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]

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

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

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