RECOGNITION AND CLASSIFICATION FOR $O(N)$-EQUIVALENT BIFURCATIONS WITH $O(N)$-CODIMENSION LESS THAN OR EQUAL TO 5

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Abstract. In this paper we investigate the equivalent singularity theory of bifurcation problem under the standard action of the orthogonal group $O(n)$. The $O(n)$-codimension which is less than or equal to 5 is classified into 27 classes. For each class the normal form and one universal unfolding are calculated and the recognition problems are solved.

Keywords. $O(n)$-codimension, equivalent singularity theory, normal form, universal unfolding, recognition condition.

1   Introduction

Equivalent singularity theory is an important tool for the study of local bifurcation with symmetry and its main topics include normal form (the simplest possible forms), universal unfolding (a comprehensive way to understand the degeneracy and the complexity of the bifurcation problem) and recognition problem (finding conditions for determining a singularity to be equivalent to the normal form).

   M. Golubitsky and D. G. Schaeffer have already given the ordinary (asymmetric) equivalent singularity theory in [1]-[2]. The equivalent bifurcation problem with Z_2-codimension less than or equal to 3 are considered by Golubitsky and Langford in [1]. In [1]-[4], the complete discussion was given which include the classification, universal unfolding problem and recognition problem. Similarly, the discussion for the case with Z_2-codimension which is equal to 4 was extended in [5] by Shi. The $O(n)$-equivalent bifurcation problem with codimension less than or equal to 4 were resolved by Wang, etc. in [6]. They also prove that the system of $O(n)$-equivalent singularities