For a smooth algebraic affine variety \( X^n \) the topology of generic polynomial mappings \( F : X \to \mathbb{C}^m \) with bounded degrees of its components (by \( d_1, \ldots, d_m \)) is studied. The space of all such mappings is denoted by \( \Omega_X(d_1, \ldots, d_m) \). Each element \( F \in \Omega_X(d_1, \ldots, d_m) \) generates the mapping \( j^q(F) \) (defined by \( x \mapsto (x, F(x), (\partial^q F(x))_{1 \leq |\alpha| \leq q}) \) in local coordinates) of \( X \) into the space of \( q \)-jets \( J^q(X, \mathbb{C}^m) \), and similarly the mapping \( j^{q_1, \ldots, q_r}(F) \) of \( X \) into the space of multi-jets \( J^{q_1, \ldots, q_r}(X, \mathbb{C}^m) \). One of general theorems (for arbitrary \( n \) and \( m \)) is that a generic element of \( \Omega_X(d_1, \ldots, d_m) \), treated as the above mapping, is transversal to any algebraic modular submanifold of the space of multi-jets \( J^{q_1, \ldots, q_r}(X, \mathbb{C}^m) \). An effective result is that a generic element of \( \Omega_X(d_1, \ldots, d_m) \) is transversal to any smooth (locally closed) algebraic subvariety if \( d_i \geq \sum_{j=1}^m q_j + r - 1, \ i = 1, \ldots, m \). More specific results are given in particular cases \( X = \mathbb{C}^2 \) or \( X = \{ x^2 + y^2 + z^2 = 1 \} \subset \mathbb{C}^3 \) and \( m = 2 \). The authors prove that a generic element \( \Omega_X(d_1, d_2) \) has only cusps, folds and double folds as singularities and compute the numbers of these singularities. Moreover, they describe the topology of the set of critical points \( C(F) \) of generic \( F \) and the topology of the discriminant \( \Delta(F) \) of \( F \).

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