Poster: Visual Cue-Based VRU Protection on Smartphones

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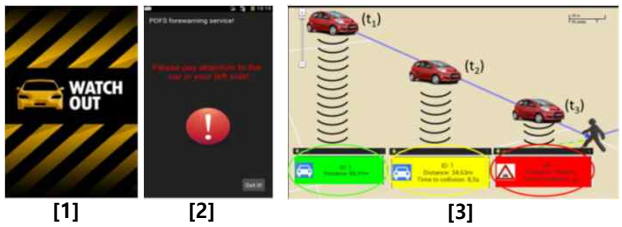
Motivation

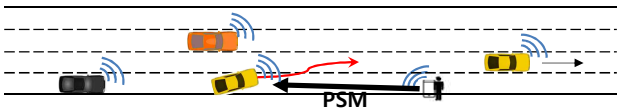
- Vehicle communication starts to be enforced by law from 2020
  - Protecting VRUs using vehicle communication is receiving attention
- Most apps are using Wi-Fi or Wi-Fi Direct as replacements of DSRC
- Inefficient alarm methods lower the utility of the VRU protection
  - Pop-up alarms prevent using other apps [1], [2]
  - Using notification messages is less intuitive [3]



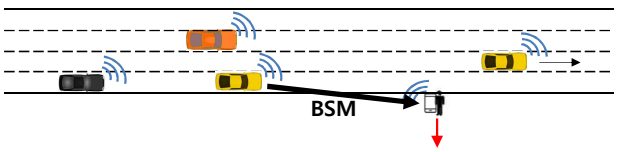
[1] [2] [3]

V2P Communication for VRU Protection

- SAE J2735 (pedestrian -> vehicle)
  - It is the vehicles that take the responsibility for VRU protection
  - User devices transmit Personal Safety Messages (PSMs)
  - On receiving PSMs, the drivers take necessary measures

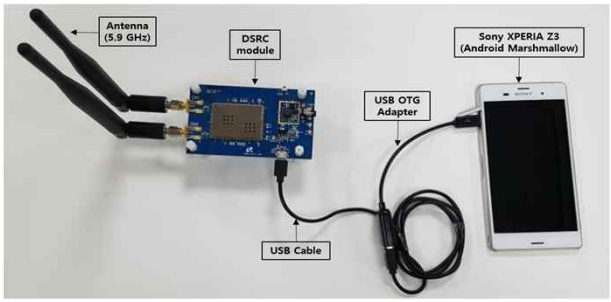


- Our approach (vehicle -> pedestrian)
  - The road users also need information about nearby vehicles
  - Vehicles transmit Basic Safety Messages (BSMs)
  - On receiving BSMs, the road users protect themselves from dangerous situations

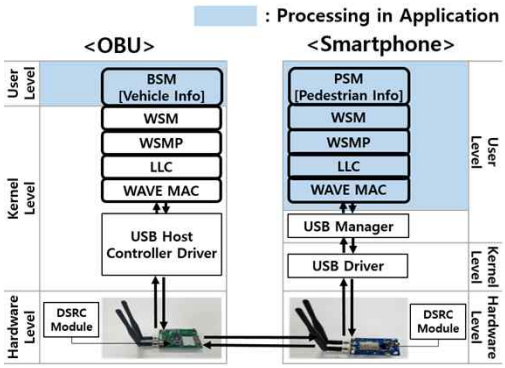


System Architecture

- Hardware components



- VRU platform architecture



Visual Cue-Based VRU Protection App

- Parsing and decoding messages
  - From this procedure, it gets vehicle information in the BSM
- Calculating a marking position and the level of danger for the incoming vehicle
  - GPS coordinate, heading, and speed data in BSM are applied
- Highlighting the screen edge on the incoming vehicle side
  - The highlighted part is moving along the edge
  - The visual cue color is changed along the level of danger
- Effects
  - Smartphone users can utilize other apps regardless of the existence of visual cue
  - They can also recognize vehicle information intuitively

Conclusion

- We provide intuitive visual cues to the smartphone user looking at the screen
- People can use their discretion to determine the level of danger for themselves
- It could be an imposing application of VR to provide visual cues to pedestrians

[1] Wu, Xinzhou, et al. "Cars talk to phones: A DSRC based vehicle-pedestrian safety system." Vehicular Technology Conference (VTC Fall), 2014 IEEE 80th. IEEE, 2014.

[2] Liu, Zhenyu, et al. "POFS: A novel pedestrian-oriented forewarning system for vulnerable pedestrian safety." Connected Vehicles and Expo (ICCVE), 2015 International Conference on. IEEE, 2015.

[3] Anaya, José Javier, et al. "Vehicle to pedestrian communications for protection of vulnerable road users." Intelligent Vehicles Symposium Proceedings, 2014 IEEE. IEEE, 2014.

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