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Vehicular Tracking and Reporting by Vehicle to Vehicle (V2V) Communication

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ABSTRACT: Vehicular networks is attracted a lot of attention recently. The application of vehicular networks is to use video cameras embedded in vehicles to support video surveillance, which we call “surveillance on-the-road”. Monitoring and Tracking suspicious vehicles (such as stolen cars) on the road through license plate recognition (LPR). Vehicles can work cooperatively through vehicle-to-vehicle (V2V) communications to achieve this goal. With a tracking and reporting modules, our solution does not rely on infrastructure networks. The tracking module allows handoff of a tracking job to neighboring vehicles as necessary and report of suspicious vehicles to nearby police cars. In the framework can be applied to the developing WAVE/DSRC (Wireless Access in Vehicular Environments/Dedicated Short Range Communications) standards.

KEYWORDS: V2V, LPR, WAVE/DSRC.

I. INTRODUCTION

Video surveillance is the advances of video technologies and embedded computing and communications technologies. Vehicular surveillance applications such as vehicle security[1], brake warning[3], and urban monitoring [8]. Traditional surveillance systems only rely on fixed stations on the roads to monitor road conditions. Embedded on vehicles to help the surveillance job, which we call “surveillance on-the-road”. In addition to fixed video cameras, millions of cameras installed on vehicles may help the surveillance job. Most vehicles nowadays have rear cameras to assist backward driving. With vehicular cameras, deeper and richer road conditions may be tracked. The communication issues to support such “on-the-road” Surveillance scenarios through vehicle-to-vehicle (V2V) communications.

Tracking and Reporting suspicious vehicles rely on roadside infrastructures [6] to achieve this goal. The proposed work is an infrastructure-less framework for tracking and monitoring suspicious vehicles by vehicles on the roads. Our solution consists of a tracking module and reporting modules. The tracking module allows a vehicle to keep tracking an identified suspicious vehicle and handoff [5] its tracking job to neighboring vehicles as necessary. It allows a tracking vehicle to report the intersection passed by the suspicious vehicle to nearby police cars even if it has no digital map information at hand.

The reporting module helps find the nearest police car at low message cost without relying on costly roadside infrastructures, such as roadside units (RSUs) and wireless local area network access points (WLAN APs) [9]. It only relies on V2V communications, that if both the tracking vehicle and the nearest police car have 3G/3.5G radio interfaces, the discovery for suspicious vehicles might be directly reported to the nearest police car via 3G/3.5G communications.

Vehicle to Vehicle (V2V) communications will be used to report the discovery as proposed in this work. On the other hand, propose to enhance LPR (license plate recognition) capability to a vehicular camera, so a suspicious license number which is to be tracked can be recognized locally in a vehicle. The work should be applicable to the developing WAVE/DSRC (Wireless Access in Vehicular Environments/Dedicated Short Range Communications) [4] standards.

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II. SYSTEM MODEL

Vehicular surveillance networks via V2V communications. Each vehicle is equipped with a GPS receiver and some video cameras. These video cameras can help recognize the license plates of the vehicles immediately in front/rear of it. With license plate recognition (LPR) techniques, transmitting license plate images is not always necessary. For identifying suspicious vehicles, the police department may publish a list of license plate numbers to be tracked in a particular region. Then vehicles in that region can try to recognize these plate numbers and keep those video clips when there is a match.

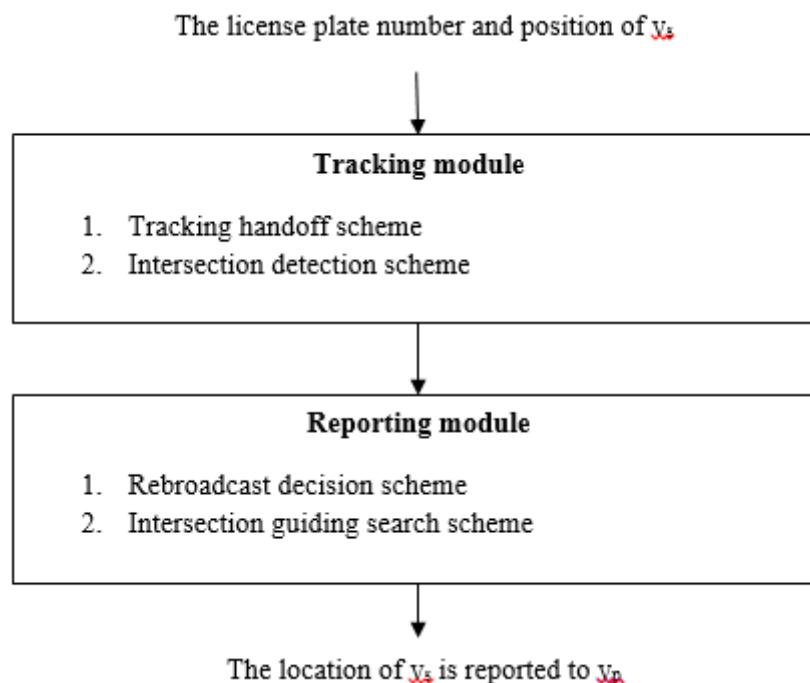


Fig 1: Tracking and Reporting Module

Vehicles can immediately communicate with each other upon encountering on the road without having to join a BSS. Vehicles transmit periodical beacons to exchange ID positions with neighboring vehicles indicated in broadcasting messages to limit their ranges.

1. **Tracking handoff:** How do we handoff the tracking job to neighboring vehicles as v_s (Suspicious vehicle) changes its lane or direction so that v_s can be continuously tracked on the road?
2. **Intersection detection:** How do we detect an intersection without digital maps at hand so that each intersection passed by v_s can be reported to v_p (Police vehicle) for maintaining the up-to-date location of v_s ?
3. **Rebroadcast decision:** How do we report the location of v_s to nearby v_p such that the number of rebroadcasts of m_r can be minimized?
4. **Message guiding:** How do we guide the propagation of m_r to the nearest v_p without flooding the network so that the message overhead for reporting can be reduced?

III. TRACKING AND REPORTING PROTOCOLS

It is an infrastructure-less framework for the vehicle tracking and reporting problem, which consists of a tracking module and a reporting module. First, to keep tracking an identified v_s , and propose a tracking handoff scheme and an

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intersectiondetection scheme. Second, to efficiently deliverreporting messages about v_s to the nearest v_p , and finally rebroadcast decision, an intersection-guidingsearch, and amemory-based backoff schemes.

IV. EXPERIMENTAL RESULT

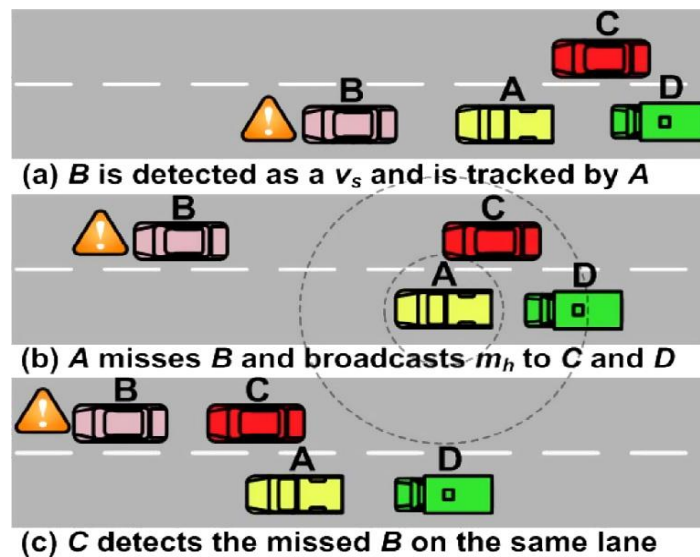


Fig 2: Simulation Result

Estinet8.1 is used for the simulation result, here A, C, D is the neighbor vehicle, B is the suspicious vehicle and finally the location of the suspicious vehicle is reported to the police vehicle (v_p).

V. CONCLUSION

“Surveillance On-the-Road” that integrates surveillance technologies with WAVE/DSRC communications to support vehicle tracking and reporting applications. Vehicles can work cooperatively through V2V communications to achieve this goal. The tracking module can handoff a tracking job to neighboring vehicles as necessary and report suspicious vehicles to nearby police cars. The reporting module can help guide message flows to avoid flooding the network. In the paper, mainly focus on how to design the vehicular tracking and reporting by V2V communications.

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