

**Brown, Morton**

**A new proof of Brouwer's lemma on translation arcs.** (English) Zbl 0551.57005  
Houston J. Math. 10, 35-41 (1984).

In 1912, *L. E. J. Brouwer* [Math. Ann. 72, 37-54 (1912)] began the study of fixed-point-free orientation-preserving homeomorphisms of the plane. In this paper, Brouwer presented a theorem known as the "plane translation theorem". Several authors have noted problems with Brouwer's proof of this theorem, and they give proofs of the fundamental starting point for the theory, the Brouwer lemma on translation arcs. A planar arc  $A$  from  $a$  to  $b$  is a translation arc for a homeomorphism  $h$  of  $\mathbb{R}^2$  if  $h(a) = b$  and if  $b$  is the only point of intersection of  $A$  and  $h(A)$ . Brouwer's Lemma states: Let  $f$  be a fixed-point-free orientation-preserving homeomorphism of  $\mathbb{R}^2$  and let  $A$  be a translation arc for  $f$ . Then for each integer  $n \geq 2$ ,  $f^n(A)$  and  $A$  are disjoint. - This paper gives another proof of Brouwer's lemma, using the Brouwer degree (index) and a notion of free equivalence, introduced in the paper.

Reviewer: [M.Marx](#)

**MSC:**

57N05 Topology of the Euclidean 2-space, 2-manifolds (MSC2010)  
57S30 Discontinuous groups of transformations  
54H20 Topological dynamics (MSC2010)

Cited in **22** Documents

**Keywords:**

fixed-point-free orientation-preserving homeomorphisms of the plane; translation arcs; Brouwer degree; free equivalence