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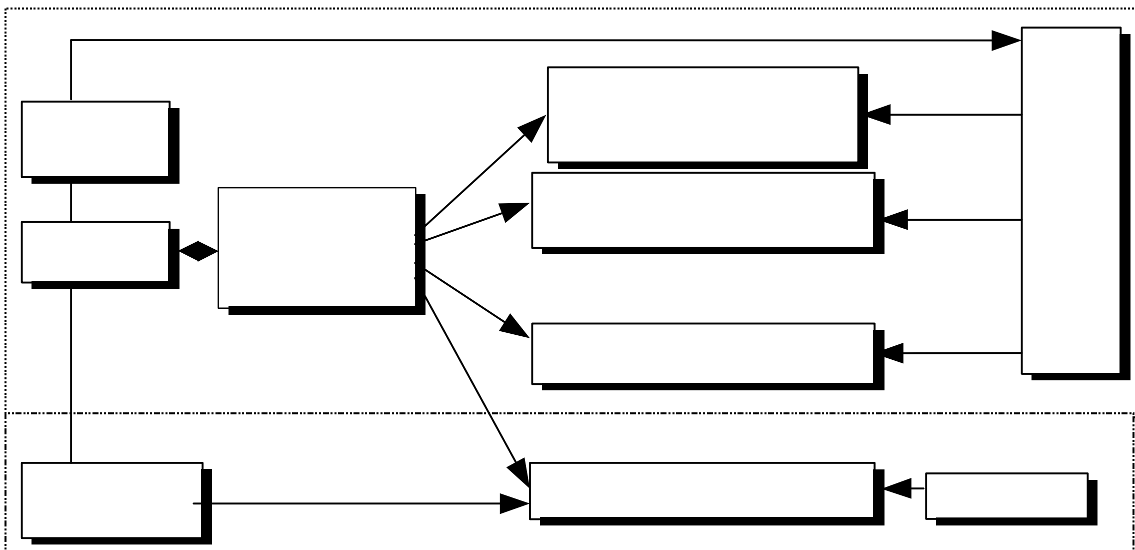
This paper presents a controller based on Kohonen's Self-Organizing Map (SOM), used in commanding the time varying systems with uncertainties task. An application of a missile-target tracking was implemented using the mentioned method, and the results are compared with those obtained in a classical approach.

The missile control systems can be done in two ways (as shown in Fig. 1):

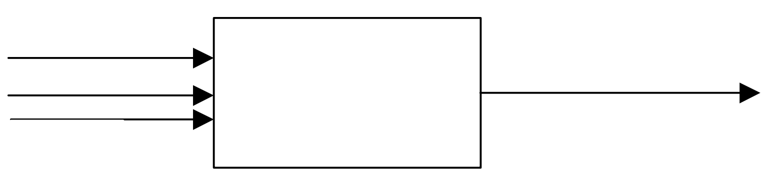
- The first one, which I called it the classical control, made by the "automatic flight control



system" and can be designed in three modes:
  - using the quadratic linear method;
  - using the optimal method;
  - using the H_∞ method.

  In this case for the missile we must choose a linear model and for the unknown parameters (like the target state and some missile state) we have to design an apriori state observer.
- The second way, typical for the non-linear model, is to design an automatic flight control system based on artificial intelligence. The particularity of this is that of an existing teacher which must learn the network how to answer at the input signal.

Designing a controller means to find the values of the actual control using the input values, the state values and the previous control (Fig.2). So, in this case the network's output must be the current control and the inputs are the state, the input and the previous control.



We design the neural control of a missile which track a target with an unknown dynamics and evolution.

The distance missile-target R, the line of sight angle Φ and the tilt angle of the trajectory θ, parameters depending on the previous command, are the inputs of the SOM, so the network has 3 input nodes admissible overload condition n = ± 10g). The output range was divided into 11 intervals, each of them corresponding to a class of command. We choose a 5x5 square output layer, so after training the Kohonen's SOM each class of command is represented by a cluster of output neurons.

In Fig.3 and Table above are presented the results of the simulation using the controller based on a neural network described above. The results are compared with those obtained using a robust controller. Speaking from the quality point of view, which is the catching time of target, we can see that our method with neural network is better than the classical one (the robust controller).

Table: *Comparison of the classical and SOM controller*

The initial missile-target distance [m]	The line of sight angle [°]	Time [s]	
		Robust controller	SOM controller
1000	-15	3.36	3.15
1500	25	4.89	4.65
2500	45	7.77	7.45
2500	-50	7.23	6.6
3000	-20	9.78	9.69

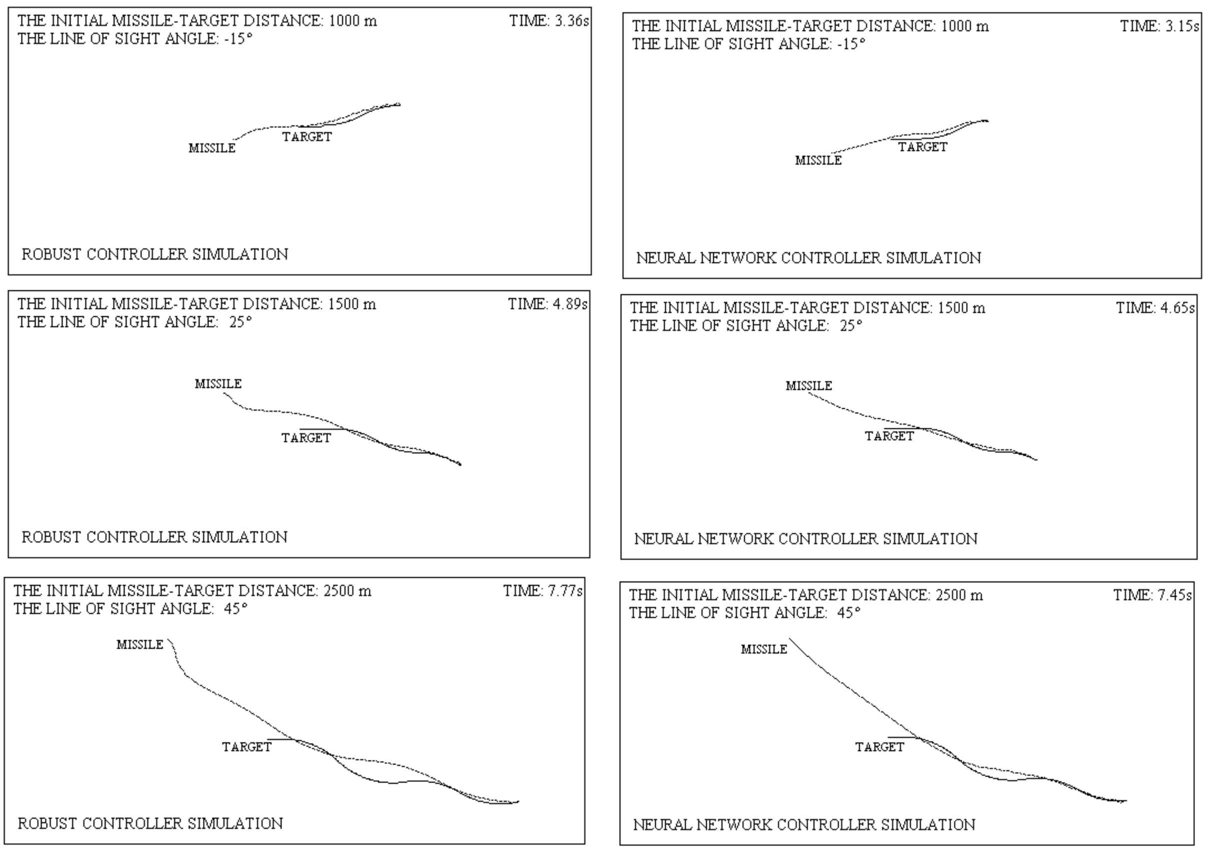


Fig.3 Simulation of the classical and SOM controller

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