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COMMENT

The graph partitioning and the spin glass—comments on papers by Sherrington and his group

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Abstract. The recent theory of graph partitioning proposed by Sherrington and his group used the integral equation to determine the field distribution. This integral equation and its solution are pointed out to be the same as those used by Katsura and co-workers for spin glasses.

Recently Sherrington and his group (Sherrington and Wong 1987 (hereafter referred to as SW), Wong and Sherrington 1987 (hereafter referred to as WS), Wong *et al* 1988 (hereafter referred to as WSMDD) related the theory of graph partitioning to that of spin glasses. They treated the first problem in terms of an integral equation for the field distribution. Their integral equation is identical to the one which our group used in treating the spin glass. In fact, equation (1) of WS (equation (4) of WSMDD) is the same as (2.17) in Katsura and Fujiki (1979, hereafter referred to as KF) and as (3.5) in Katsura *et al* (1979, hereafter referred to as KIF). The form in WSMDD equation (12) is given as (9) in Morita (1979) and (2.5) in Inawashiro and Katsura (1980, hereafter referred to as IK). The total field equation (WS equation (2)) is included in IK equation (2.6) and in equation (12) of Katsura (1980). These equations were also solved by our group. The integral multiple solution for $c=3$ and 4 were given in (8.4) of KIF (see also Katsura (1980, p 337)) and those for $c=5$ and 6 in the appendix of IK: $E=(\frac{23}{27})\times(\frac{3}{2})$, $(\frac{3}{4})\times(\frac{4}{2})$, $0.676\,531\,626\times(\frac{5}{2})$, $(\frac{5}{6})\times(\frac{6}{2})$ for $c=3, 4, 5, 6$ respectively (cf table 1 of WSMDD). The integral multiple solution for M larger than 1 was found by Inawashiro (unpublished) and the method and results for $M=1, 2, 3$ and 4 are given by Katsura *et al* (1987): $E=(\frac{23}{27}, 0.850\,426, 0.850\,139, 0.849\,979)\times(\frac{3}{2})$, respectively (cf table 2 of WSMDD). The continuous solution for $c=3$ was given by Morita (1984) numerically (the energy was 1.276, an unpublished result) and by Katsura (1986, 1987) analytically:

$$f(\xi)=0.106\,83\delta(\xi)+0.218\,43[\delta(\xi-1)+\delta(\xi+1)]+0.228\,16+0.057\,59(3\xi^2-1)/4$$

(cf table 2 of WSMDD). It is also to be noted that many parts of Bowman and Levin (1982) are covered in our papers cited above and the Thorpe (1982) recurrence equation (SW equation (3)) is given in equation (2.7) in KF.

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