

An Evolutionary Game Theoretic Approach for Stable Clustering in Vehicular Ad hoc Networks (VANETs)

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"Nothing is impossible if you have faith in God and you set your mind to it"

(Ammara Khan)

Abstract

Finding and maintaining efficient routes for data dissemination in VANETs is a very challenging problem due to the highly dynamic characteristics of VANETs. Clustering in Vehicular Ad hoc Networks (VANETs) is one of the control schemes used to provide efficient and stable routes for data dissemination in VANETs. The rapid changes in the topology of VANETs have instigated frequent cluster formation and reorganization which has seriously affected route stability in Vehicular Ad hoc Networks. Considerable work has been reported into the development of clustering protocols while keeping in view the highly dynamic topology of VANETs, but the objective of imbuing the system with a stable underlay is still in the infant stage. The analytical models used for studying the behaviour of Vehicular Ad hoc Networks have been scarced due to distributed, highly dynamic and self-organizing characteristics of VANETs. In contrast, game theory is emerging as a novel analytical tool that can be used to tackle the technical challenges concerning the current and future problems in wireless and communication networks. A two-layer novel Evolutionary Game Theoretic (EGT) framework is presented to solve the problem of in-stable clustering in VANETs. The aim of this research is to model the interactions of vehicular nodes in VANETs, to retain a stable clustering state of the network with evolutionary equilibrium as the solution of this game. A stable clustering scenario in VANETs is modelled with a reinforcement learning approach to reach the solution of an evolutionary equilibrium. Performance of the proposed “evolutionary game based clustering algorithm ”is empirically investigated in different cases and the simulation results show that the system retains cluster stability.

Declaration

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

Signature:

Ammara Anjum Khan

Dedication

To my beloved mother Najma khan and my father Salah Uddin Khan .

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Thanks to ALMIGHTY ALLAH for giving me strength and ability to understand learn and complete this thesis. No doubt he is the best disposer of all affairs.

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