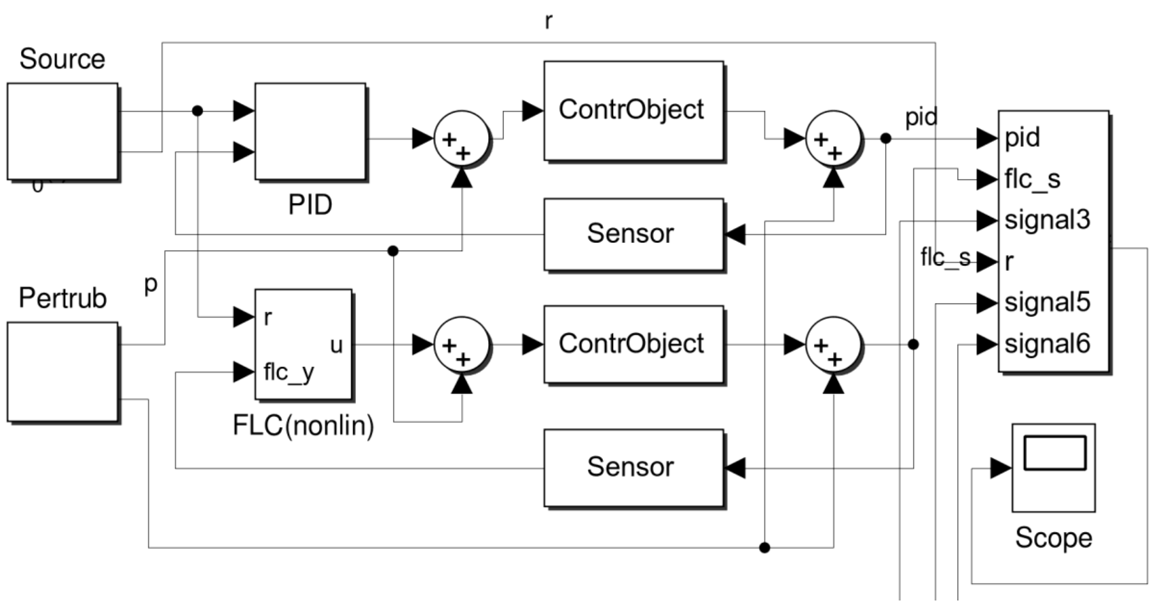

Fig. 2. The simulation model

To verify the developed simulation model we consider the well-known antenna azimuth positioning system [2] with the discrete transfer function $W(z)$ given in Eq. (2) as the generalized controlled object.

$$W(z) = \frac{0{,}000274(z + 2{,}959)(z + 0{,}2037)}{(z - 1)(z - 0{,}983)(z - 0{,}3679)} \qquad (2)$$

According to [3] the detailed cross-reference rules sets between inputs and output for both Mamdani-type (M) and Takagi-Sugeno-type (TS) FLC were obtained and are defined in Tables 1 and 2, in which next abbreviations are used: N – Negative, NB – Negative Big, NM – Negative Medium, Z – zero, P – Positive, PM – Positive Medium, PB – Positive Big, Min – Minimum, Max – Maximum.

The resulting set of rules for a fuzzy controller allows modeling the behavior of the antenna installation under various initial conditions and under the influence of various external factors in the control loop.

Table 1. Mamdani-type FLC rules set

$\Delta u(k)$		$\Delta e(k)$		
		N	Z	P
$\Delta e(k)$	N	NB	NM	Z
	Z	NM	Z	PM
	P	Z	PM	PB

Table 2. Takagi-Sugeno-type FLC rules set

$\Delta u(k)$		$\Delta e(k)$	
		N	P
$\Delta e(k)$	N	Min	Z
	P	Z	Max

Conclusion. The paper deals with antenna azimuth control system, which is controlled by using conventional proportional-integral-derivate (PID) controllers and both Mamdani-type and Takagi-Sugeno-type fuzzy logic controllers (FLC). In order to obtain system response to various external perturbations the simulation model was developed in Matlab / Simulink environment. The advantages of FLC in comparison with conventional PID controllers were observed under the action of various external perturbations.

Prospects for further research – development of models for the antenna system taking into account the oscillatory motion of the platform in the process of setting the direction to a telecommunication or specialized satellite.

References

1. Hao L., Yao M. SPSA-based step tracking algorithm for mobile DBS reception. Simulation Modelling Practice and Theory. February 2011. Vol. 19, Iss. 2. Pp. 837-846.
2. Nise N. Control Systems Engineering. Wiley, 2011. 944 p.
3. Precup R.-E., Ianc P. A. , Petriu E. M. and others Low-cost fuzzy control approaches to a class of state feedback-controlled servo systems. *Advanced Intelligent Mechatronics (AIM)*: IEEE/ASME Int. Conf. 2011. Pp. 1022–1027.

Pkhydenko A. L.

ANALYSIS OF ROAD SAFETY ASSESSMENT METHODS BY ACCIDENT AND TRAFFIC SAFETY COEFFICIENTS

Scientific Advisor – Cand. Eng. Sc., Assoc. Prof. Dorozhko E. V.
Language Advisor – Cand. Econ. Sc., Assoc. Prof. Fandieieva A. Ye.
Kharkiv National Automobile and Highway University

The problem of convenience and road safety is not new, but nevertheless its relevance is not reduced. Under the term "road safety" we understand the problem, which includes the analysis of the causes of accidents that occur when individuals and vehicles move on public roads and measures to prevent them.

Road conditions on different sites differ in their properties (type, placement in the field of view of the driver and others). Therefore, drivers are constantly faced with the need to make a decision that is most appropriate for a given traffic situation. The condition of convenient and safe traffic is the creation of such a traffic situation on the road sections, taking into account the psychophysiological characteristics of drivers [1]. The road environment should be created to ensure high traffic safety.

Before developing specific measures to improve the road situation, it is necessary to assess road safety, identify dangerous places. For identification of dangerous sites and forecasting of degree of danger of separate sites of the road use the method offered by Professor V. F. Babkov, - a method of coefficients of accident rate [1-4]. This method is based on the generalization of traffic accident statistics. The degree of danger of road sections is characterized by the final accident rate, which is the product of partial coefficients that take into account the influence of individual hazardous elements of the plan and the longitudinal profile.

With the deterioration of traffic conditions on the road, the values of private accident rates increase.

The final accident rate is determined on the basis of a linear graph of the studied road section. On the schedule put the compressed plan and a longitudinal profile of the road with identification on them of all elements influencing traffic safety (longitudinal slopes crossing roads and footpaths and so forth). In a special graph write out or graphically represent the actual distance of visibility. The scale of the plan and profile is chosen depending on the complexity of the terrain and the situation. The graph captures the intensity according to the records conducted by

In order to curb these disasters, we must plant more trees. Restoration of existing vegetation is equally essential. Population control is another indirect method to save trees and forest areas.

References

1.https://youmatter.world › definition › definitions-...
2.https://rainforests.mongabay.com › 09-consequen...
3.https://vocal.media › futurism › deforestation cau...
4.https://science.howstuffworks.com › deforestation2

Наукове видання

СТУДЕНТСТВО. НАУКА. ІНОЗЕМНА МОВА

Збірник наукових праць

Випуск 12

Частина 3

ІНФОРМАЦІЙНІ ТЕХНОЛОГІЇ
ТРАНСПОРТНІ ТЕХНОЛОГІЇ
ПРИРОДНИЧІ НАУКИ

Засновник – Харківський національний автомобільно-дорожній університет

Свідоцтво про державну реєстрацію

Серія ХК № 1495-236Р

від 29 грудня 2008 року

Адреса редакції: 61002, м. Харків, вул. Ярослава Мудрого, 25, тел. 752-88-87