

Young Mathematicians Conference 2018
The Ohio State University, August 10-12

THE NUMERICAL RANGE OF A COMPOSITION OPERATOR ON THE HARDY
SPACE ON THE UNIT BALL

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[Mentor: John Clifford]

Abstract of Report Talk: For a bounded operator T on a Hilbert Space \mathbb{H} , the numerical range of T is the subset $W(T)$ of \mathbb{C} given by $W(T) = \{ \langle Tx, x \rangle : \|x\| = 1 \}$. We study the numerical range of the composition operator, C_A , on the Hardy space $H^2(\mathbb{B}_n)$ where A is an $n \times n$ matrix that is a self-map of the unit ball. We show the set of homogeneous holomorphic polynomials of degree k is a reducing subspace for C_A ; it follows that $W(A) \subseteq W(C_A)$. In the special case where A is a weighted shift, $W(C_A) = \text{convex hull}(W(A) \cup \{1\})$. We completely characterize the numerical range of the operator when A is unitarily similar to a Jordan-normal form that maps the ball to the ball by decomposing our operator into the direct sum of shifts and normal operators.

[Joint work with Julia Balukonis, Fatme Hourani]

Received: July 18, 2018