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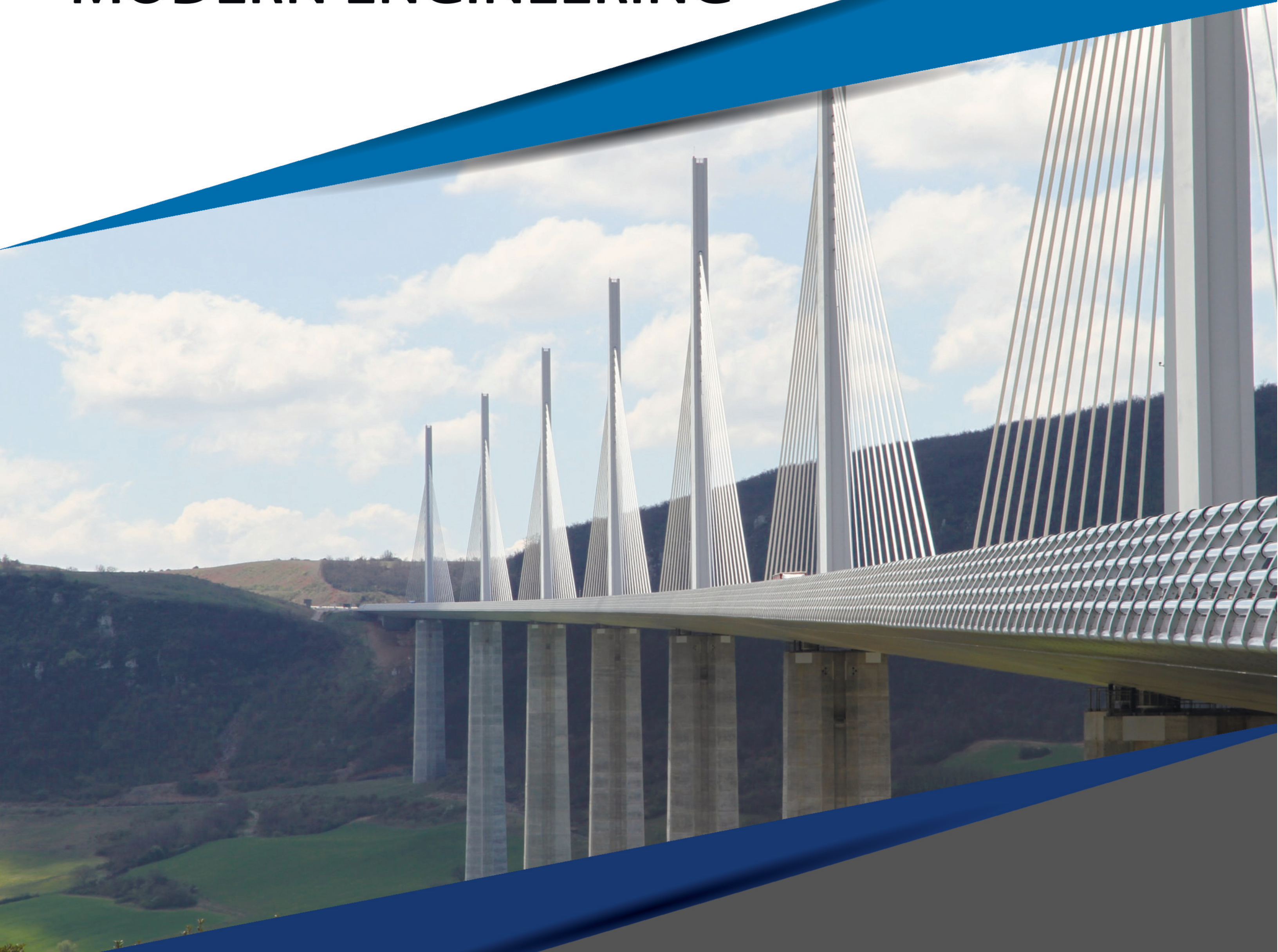
THEORETICAL ASPECTS OF MODERN ENGINEERING



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Authors - Hnes L., Kunytskyi S., Medvid S., Khovanskyy S., Sotnyk M., Sapoznikov S., Boiko V., Shkliar S., Vasylkova I., Usachova O., Vovk L., Matsiyevska O., Zhdanov O., Дудка О.М., Попова О.А., Смірнова О.В., Bereziuk O., Lemeshev M., Cherepakha A., Senyk I., Butenko O., Khomenko V., Chernysh O., Шматок Ю., Чикида Т., Глоба Н., Ліснича Т., Кириллов С., Boyko N., Dmytrenko T., Derkach T., Dmytrenko A., Kulykovska N., Terentyev O., Gorbatyuk I., Rusan I., Borodavka Y., Balina O., Tkachenko S., Stepanov D., Stepanova N., Гулевський В., Постол Ю., Стручаєв М., Попрядухін В., Борохов І., Сафронов О., Mandrichenko O., Demydenko T., Dorozhko V., Pshenychna Y., Topchii O., Verchenko M., Honcharenko T., Sotnyk M., Marynych T., Drozdenko A., Leontiev P., Telizhenko O., Левченко Л.О., Ходаковський О.В., Козачук А., Pryadko N., Arkhypov O., Bakun V., Sukhov V., Kozei Y., Marynoshenko O., Chasov D., Ventsel Y., Shchukin O., Orel O., Yevtushenko A., Voronova Y., Бондарева О.М., Kopayev A., Zadnieprianniy D., Kovalenko T., Matiko H., Serdiuk V., Sotnyk M., Telizhenko O., Sotnyk I., Kurbatova T., Koplyk I., Moroz L.B., A.V. Uhrynovskyi, Osinnij V., Makeiev S., Havrilov D., Volovyk A., Koval L., Yarovyi D., Piltyay S., Bulashenko A., Sokol G., Gerasymov D., Shuhailo A., Gordiienko S., Pluznikova A., Kalinichenko Y., Alexandrovskaya N., Stenhach O., Kunda N., Sharai S., Oliskevych M., Roi M., Silenko V., Tretynychenko A., Tretynychenko Y., Sokulskyi O., Hilevska K., Vasiltsova N., Lebid V., Kopiak N., Петрик А., Козлов В., Головатюк М., Шапенко Є.М., Лебідь В.В.,Serediuk D., Pelikan Y., Bas O..

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SECTION 13. TELECOMMUNICATIONS

13.1 Analysis of recursive estimation procedure

In the capacity of evaluation procedure, it is reasonable to use Kalman-Bucy recursive algorithm for the local search optimization. Optimal evaluation according to the integral square error criterion is determined from the recursion equation solution also known as Kalman-Bucy method:

$$\hat{x}(k+1) = F(k+1,k)\hat{x}(k) + K(k)[H(k)F(k+1,k)\hat{x}(k) - y(k)] \quad (1)$$

where $K(k) = V(k)H^T(k)N_v^{-1}$ is a coefficient, which provides evaluation optimality and procedure convergence degree.

The template that includes observation, evaluation and processing models reflects distinct FKB deviations influence of the chosen model. Block diagram of the simulant is shown on Figure 1.

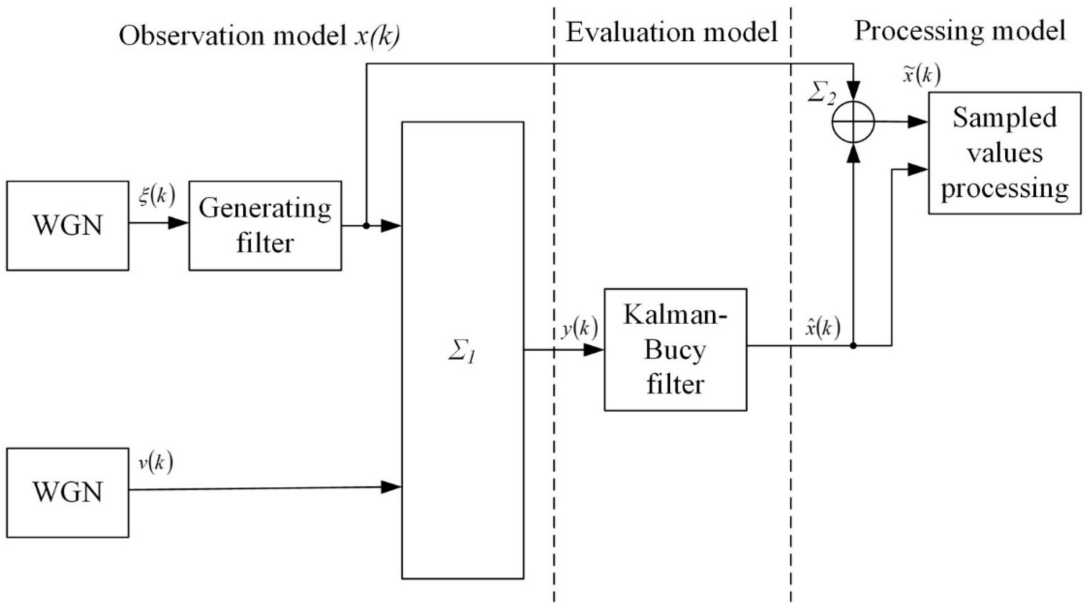

Figure 1: Block diagram model of the distinct FKB stimulant.

Proposed computer test model gives an opportunity to select options of the evaluated process model x(k) and inspection noise model $N_v(k)$ as to the stationary state and transient state. Individual noise $\xi(k)$ and $v(k)$ generators are to be standardized formation procedures with the choice of corresponding spectral power density $N_v(k)$ and $N_\xi(k)$ values. Models chosen parameters consistency is proved by receiving sample estimations of these parameters.

As it was mentioned above, the results of theoretical analysis of the filter responsivity under the effect of signal models, parameters of which differ from the filter parameters. It is shown that under deviation of filter parameters from the chosen model, the quality of estimation changes for the worth. A distinctive feature of nonstationary models is that the mentioned deviations of model parameters are not simply deviated, but these deviations are time variant. Therefore, the study of nonstationary effects is an assumption of the responsivity study under changing model parameters over time. At that, it is important to know how does FKB response on those or other nonstationary effects having different rates of these changes under various choice of filter parameters. We refer to the two standard for telecommunication situations when non- stationary changes are of gradual and stick-slip nature.

The effect of nonstationarities is evident from the moment of emitting useful signal to the filter input. Thus, different filters react on nonstationary signal differently. This response appears in the form of the transition process from the emitting until setting a stationary filter mode.

The analysis of filter efficiency at the nonstationary conditions has been held under the advanced observation model. Additive identity that reflects level and speed changes of the nonstationarity has been comprehended to the watch equation. Sinuous nonstationarity model has been chosen to be primary taking into the consideration the fact that traffic change is a result of multiple actions on the network load:

$$y(k) = H(k)x(k) + C\,sin(\,lkT/\tau_{cor}) + v(k) \quad (2)$$

where l is a multiplication factor that changes nonstationary actions period, C changes nonstationarity value, T/τ_{cor} changes intervals rate between sam-ple spacings T and correlation intertissue τ_{cor}.

In this work examine the situation for different cases of T_s periods, non-stationary changes. When provided changes become commensurable to the time of the process transition $T_s = 5\Delta t$ (Fig. 2) at low-speed nonstationary change $T/\tau_{cor} = 25\Delta t$ (Fig.3) and $T/\tau_{cor} = 500\Delta t$ (Fig. 4).

The intent of the nonstationary entry influence is that evaluation stationary process has not approached yet but in the observation results there have already occurred the changes that the filter shall obtain as re-emerged information. Thus, the filter functions persistently as if in the transient mode.

Sampled values of posteriori variances are little different from functioning results of basic stationary process at the low-speed change. Thus, evaluation accuracy can be obtained at sample spacing shorthand in the condition of static entry changes.

In this work consider the influence of nonstationary processes of parameters abrupt change. Abrupt changes are typical at the traffic change. At this:

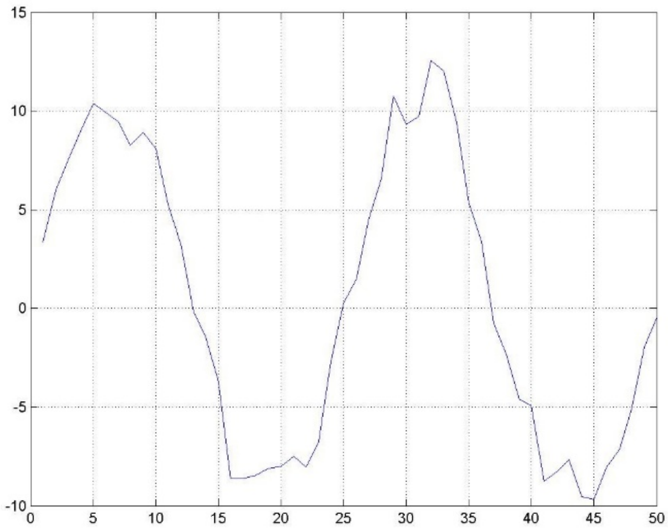

Figure 2: Realization segment of nonstationary signal at fast changes of nonstationary function

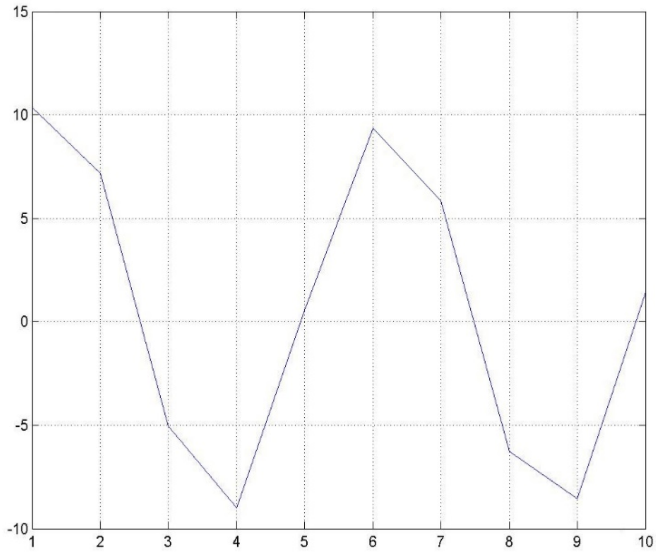

Figure 3: Realization segment of nonstationary signal at mean changes of nonstationary.

Function rate, on or off of acceptors with extensive datastream induces load abrupt changes. To perform abrupt changes modeling we avail an additive identity.

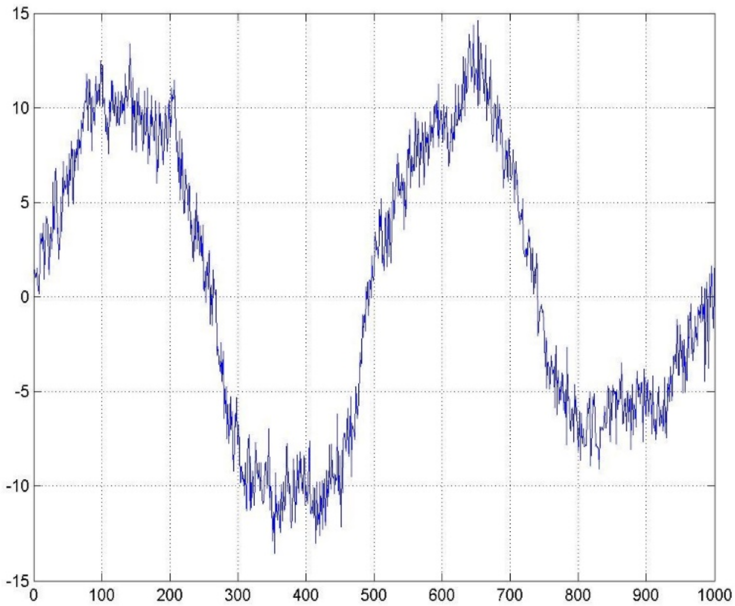

Figure 4: Realization segment of nonstationary signal at low-speed changes of nonstationary function (2)

In this case $sin(lkT/\tau_{cor}) = 1$ and value C will build squarewave signal with the period of 100 sample spacings with various l values.

The diagrams reflect that transiency in the form of discrete edge provides sharp increase of posteriori variance values. This value outweighs stationary condition by 50 and more times. Transient process is derived from the non-stationary impulse occurrence and endures for 100–150 steps. Such values increase of the posteriori variance results in control errors. It is typically that filter action is less tangible at nonstationary impulses dump than at its occurrence. Thus, sample spacing reduction gives an opportunity to control nonstationary changes that is an important factor that provides stable functioning of evaluation and control algorithms.