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**On the convergence of a method analogous to method of tangent hyperbolas in Fréchet spaces.** (English) Zbl 0752.65048

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For the solution of the operator equation $P(x)=0$ in a Fréchet space, a method analogous to the method of tangent hyperbolas is presented, where $P:X\to X$ is a nonlinear continuous mapping and $X$ is a Fréchet space with given quasinorm. The operator $P$ has the form $P(x)=x-F(x)$, and the iterative scheme of the method is given by $x_{n+1}=x_n-\Lambda_n(I-[x_n,u_n,v_n;P]\tilde{\Lambda}_nP(u_n)\Lambda_n)^{-1}P(x_n)$ where $\Lambda_n=[x_n,u_n;P]^{-1}$ and $\tilde{\Lambda}_n=[u_n,v_n;P]^{-1}$ are the inverses of the divided differences of the first order of $P$, $[x_n,u_n,v_n;P]$ is the divided difference of the second order of $P$, $u_n=F(x_n)$, and $v_n=F(u_n)=F(F(x_n))$.

It is proved under mild conditions that the operator equation has a unique solution $x^*$ in a proper neighbourhood of the given initial point, and that the sequence generated by the method converges to $x^*$.

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**MSC:**

65J15 Numerical solutions to equations with nonlinear operators
47J25 Iterative procedures involving nonlinear operators

**Keywords:**

convergence; iterative method; Fréchet space; method of tangent hyperbolas; divided difference; nonlinear operator equation