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GENERALIZATION OF THE SYMMETRICITY PROPERTIES OF POLYNOMIALS DEFINING DISTINGUISHED VARIETIES ON THE OPEN UNIT BIDISK

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Let $\mathbb{D}$ be the open unit disk, $\mathbb{T}$ be the unit circle, and $\mathbb{E}$ be the exterior of the closed unit disk in $\mathbb{C}$. A polynomial $p(z,w)$ is said to define a distinguished variety on $\mathbb{D}^2$, if $Z(p) = \{\, (z,w) \in \mathbb{C}^2 : p(z,w) = 0 \,\} \subseteq \mathbb{D}^2 \cup \mathbb{T}^2 \cup \mathbb{E}^2$. For such polynomials, the zero set $Z(p)$ inside $\mathbb{D}^2$ is called a distinguished variety on $\mathbb{D}^2$. For a polynomial $p(z,w)$ with two variables having bidegree (n,m), the reflection is defined by $\tilde{p}(z,w) = z^n w^m \overline{p\left(\frac{1}{\bar{z}}, \frac{1}{\bar{w}}\right)}$. A polynomial $p \in \mathbb{C}[z,w]$ is essentially $\mathbb{T}^2$ −symmetric if $p(z,w) = c\tilde{p}(z,w)$ for some $c \in \mathbb{T}$. In 2010, Greg Knese introduced the concept of symmetricity for polynomials defining distinguished varieties on $\mathbb{D}^2$ and has shown that a polynomial p defining a distinguished variety on $\mathbb{D}^2$ is essentially $\mathbb{T}^2$ −symmetric. In this study, this concept of symmetricity is generalized for polynomials defining distinguished varieties on open unit polydisk $\mathbb{D}^n$, by considering polynomials with n variables. A polynomial $p(z_1, z_2, \dots, z_n)$ is said to define a distinguished variety on $\mathbb{D}^n$, if $Z(p) = \{\, (z_1, z_2, \dots, z_n) \in \mathbb{C}^n : p(z_1, z_2, \dots, z_n) = 0 \,\} \subseteq \mathbb{D}^n \cup \mathbb{T}^n \cup \mathbb{E}^n$. For such polynomials, the zero set $Z(p)$ inside $\mathbb{D}^n$ is called a distinguished variety on $\mathbb{D}^n$. For a polynomial $p(z_1, z_2, \dots, z_n)$ with n variables having degree $(m_1, m_2, \dots, m_n)$, the reflection is introduced by $\tilde{p}(z_1, z_2, \dots, z_n) = z_1^{m_1} z_2^{m_2} \dots z_n^{m_n} \overline{p\left(\frac{1}{\bar{z}_1}, \frac{1}{\bar{z}_2}, \dots, \frac{1}{\bar{z}_n}\right)}$. We defined a polynomial $p \in \mathbb{C}[z_1, z_2, \dots, z_n]$ to be essentially $\mathbb{T}^n$ −symmetric if $p(z_1, z_2, \dots, z_n) = c\tilde{p}(z_1, z_2, \dots, z_n)$ for some $c \in \mathbb{T}$. This study proves that a polynomial p defining a distinguished variety on $\mathbb{D}^n$ is essentially $\mathbb{T}^n$ −symmetric for any $2 \leq n < \infty$. Future studies can focus on proving properties that already exist for two variable polynomials in the case of polynomials with n variables.

Keywords: Distinguished varieties, Inner toral polynomials, Symmetricity