Abstract

Throughout the last years, computers have turned to be a part of everyday activity when designing structures. Nowadays, the main computational appliances focus on those fields with defined and known steering laws. Usually, a theoric model is needed in order to understand the problem and thus, achieve an optimum design.

In front of complicated phenomena, the attainment of a proper theoric model can become unapproachable. Artificial neuronal networks, a computational tool based upon artificial intelligence, rise as an alternative method. Learning from experience is the neuronal networks' main feature, therefore, the need of elaborating theoric models can be left out. Neuronal networks' internal structure seeks to emulate the human brain by setting processing units un layers highly interconnected. As a matter of fact, the adjustment of the connections between neurons allows the net to learn from known cases and to give answer to new ones.

Plate girders, which are a sort of structure very common in civil engineering and edification, are an example that shows the problems related to the design o f structures. Plate girders are used in certain situations of design, when large span lengths are involved or when it is needed to bear heavy loads. Under these circumstances, standard rolled beams are not strong enough or don't result profitable economically.

A big part of the difficulty of the carbon-steel plate girders' design lies on the determination of the ultimate shear strength. So high is the slenderness of the web panel of the girder, that it becomes unstable and buckles at small loads. Due to the non-linearity of the post-critical behaviour of the plate girder after buckling, it is usually difficult to obtain a suitable design code. Within these conditions, artificial neuronal networks' characteristics fit the best.

A neuronal network has been trained by means of a compilation of experimental tests with plate girders in order to determinate their ultimate shear strength. Results obtained have been compared with the three design methods available in Eurocode 3. This comparative analysis reveals that neuronal networks area very accurate tool which doesn't depend on the main variables of design. Furthermore, a set of corrections have been proposed so as to improve the neuronal network's response.