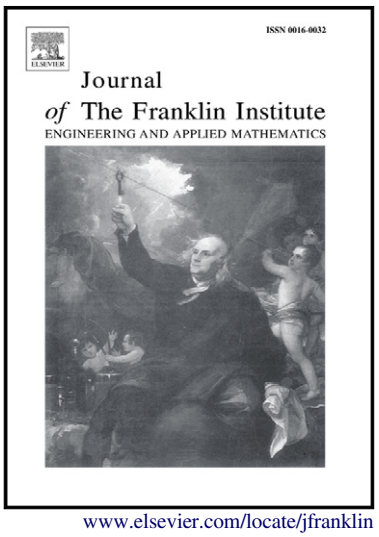

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Abstract

This paper addresses the finite-time dynamic coverage problem for mobile sensor networks in unknown environments. By introducing a condition where dynamic coverage of all points within the sensing range of each sensor exceeds the desired coverage level by a positive constant, a switching control strategy is developed to guarantee the achievement of desired coverage of the whole mission domain in finite time. The environment is modeled by a density function and neural networks are introduced to learn the function. Due to the approximation capability of neural networks, the proposed control scheme can learn the environment without *a priori* knowledge on the structure of the density function.

Index Terms

Coverage control; finite-time convergence; neural networks; sensor networks.

I. Introduction

In the past decade, mobile sensor networks have received increasing attention due to its versatility in many applications such as environment surveillance, infrastructure security and forest fire monitoring. Compared with a single sensor, a network of mobile sensors is competent for more complex tasks due to cooperation among sensors [1]-[4].

Coverage is a fundamental problem in mobile sensor networks, which can be regarded as a measure of the quality of service provided by a sensor network [5]-[9]. In [6], Voronoi partition is used to design coverage control laws to drive each sensor to the centroid of its corresponding Voronoi partition. In [8], coverage control for networked robots in unknown environments is addressed and a decentralized adaptive control law is proposed to drive the sensor network to a near-optimal sensing configuration. Coverage control and data collection for mobile sensor networks are addressed simultaneously in [9] by solving an optimization problem trading off the two objectives.

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