1109-37-219 **Nandor J Simanyi*** (simanyi@uab.edu), UAB Department of Mathematics, Campbell Hall, 1300 University Boulevard, Birmingham, AL 35294-1170, and **Caleb C Moxley** (ccmoxley@uab.edu), UAB Department of Mathematics, Campbell Hall, 1300 University Boulevard, Birmingham, AL 35294-1170. *On homotopical rotation numbers.* Preliminary report.

In a billiards system in $\mathbb{R}^n/\mathbb{Z}^n \setminus \{\text{obstacles}\}$ one lifts the billiard orbit to the universal covering space $\mathbb{R}^n$ of $\mathbb{R}^n/\mathbb{Z}^n$, and takes the average displacement vector in $\mathbb{R}^n$ as the rotation vector of the considered orbit. For systems with one obstacle, the topological study of the arising rotation vectors and sets was carried out by A. Blokh, M. Misiurewicz and myself in 2006. The next step is to consider 2D billiards in a billiard table Q with highly non-commutative (hyperbolic) fundamental group $\pi_1(Q)$, and to lift the billiard orbits to the Cayley graph of the group $\pi_1(Q)$, and investigate the following: In what directions ω and at what speed s can the lifted path converge to a point on the infinite horizon of (the Cayley graph of) the group $\pi_1(Q)$? The ordered pair (ω, s) will be called the "homotopical rotation number" of the investigated orbit. Initial results for some 2D billiards were obtained by L. Goswick and myself in 2011. We present a research plan, joint with C. Moxley, on getting generalizations of those results for some higher-dimensional billiards with intriguing fundament groups $\pi_1(Q)$. (Received February 02, 2015)