

# On the extended 1-st Johnson homomorphism of the braid group

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**Abstract.** The braid group  $B_m$  of degree  $m$  is regarded as a mapping class group  $M(D_m)$  of the  $m$ -punctured disk  $D_m$ . There exists a natural surjective homomorphism from  $B_m$  to the symmetric group  $S_m$  of degree  $m$ , which is regarded as a homomorphism from  $M(D_m)$  to the automorphism group of the 1-st homology group  $H_1(D_m)$ . By using an analogy of the Johnson's theory for mapping class groups of compact oriented surfaces, we construct a homomorphism from  $B_m$  to a group extension of  $S_m$ . We call it the extended 1-st Johnson homomorphism of  $B_m$ . We also study a way to calculate the extended 1-st Johnson homomorphism by using braid diagrams. This is a joint work with Yusuke Kuno.