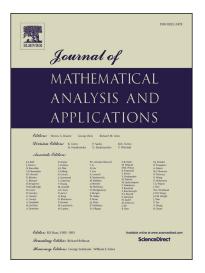
## Accepted Manuscript

Local convergence analysis of Newton's method for solving strongly regular generalized equations

O.P. Ferreira, G.N. Silva



 PII:
 S0022-247X(17)30852-1

 DOI:
 http://dx.doi.org/10.1016/j.jmaa.2017.09.023

 Reference:
 YJMAA 21691

To appear in: Journal of Mathematical Analysis and Applications

Received date: 26 September 2016

Please cite this article in press as: O.P. Ferreira, G.N. Silva, Local convergence analysis of Newton's method for solving strongly regular generalized equations, *J. Math. Anal. Appl.* (2018), http://dx.doi.org/10.1016/j.jmaa.2017.09.023

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

### ACCEPTED MANUSCRIPT

# Local convergence analysis of Newton's method for solving strongly regular generalized equations

O. P. Ferreira<sup>\*</sup> G. N. Silva<sup>†</sup>

July 11, 2017

#### Abstract

In this paper, we consider Newton's method for solving a generalized equation of the form  $f(x) + F(x) \ni 0$ , where  $f : \Omega \to Y$  is continuously differentiable, X and Y are Banach spaces,  $\Omega \subset X$  is open, and  $F : X \rightrightarrows Y$  has a nonempty closed graph. We show that, under strong regularity of the equation, the method is locally convergent to a solution with super-linear/quadratic rate. Our analysis, which is based on general majorant condition, enables us to obtain a convergence result under the Lipschitz, Smale's, and Nesterov-Nemirovskii's self-concordant conditions.

Keywords: Generalized equation, Newton's method, strong regularity, majorant condition. Mathematical Subject Classification (2010): Primary 65K15; 49M15; 90C31

#### 1 Introduction

In this paper, we consider Newton's method for solving a generalized equation of the form

$$f(x) + F(x) \ni 0,\tag{1}$$

where  $f: \Omega \to Y$  is a continuously differentiable function, X and Y are Banach spaces,  $\Omega \subset X$ is an open set and  $F: X \Rightarrow Y$  is a set-valued mapping with a closed nonempty graph. As is well-known, (1) is an abstract model for a wide range of problems in mathematical programming, and therefore, it has been studied in several works having [3, 4, 11, 15, 16, 17, 25, 26, 27, 28, 35] as part of a whole. For instance, if Y is the dual  $X^*$  of X and F is the normal cone mapping  $N_C$  of a closed convex set  $C \subset X$ , then (1) is called variational inequality for f and C; for more details, see [1, 3, 15].

Newton's method is undoubtedly one of the most popular methods for numerically solving nonlinear equations due to its property of quadratic convergence. Over the years, this method has been extended in many directions by several authors; one of the most studied currently is its generalization to solve (1), which has its origin in the works of N. H. Josephy [26]. Following the idea of [26], we study local convergence of the following Newton's method for solving (1): For an initial point  $x_0$ , define

$$f(x_k) + f'(x_k)(x_{k+1} - x_k) + F(x_{k+1}) \ge 0, \qquad k = 0, 1, \dots$$
(2)

<sup>\*</sup>IME/UFG, CP-131, CEP 74001-970 - Goiânia, GO, Brazil (Email: orizon@ufg.br). The author was supported in part by FAPEG, CNPq Grants 305158/2014-7 and PRONEX?Optimization (FAPERJ/CNPq).

<sup>&</sup>lt;sup>†</sup>CCET/UFOB, CEP 47808-021 - Barreiras, BA, Brazil (Email: gilson.silva@ufob.edu.br). The author was supported in part by CAPES.

Download English Version:

https://daneshyari.com/en/article/8900326

Download Persian Version:

https://daneshyari.com/article/8900326

Daneshyari.com