'ramāṇa – J. Phys., Vol. 28, No. 6, June 1987, pp. 645–651. © Printed in India.

;alculation of geometrical coupling coefficients for the hyperspherical ıarmonics approach

TAPAN K DAS and TUSHAR BARAN DE
Physics Department, University of Burdwan, Burdwan 713 104, India

MS received 4 February 1987

Abstract. An elegant and fast method for the calculation of geometrical structure coefficients needed for an expansion of a few-body wavefunction and interaction in hyperspherical harmonics has been proposed. A sum rule for the GSC has also been derived, which is useful for an independent check of the coefficients. The proposed method of computation is many orders of magnitude faster than conventional methods.

Keywords. Nuclear structure; few-body problem; hyperspherical harmonics method; geometrical structure coefficients.

PACS Nos 02·30; 21·40; 02·70

Introduction

n exact solution of the few-body Schrödinger equation is of great interest in many :anches of physics. Apart from the inherent interest in the precise structure and ıysics of few-body systems, such systems are very good testing grounds for few-ırticle interactions as well as for approximation methods. For exact calculations of ıe few body systems the methods of Faddeev (Faddeev 1960; Schmid and Ziegelmann ›74) or Yakubowski (1967) equations and hyperspherical harmonics (Ballot and ıbre 1980; Simonov 1966, 1972) (also called K harmonics) have been widely used. mong these a particularly powerful method is the hyperspherical harmonics :pansion (HHE) method, which has been extensively used to investigate trinucleons ;rens *et al* 1971; Demin *et al* 1973; Ballot and Navarro 1975; Das *et al* 1982; Das and ɔelho 1982; Coelho *et al* 1983) as well as other three- and four-body problems 'allieres *et al* 1976a, b; Ballot *et al* 1972). The hyperspherical harmonics (HH) are the ultidimensional analog of the ordinary spherical harmonics, which are used as a ımplete basis set for expansion of the hyperangular part of the few-body space wave nction. The HHE method (Ballot and Fabre 1980) deals directly with wave function configuration space and this provides a clear insight into the physics of the problem. clusion of long-range, hard-core or many-body (Erens *et al* 1971; Demin *et al* 1973; ıllot and Navarro 1975; Das and Coelho 1982; Das *et al* 1982; Coelho *et al* 1983; ıbre 1979) interactions is straightforward in this method and the structure of the uations in the HHE method remains unaltered due to the inclusion of such teractions.

In the standard HHE approach (Ballot and Fabre 1980) both the space wavefunction d the interaction potential are expanded in terms of suitable HH basis. Substitution