Euclidean dynamical symmetry in nuclear shape phase transition

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A novel algebraic model with Euclidean dynamical symmetry in five dimension, called $F(5)$, is proposed. It is shown that the Euclidean dynamical symmetry arises naturally at the critical point of the $U(5)$-$SO(6)$ transition in the interacting boson model. More importantly, structural evolution from the $E(5)$ to $X(5)$ critical point symmetry is realized in the model with a nonlinear projection, which thus provides a unified symmetry-based way to describe shape phase transition occurring around the critical line connecting the $U(5)$-$SO(6)$ and the $U(5)$-$SU(3)$ critical points.