Vehicular Video Applications
“Interesting Videos to Watch”

MOST VIEWED FUNNY VIDEOS OF THE YEAR - YouTube
www.youtube.com/watch?v=ySo-v4tnczO
Sep 7, 2013 - Uploaded by The Most Viewed Videos of Youtube
NEW VERSION. MOST VIEWED + HOT CLICK ↓
http://www.youtube.com/watch?v=GtDnBu3MNgs Part 2 ...

MOST INTERESTING MAN IN REAL LIFE!! - YouTube
www.youtube.com/watch?v=v1vaigS7rJo
Sep 30, 2013 - Uploaded by Disturb Reality
MORE MOST INTERESTING MAN: http://youtu.be/BX4VhdVOjXY
RAW FOOTAGE ... You need Adobe Flash ...
ACDC Project (2014-2016)
Autonomous Cooperative Driving: Communications issues
WP7: Vehicular Video System

Use Case 1: Video conferences in platooning

- **V2V: Infotainment** scenario of a group video conferencing between vehicles in a platoon
Use Case 2: In-vehicle video surveillance

- **V2I**: Improving a **public security** by monitoring of a public transportation to help counteract terrorism, vandalism and other crimes

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Use Case 3: Traffic conditions surveillance

- **V2I:** Contributing to a traffic control, since it might be necessary to ascertain the current situation at a given road section, intersection or even a lane
Use Case 4: Police assistance at a crime scene

- V2V and V2P: Improving public security by accessing the view of other emergency vehicles or even a particular policeman
Use Case 5: Overtaking assistance

- **V2V**: Real-time video is delivered from the truck to the vehicles behind in a classical dangerous **rural roads** scenario.
End-to-end Latency Requirements

- **“Streaming” case**
  Pre-encoded video; buffering latency of 5-15 seconds is acceptable

- **“Surveillance” case**
  Real-time encoding; end-to-end latency should not exceed 10 seconds

- **“Interactive” case**
  Real-time encoding; end-to-end latency should not exceed 200 ms
Visual Quality Requirements

Overtaking scenario:

- During a short interval of time when two platoons are about to meet each other, the channel load **rapidly increases**
- We are not interested in **average** visual quality over a long time period, but on the most critical part of the platoons meeting

Technical challenge:

Quick Channel Adaptation

- Normal operation with one platoon
- Influence of the approaching platoon
- Sudden decrease of visual quality
- Adaptation to the new conditions
- Optimal operating point for two platoons

For high velocities may be sudden
Moving along curve may be time consuming, since channel estimation requires time

Low compression ratio
High compression ratio

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The information about the oncoming vehicle obtained from the beacons and received on the control channel is available on the encoder before the actual service channel degradation occurs.
Performance Evaluation Results

Quantization step minimizing end-to-end distortion:

\[ \Delta_n^{(k)} = \sqrt{\frac{12\theta T_{SI}}{X(\delta, x) b_0 - R^0 T_{SI}} + 12D^0} \]

[Video] Operational rate-distortion function model parameters

[Network] Mean number of successfully transmitted video packets
Belyaev E., Molchanov P., Vinel A., Koucheryavy Y. The use of automotive radars in video-based overtaking assistance applications
Motivations against H.264/SVC

- **Computational complexity**
  H.264/SVC is a good solution for the pre-encoded video

- **Unequal packet loss protection**
  Mapping of a protection mode to a distortion caused by the loss of each individual packet is difficult

- **Robustness to “bad” channels**
  H.264/SVC is very sensitive to packet losses
H.264/SVC versus 3-D DWT: robustness to packet losses