Dérivées numériques d'ordre 1 – Formule de différences finies centrée (2)

Introduction à l'analyse numérique

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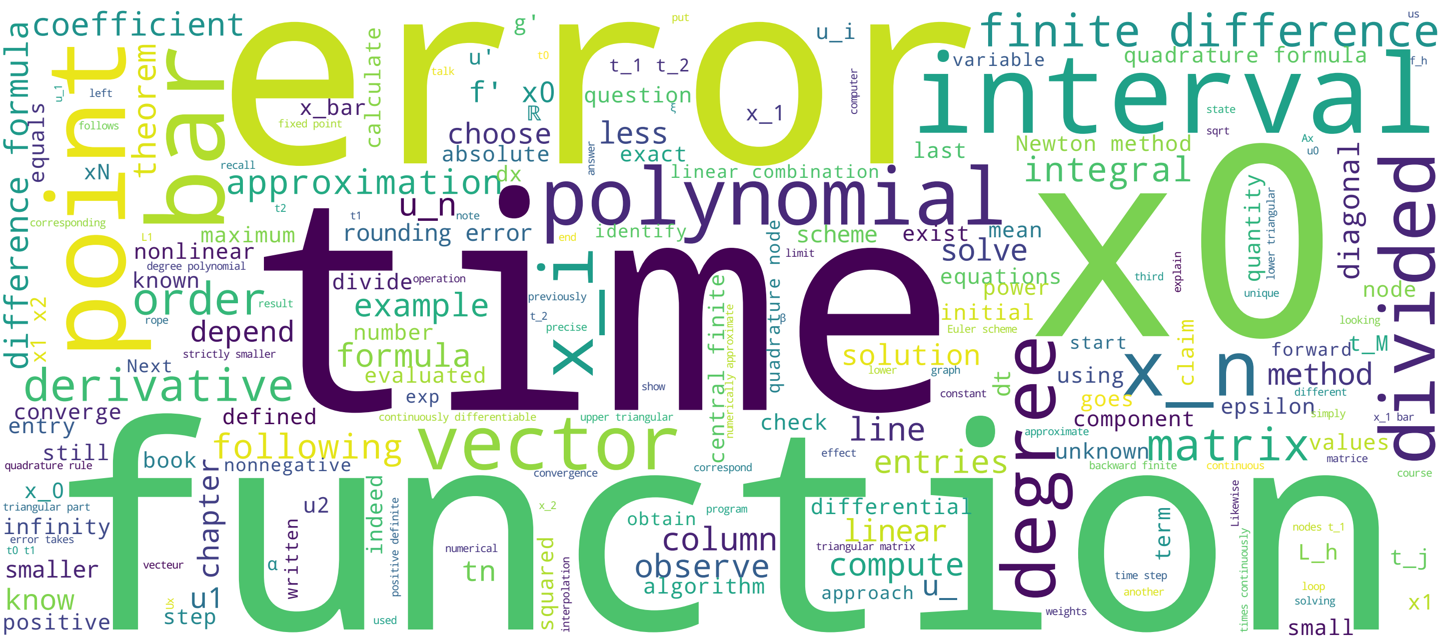
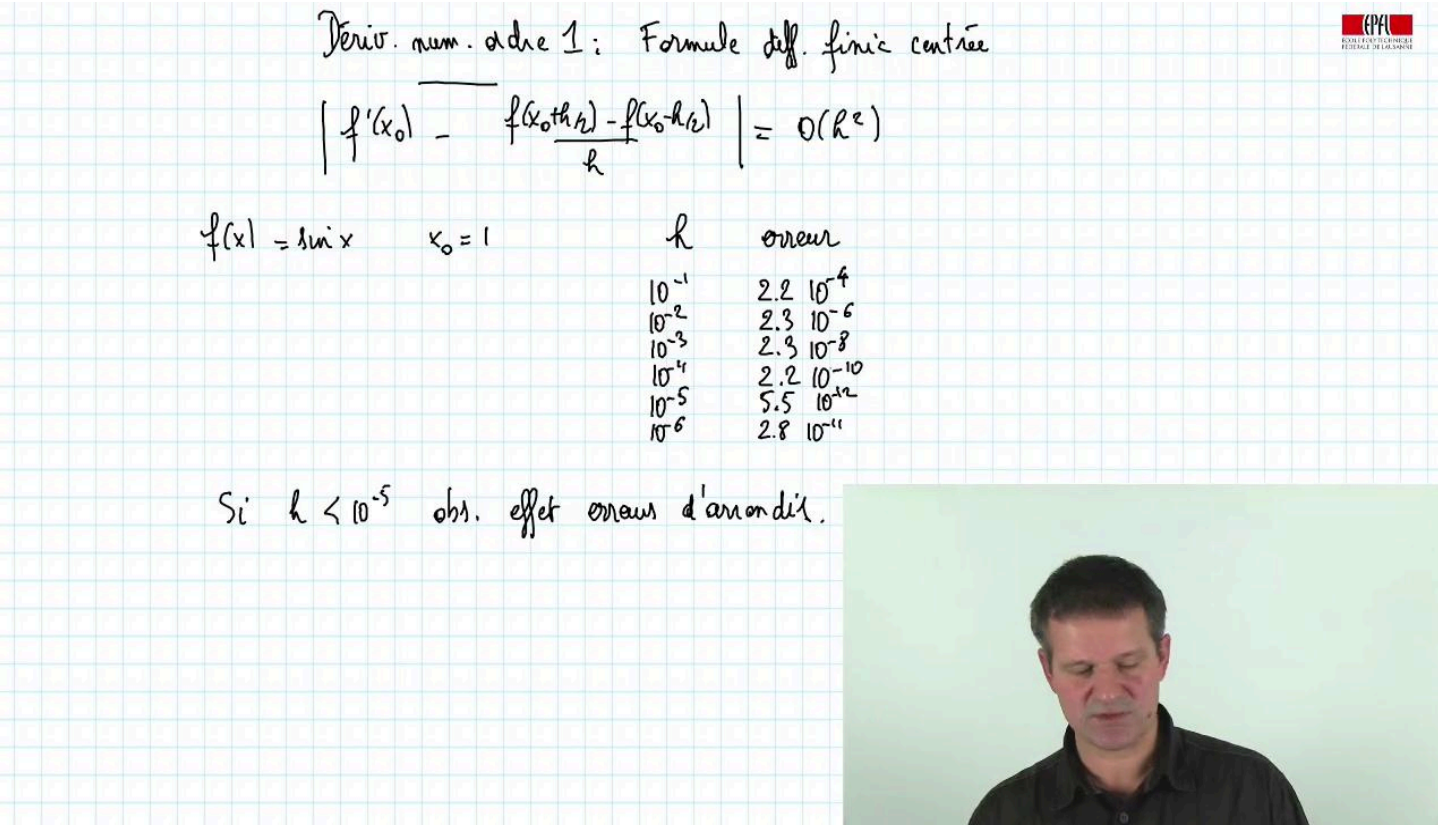


Video



We'll now check the central finite difference formula is indeed of order 2 in h So the error between f'(x0) and its approximation by a central finite difference formula is in h squared So choose a function f, for example sin(x) Choose a point x0, for example x0=1 And we can use a program that computes the error for a given h that is the difference between f'(x0) and its approximation by the central finite difference formula So for h = 10^(-1), observe an error of 2.2*10^(-4) So the formula is a lot more precise than the forward and backward finite difference formulaes We expected it, because the error is in h² instead of h For h=10^(-2) so when h is divided by 10 then the error is approximatively divided by 100. For h=10^(-3) the error is divided by 100 again Likewise for 10^(-4). For 10^(-5), the error isn't divided by 100 but less and for 10^(-6) the error increases what we observe here is that the truncation error takes over when h is relatively small this is still the truncation in Taylor's formula. And if h is very small, the rounding error takes over. So if h is less than 10^(-5) observe the effect or rounding errors. We'll now try to explain where those rounding errors come from.

Notes

Summary

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