The « alpine » function

This function is defined by

$$z = f(x_1,\ldots,x_D) = \sin(x_1)\ldots\sin(x_D)\sqrt{x_1\ldots x_D},\ (x_1,\ldots,x_D)\quad [0,x_{max}]^D \qquad \textit{Equ. 1}$$

In dimension two and on $[0,10]^2$ it gives the Figure 1. With a lot of imagination, you can almost recognize the French Côte d'Azur on the south and the Mont Blanc as the highest summit. This function is interesting for testing the search of an extremum for the following reasons:

- there are as many local extrema we want, just by increasing x_{max},
- there is just one global extrema,
- the solution can easily be directly computed.

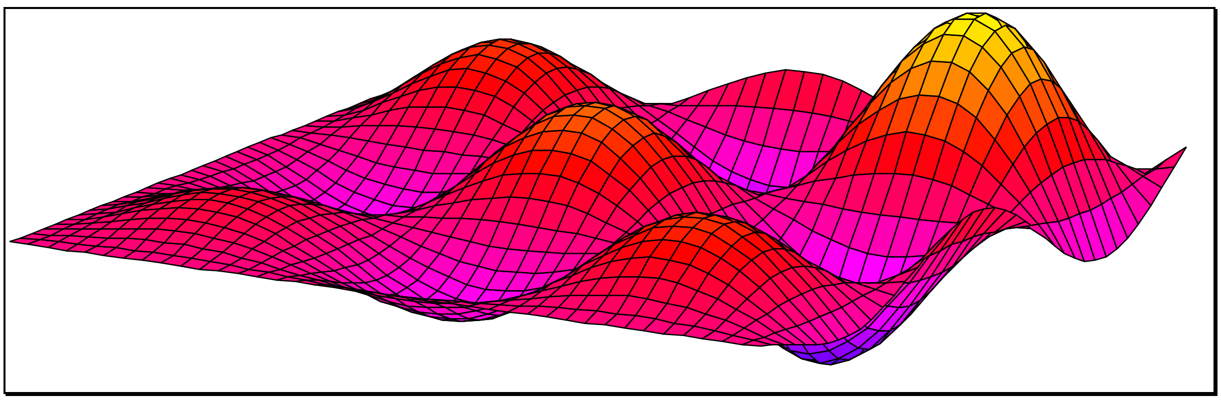

Figure 1. The 2D alpine function.

In any dimension D, in the hypercube $[0,10]^D$, the maximum is at the point $(x_s,x_s,\ldots,x_s)\quad[0,1]^D$ where x_s is the solution of

$$\tan(x)+2x=0,\ x\quad \left]\frac{5\pi}{2},\frac{6\pi}{2}\right[\qquad \textit{Equ. 2}$$

that is to say the point $(7.917,\ldots,7.917)$. The maximal value is then about 2.808^D.