# Nonwandering flows of some spaces

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**Abstract**

In this paper, Our effort is studying nonwandering flows, Planar flows, and their properties. We have shown that the set of periodic (noncritical) points is open. When $S$ is connected, such a flow has a simple characterization; namely, it is nonwandering. We have given conditions on some spaces by their flows that proves when a space is disconnected.

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## 1 Introduction

The theory of prolongation, introduced by T. Ura [1], has proven to be a rather useful apparatus in studying the structure of dynamical systems. In [2], the first author studied planar flows in which the positive prolongation of each point coincided with the closure of the positive semitrajectory through the point. Such flows were referred to as flows of characteristic $0^+$. Such flows were subsequently studied over more general phase spaces in [3], [4], [5], [6], and [7]. Knight [8] carried on a similar study for planar flows of characteristic 0; these are flows where the prolongation of each point coincides with the closure of the trajectory through the point. The structure of these flows turned out to be surprisingly simple. In this paper, we study nonwandering flows, planar flows and their properties. An interesting characterization, which is somewhat surprising, is that if the phase space is Hausdorff then the flow is nonwandering if and only if the positive prolongation of each point coincides with its negative prolongation.We have shown that the set of periodic (noncritical) points is open. When $S$ is connected, such a flow has a simple characterization; namely, it is nonwandering if and only if every point of $R^2 - S$ lies on a cycle surrounding $S$ ; then we prove that if $S$ is unbounded and the flow is nonwandering, $S$ is disconnected.

**Definition 1.1. Dynamic System(Continues Flow)**Let $X$ be a topological space and let $R$ denote the additive group of real num- bers with the usual topology. The pair $(X, \pi)$ is called a dynamical system or a continuous flow if $\pi : X \times R \to X$ is a continuous mapping such that for each $x \in X$ and $s, t \in R$ , $\pi(x, 0) = x$ and $\pi(\pi(x, s), t) = \pi(x, s+t)$.

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