Acta Mathematica Sinica, English Series   2007 23 (4): 577-598   ISSN: 0583-1431   CN: 11-1914/R

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收稿日期 2006-1-26 修回日期   网络版发布日期 2007-3-5 接受日期 2006-12-21

摘要

关键词 Lorentz spin group representation Yang--Mills equation

分类号 15A66

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A Representation of the Lorentz Spin Group and its Application

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Abstract For an integer $m \geq 4$, we define a set of $ 2^{[\frac m2]}\times 2^{[\frac m2]}$ matrices $\gamma_j(m), (j=0,1,\ldots,m-1)$ which satisfy $ \gamma_j(m)\gamma_k(m)+\gamma_k(m)\gamma_j(m)=2\eta_{jk}(m)\mbox{I}_{[\frac m2]}, $ where $\big(\eta_{jk}(m)\big)_{0\leq j,k\leq m-1}$ is a diagonal matrix, the first diagonal element of which is 1 and the others are -1, $\mbox{I}_{[\frac m2]}$ is a $ 2^{[\frac m2]}\times 2^{[\frac m2]}$ identity matrix with $[\textstyle\frac m2]$ being the integer part of $\textstyle\frac m2$. For $m=4$ and 5, the representation ${\mf H(m)}$ of the Lorentz Spin group is known. For $m\geq 6$, we prove that $({\mbox {i}})$ when $m=2n, (n\geq 3)$, ${\mf H}(m)$ is the group generated by the set of matrices \bd \Bigg \{ \mbox{T} \Bigg|\mbox{T}=\frac 1{\sqrt{\xi}} \left(\ba{cc}\mbox I +K&0\0&\mbox I -K\ea\right) \left(\ba{cc}U&0\ 0&U\ea\right), \ed\bd\qquad\qquad\qquad\qquad\qquadU\in {\mf H}(m-1),\quad K=\sum_{j=0}^{m-2}a^j\gamma_j(m-1), \quad \xi=1-\sum_{k,j=0}^{m-2}\eta_{kj}a^ka^j>0 \Bigg\}; \ed %and $({\mbox {ii}})$ when $m=2n+1\ (n\geq 3)$, ${\mf H}(m)$ is generated by the set of matrices \bd \hspace{-5mm}\Bigg \{ \mbox{T} \Bigg|\mbox{T}=\frac 1{\sqrt{\xi}} \left(\ba{cc}\mbox I&K\-K^-&\mbox I\ea\right) U, U\in {\mathfrak H}(m-1),\quad \xi=1-\sum_{k,j=0}^{m-2}\eta_{kj}a^ka^j>0, \ed\bd K={\rm i}\bigg[\sum_{j=0}^{m-3}a^j\gamma_j(m-2)+a^{m-2}\mbox{I}_n\bigg], \quad K^-={\rm i}\bigg[\sum_{j=0}^{m-3}a^j\gamma_j(m-2)-a^{m-2}\mbox{I}_n\bigg] \Bigg\}. \ed

Key words Lorentz spin group representation Yang--Mills equation

DOI: 10.1007/s10114-007-0930-z

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