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A NEWLY DESIGNED MOTORWAY WIRELESS AD HOC CAMERA NETWORK SYSTEM TO IMPROVE PHYSICAL SAFETY

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INTRODUCTION

Surveillance systems are used in motorways to obtain information about traffic conditions such as density, accidents and other useful information. In traditional motorway surveillance systems, the system is designed to send the information (images) to predetermined location (Base Station) for processing and monitoring or to gateway points which send all the information to the base station. The system does not allow the motorway's user from accessing surveillance system network effectively, for example, not all vehicles have access to the base station or the gateway points, because, the distance between the vehicle and the gateway is too far, thus the need to have more base stations.



OBJECTIVES

1. Design and develop a model for a new Motorway Surveillance System based on mobile Ad hoc networks (MANET).
2. Design and develop a new positioning protocol based on the transmission range of the nodes to manage the operation of selecting, finding, and requesting any camera within the proposed system.
3. Evaluate, compare and analyze the performance of different routing techniques based on various MSS scenarios.
4. Modify the selected routing technique from the third objective above by decreasing the protocol overhead in order to improve throughput in the proposed MSS network.



Block Diagram of the Proposed Motorway Surveillance Design Stages

BENEFITS & APPLICATIONS

The major benefits of this project are:

- Improve the physical safety of vehicle's driver.
- Decrease the MSS constructing cost (no need for network infrastructure).
- Increase the flexibility of accessing MSS data by the vehicle's driver without using special software and no need to pay.

There are many application of this project these are:

- Monitor flooding may be caused on motorways.
- Monitor Crashes may be caused on motorways.
- Monitoring emergency stop.
- Monitoring Landslide.

NOVELTY

- Develop a new motorway surveillance system with image acquisition technique. The proposed system enable the users of motorway to access the data (images) generated by the system's camera network without any additional infrastructure or special software, and for any reasonable distance between the vehicle and the desired camera.
- Design a new positioning protocol to select, find and request the desired camera without needing the GPS or any positioning infrastructure.
- Improve the routing performance of the proposed MSS by modify the AODV routing protocol.



COMMERCIAL VALUE

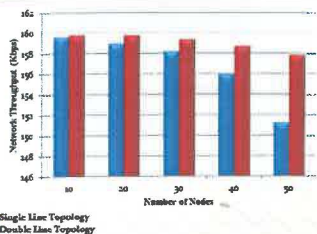
This project has the potential to be commercialized since

1. The proposed system can be implemented on any highway or city's roads in Malaysia or anywhere to improve vehicle's driver physical safety.
2. The Developed positioning protocol can be used in any type of wireless networks to localize the position of any node.
3. The modified AODV routing protocol can be used in any type of Ad-Hoc network since it leads to improve network performance.

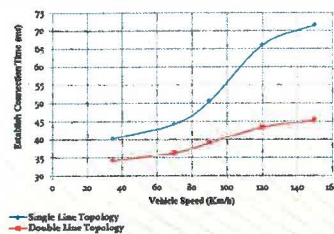
ENVIRONMENTAL FRIENDLINESS

1. The proposed MSS construction based on 4G network generation so it can be used for long time.
2. The proposed MSS decrease network infrastructure consequently decreases frequency generated which may be affect human.
3. The proposed MSS reduce the amount of consumed power by network infrastructure (no need for network infrastructure like towers or basestations).

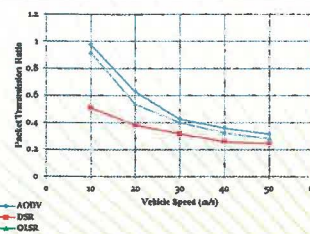
RESULTS



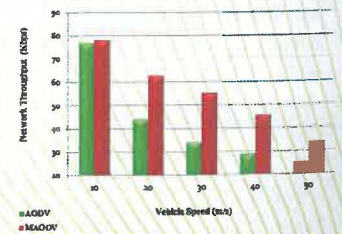
Network Throughput vs. Number of Nodes for Single and Double Line Topologies



Establishing Connection Time vs. Vehicle Speed Using SFP Protocol for Single and Double Line Topologies



Network Throughput vs. Vehicle Speed Using Heavy Network Load for Different Routing Protocols



Network Throughput vs. Vehicle Speed When Using Heavy Network Load for AODV and MAODV Routing Protocols

PUBLICATIONS

1. Books (1)
3. International Conferences (6)

2. International Journals (7)
4. International Exhibitions (3)