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What is This?
Trends in the drawing of mechanisms since the early Middle Ages

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Abstract: Drawing of mechanisms is a fundamental tool for mechanical design and representation. In this paper a historical study on the evolution of representation of mechanisms has been carried out in order to establish the historic background and identify the progress over time. Investigating several authors has identified basic changes in the evolution of mechanism drawing, and a few examples are reported in this paper to stress the main concepts. The drawing of mechanisms has evolved from an intentionally incomplete representation to a naturalistic and pictorial view, then from concise sketches and kinematic diagrams to modern abstract graphic pictures. The development of mechanism drawing has been strongly linked with and affected by the evolution of knowledge in mechanical sciences and particularly mechanism design.

Keywords: history of mechanical engineering, history of drawing, theory of mechanisms, kinematics, drawing of mechanisms

1 INTRODUCTION

The development of mechanical science has been based on the evolution of the technical means, which have been used both for enhancing knowledge and formulating better procedures and criteria for design activity. One of the fundamental means is the drawing technique. In fact, since the beginning of a technical culture, great attention has been paid to the drawing of the mechanical characteristics of machines and mechanisms by inventors, constructors, designers, scholars and academicians. This is because most concepts and design calculations have been and can be developed and formulated on the basis of the drawings of machines and mechanisms. Indeed, over time, different levels of modelling and several kinds of sketch have been developed for mechanism design or to enhance the knowledge on the properties of rigid-body motion. Moreover, the development of drawing as an expressive language has required a standardization and universal acceptance of the formalisms and representations.

In this paper a historical overview of the evolution of technical representations of mechanisms is presented by using some representative drawings in order to point out the basic developments in the drawing of mechanisms through the study of a few significant authors. Preliminary studies have been useful in focusing interest on this obscure activity of designers, and first observations have been reported in a previous paper [1]. The novel contribution of this paper is an attempt to explain the evolution of mechanism drawing from an intentionally incomplete representation to a naturalistic and pictorial view, then from concise sketches and kinematic diagrams to modern abstract graphic pictures. The peculiarity is that the drawing of mechanisms evolved very slowly, with a combination and mixture of different approaches. Moreover, over time, some authors used old representations or innovative schemes much before they were actually used.

Indeed, the specific literature on mechanical design and the theory of mechanisms has grown considerably in the last two centuries, so that in this paper the references and the authors have been limited to only a few examples. However, the reported examples can be thought of as illustrative and significant for the state of the art on the topic of this paper. In fact, this report has been developed in order to give a historical insight into the evolution of the obscure activity of mechanism drawing, which is nevertheless fundamental for mechanical design. Another goal of this paper is to sti-
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Fig. 32 Current drawings of a mechanism published in [66] in 1993: (a) kinematic chain representation; (b) graph representation.