

A Subspace Acceleration Method for Fixed Point Iterations

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Modified Newton Methods: An Aside

Newton's method for $f(x) = 0$, $f: \mathbb{R}^m \rightarrow \mathbb{R}^m$:

x_0 given

for $n = 0, 1, 2, \dots, r$

Accelerated FP Correction: Motivation

Rewrite our iteration as

```
 $x_0$  given  
for  $n = 0, 1, 2, \dots$  do  
     $v_{n+1} = f(x_n)$  (Correction)  
     $x_{n+1} = x_n - v_{n+1}$   
end for
```

If we are free to choose v_{n+1} , how would we choose it?
Perhaps as the solution of

$$0 = f(x_n - v_{n+1}) \approx f(x_n) - Df(x_n) v_{n+1}.$$

FP iteration: Don't know $Df(x_n)$, so just approximate it by I .

But if Df is constant, we

The Accelerated FP Correction

To generate the correction v_{n+1} we have available:

The Accelerated FP Iteration