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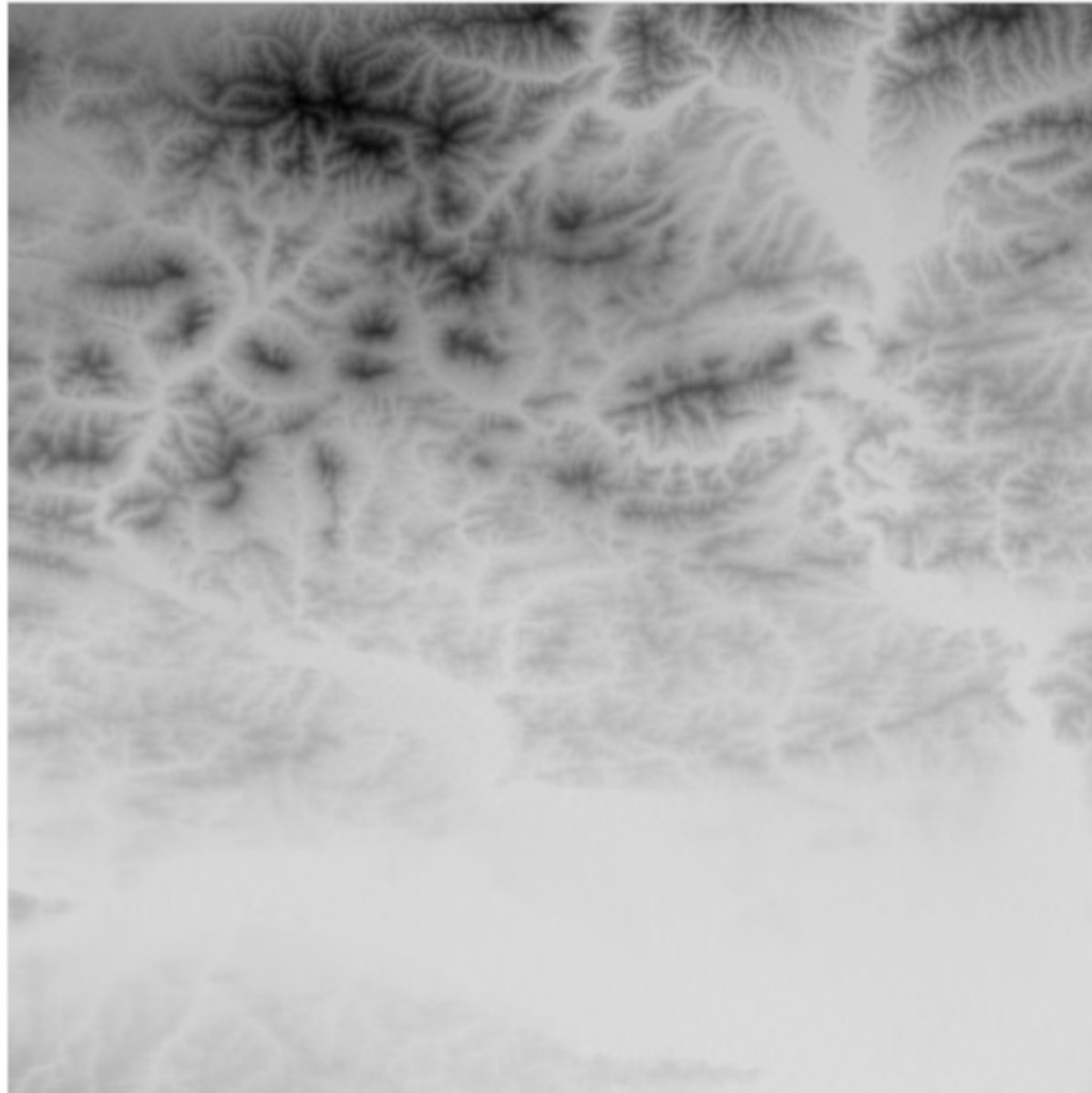
Exemplary problem of two-dimensional bitmap projection **Brak plików do pobrania.**

In this chapter, we will look at an example projection problem that we will use to build the intuition underlying the finite element method.

PRZYKŁAD

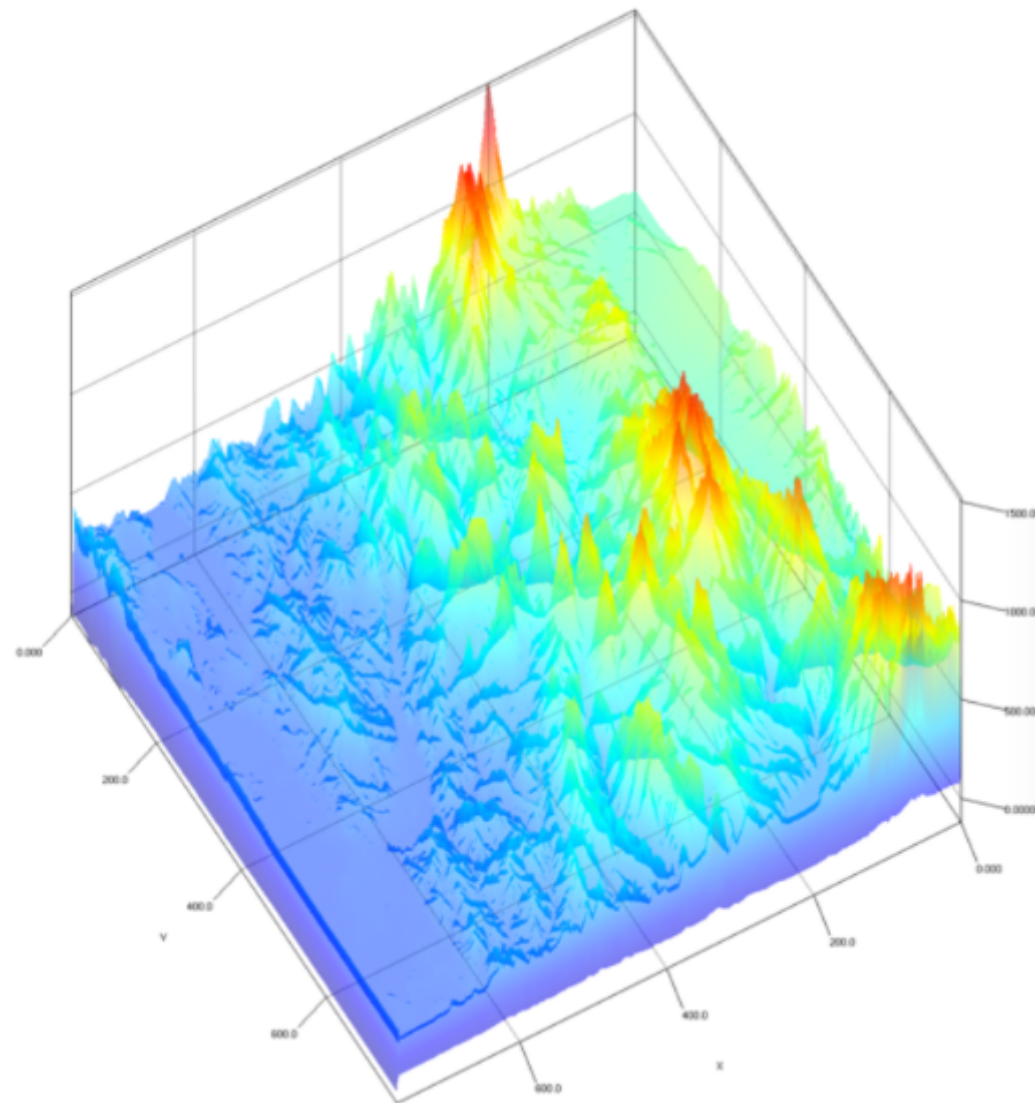
Przykład 1: The bitmap projection problem

Let's imagine we got a two-dimensional bitmap like `naAutomatic#fig2:1?`. This bitmap represents a satellite image of the topography. The bitmap is monochrome, each pixel of the bitmap has an integer value ranging from 0 to 255. A pixel value of 0, represented in the figure by black pixels, indicates the parts of the terrain with the highest average height. These are places located on the tops of the mountains. In turn, the pixel value equal to 255, represented in the drawing by white pixels, means the parts of the area whose average height is the lowest. These are places located in the valleys of the mountains.



Rysunek 1: Dwuwymiarowa bitmapa reprezentująca ukształtowanie terenu. Intensywność każdego piksela waha się pomiędzy wartościami 0 a 255. Wartość 0 (kolor czarny) teren o najwyższej wysokości (szczyt góry), wartość 255 (kolor biały) oznacza teren o najniższej wysokości (najniższy punkt w dolinie).

Now let's look at the computer representation of the terrain described by such a bitmap. Our area has been divided into square areas represented by individual pixels. The only information we have for each such fragment of the area is its average height corresponding to the height represented by the pixel intensity. If reality were like our bitmap, then we would have to jump from one square flat platform to another square flat platform, and their heights would vary from 0 to 255, in certain units resulting from the difference between the minimum and maximum topography.





Rysunek 2: Ciągła aproksymacja terenu na podstawie bitmapy przedstawiającej mapę ukształtowania terenu. Teraz, dla lepszej ilustracji, najwyższe fragmenty terenu zaznaczone zostały kolorem czerwonym, a najniższe fragmenty terenu zaznaczone zostały kolorem ciemnoniebieskim.

Let's imagine now that we want to drag our computer representation of the terrain. We want the heights to change continuously, as if our universe were made of slender plastic. Of course, such a representation of the terrain will be closer to reality, but still only an approximation. We want to make a "plastic" cast of our area as shown in [Rys. 2](#). Our model is no longer a bitmap containing flat pixels, but rather a slim plastic cast of reality on which you can slide from one place to another.

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