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A Clustering Technique using EG and Data Redundancy Avoidance Algorithm for Surveillance Systems

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Introduction

Wireless multimedia sensor networks are now used in a variety of applications. Because the quality of service is critical for traffic-intensive multimedia data, such as images and videos, WMSNs require an energy-efficient and robust routing protocol. A WMSN with multiple sinks enables cluster heads to deliver collected data to the closest sink, reducing delivery overhead. In this paper, we propose an evolutionary-game-based routing (EGR) protocol for WMSNs with multiple sinks that uses evolutionary game theory to select CHs. An algorithm for reducing data redundancy based on the overlapping field of views of multimedia sensor nodes is also presented in EGR. This algorithm reduces the number of redundant transmissions, improving network performance and energy efficiency [1].

Description

A wireless multimedia sensor network (WMSN) is made up of wirelessly interconnected devices that can retrieve multimedia content from the environment, such as videos, audios, still images, and scalar sensor data. Hardware advancement and miniaturisation can aid in the development of sensor devices equipped with audio-visual multimedia modules. The recent availability of inexpensive hardware, such as cameras and microphones, has had a significant impact on the development of WMSNs. A WMSN is defined as a network of wirelessly interconnected sensor nodes that are equipped with multimedia devices and can retrieve video and audio streams in addition to scalar sensor data. WMSNs can be used for a variety of applications in both the public and military sectors [2].

Additionally, multimedia sensor nodes collect snapshots as well as streaming multimedia content. Snapshots are created when an event-triggered observation is made over a short period of time. Streaming multimedia contents, on the other hand, are captured and generated as a result of any event-triggered observation over a longer period of time. It is critical for WMSNs to have a solid hardware foundation in order to meet quality-of-service requirements and application-specific demands. WMSNs require more bandwidth than traditional wireless sensor networks. Crossbow, an IEEE 802.15.4 compliant WSN platform, for example, has a data transmission rate of 250 kB/s, which is very low for high-end multimedia sensors. To support high data rates, WMSNs must be energy-efficient; thus, more careful considerations for energy conservation should be given [3].

These operations differ from traditional WSN sensing operations. The term FoV refers to a multimedia sensor's directional view. A camera's target object may be in a distant location. The images captured by the camera are determined by the camera's relative position and orientation towards the targeted object. Many routing protocols for WMSNs have been proposed in recent years, with a focus on energy efficiency, delay, and reliability. The real-time power aware routing protocol adjusts transmission power and routing decisions dynamically based on network load and data packet size. Its innovative forwarding and neighbour management mechanisms save energy while meeting real-time constraints. That is, a node has at least two sinks with length-bound paths. If a multimedia sensor node fails to send data due to a sink failure, it can instead send data to another sink node. Furthermore, multiple sinks aid in the implementation of advanced applications and programming abstractions for routing algorithms, as well as the avoidance of network congestions. So far, two routing protocols for WMSNs with multiple sinks have been proposed. To reduce energy consumption, multi-sink aware operations were integrated into an opportunistic routing framework. To maximise the lifetime of time-driven multi-sink networks, Tong et al. proposed Code Mesh, a coding-aware cross-path any cast routing protocol. Code Mesh integrates proactive and reactive protocol features while taking advantage of multiple sinks. Its route establishment is independent of clock synchronisation [4,5].

Conclusion

Energy efficiency is an important design goal in WMSNs because the energy must support the delivery of large amounts of data while meeting a specific end-to-end delay requirement. This type of issue makes developing a routing protocol for WMSNs more difficult. In this paper, we propose a new routing protocol for WMSNs based on a clustering technique using EG. The proposed EGR overcomes this challenge by introducing a data redundancy avoidance algorithm and intelligent CH election using EG in WMSNs with multiple sinks. Our extensive performance study demonstrates that the EGR protocol achieves lower energy consumption and longer network lifetime, implying that EGR is better suited for WMSNs that support surveillance systems subject to stringent QoS requirements. EGR can also be used for environmental and battlefield monitoring.

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