Three-particle hyper-spherical harmonics and quark bound states

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We construct the three-body permutation symmetric hyperspherical harmonics based on the subgroup chain $S_3 \otimes \mathrm{SO}(3)_{\mathrm{rot}} \subset \mathrm{O}(2) \otimes \mathrm{SO}(3)_{\mathrm{rot}} \subset \mathrm{O}(6)$ (and the subalgebra chain $\mathrm{u}(1) \otimes \mathrm{so}(3)_{\mathrm{rot}} \subset \mathrm{u}(3) \subset \mathrm{so}(6)$). These hyperspherical harmonics represent a natural basis for solving non-relativistic three-body Schrödinger equation in three spatial dimensions. In particular, we apply the calculated three-particle harmonics to the three-quark bound state problem. We consider confining Δ- and Y-string three-quark effective potentials, and then calculate the spectrum of low-lying ($K \leq 5$) bound states.