

## Impasse Bifurcations of Constrained Systems

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**Abstract.** In this paper are studied the generic bifurcations of families of constrained  $C^r$  differential systems of the form

$$\begin{aligned} a(x, y, \lambda)x' + b(x, y, \lambda)y' &= f(x, y, \lambda), \\ c(x, y, \lambda)x' + d(x, y, \lambda)y' &= g(x, y, \lambda), \end{aligned}$$

where  $(x, y)$  are plane phase variables and  $\lambda$  is a real parameter. The analysis is located around the *impasse surface*, defined by  $ad - bc = 0$ , where constrained systems differ from ordinary differential equations

### 1 Introduction

This paper is concerned with study of the bifurcations of one-parameter families of planar differential systems of the form

$$\begin{aligned} a(x, y, \lambda)x' + b(x, y, \lambda)y' &= f(x, y, \lambda), \\ c(x, y, \lambda)x' + d(x, y, \lambda)y' &= g(x, y, \lambda), \end{aligned} \tag{1.1}$$

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