eCall for Powered Two Wheeler

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Agenda

- Introduction

- eCall example for PTW

- Comparison eCall for cars and PTW

- Topics for eCall for PTW

- Description of functional principle

- Base line for eCall severity information

- Major work packages for eCall and conclusion

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Statistical entrance

Numbers from 2012:

Registered motorcycles in Germany	3.982.978
First time registered	125.673
Insurance claims (full cover)	4%
Sport Tourer, entry level bike, supersport (one brand reg)	17.876

Spare parts consumption thereof

app. 6% need repair

indicator	259
clutch lever	1.877
foot rest front	532
front fork bridge	62
rim front	44
rear frame (1540pc)	18

Source: KBA, OEM, GDV form 2013

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Short internet blog search

<u>What do you think about eCall for motorcycles?</u>
<u>What is your major concern?</u>

Astonishingly dominantly positive feedback about first system on the market!

Typical statements:
Fear not to be found after an accident!
Hopefully no blind spot for Mobil communication!
Better localisation possible!
How to avoid false alarm and misuse?
What is the best triggering of an alarm?
Data security?

How could it be guaranteed to set an alarm when it is needed?

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eCall example: Sensorbox + BodySensor + Safety unit with BT & GSM & GPS

eCall (IF* & P2P**)

Support & Services

Step 5. **Casualty** gets emergency support in time

Step 4. **Support center** analyses data & localisation

4G LTE

GPS

Step 1. **Bosch sensor(s) system** is monitoring vehicle dynamic data

Accident!

Rider can trigger eCall also **manually**

GSM Location

→**BT** for voice communication to helmet (Option)

Movement pattern of bike and driver

or CAN

Step 3. **Safety unit is automatically placing an** eCall with needed accident / vehicle /driver status and location information.

Step 2. **Safety unit** **detects** accident **+** based on *detection algorithm*

Bosch Engineering GmbH   IF=infrastructure; P2P= point to point; BT= BlueTooth

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Comparison eCall for cars and PTW

Common
- rescue chain
- billing system
- national and international standards of communication
- forces to vehicle and driver are the same if they are combined
- power supply requirement
- infrastructure and business case

Uncommon
- separation of vehicle and driver
- zero speed is safe area
- sensor types
- stability criteria
- accident detection
- location (off road)
- forces to vehicle and driver after separation
- ambient noise for voice communication
- accident recognition
- crash sensors at all sides
- population and hours of use

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Combination of Driver and Vehicle

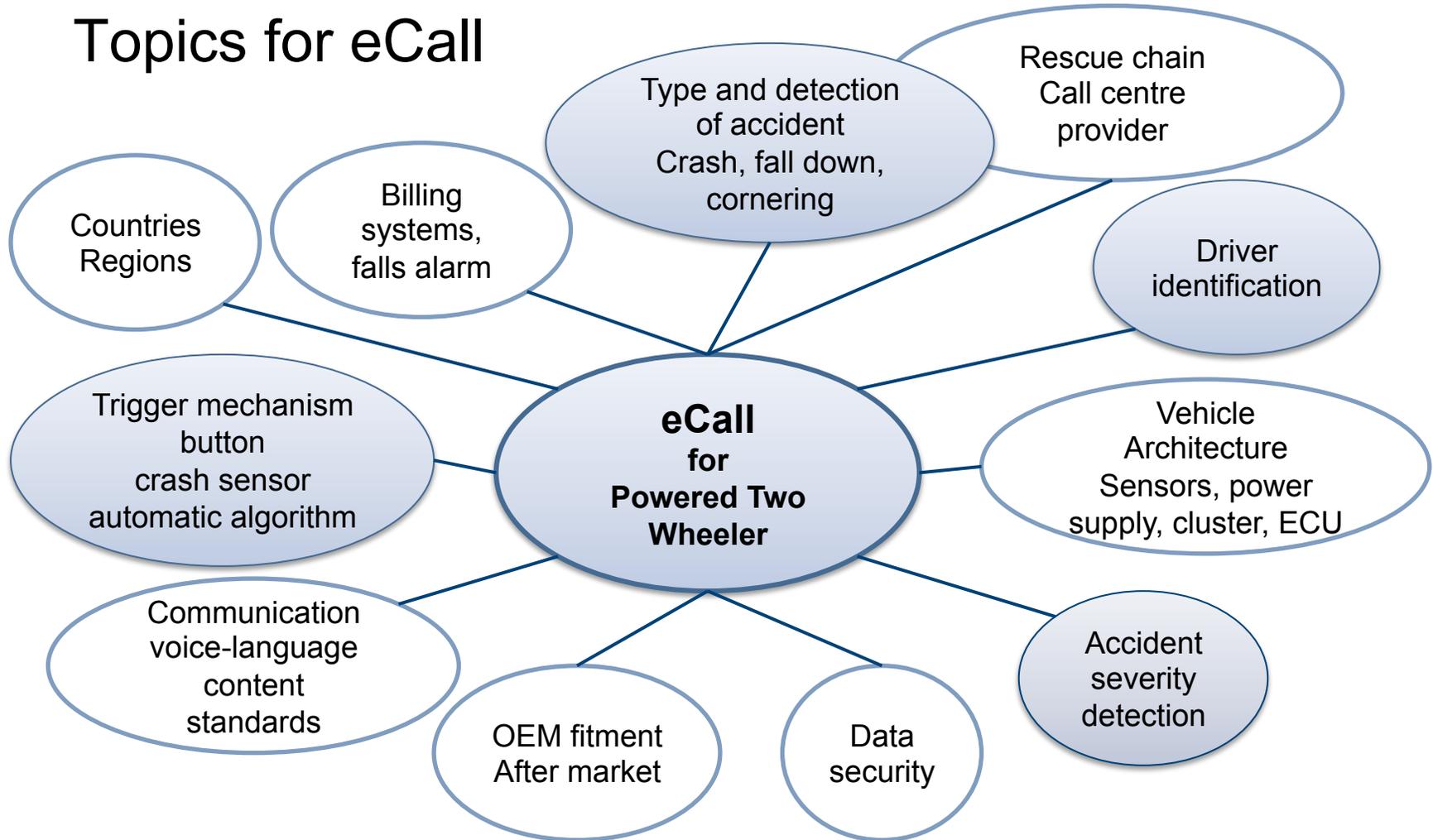Who belongs together? How to combine easily bike and rider?

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Topics for eCall

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Workspace clusters eCall

?

Solutions are available!

| Accident detection

Severity detection

Driver identification | System architecture

Communication content and transmission | Rescue chain

Call centre

Provider |

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Technical preconditions – system architecture

Driver and vehicle are equipped with multi axis sensors (min 6DoF) and a central e-call transmission and assessment unit.
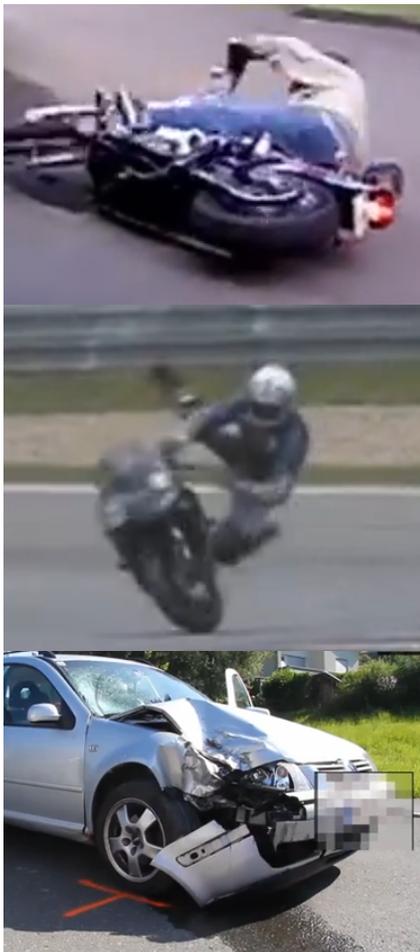
eCall – assessment and transmission unit (safety unit)
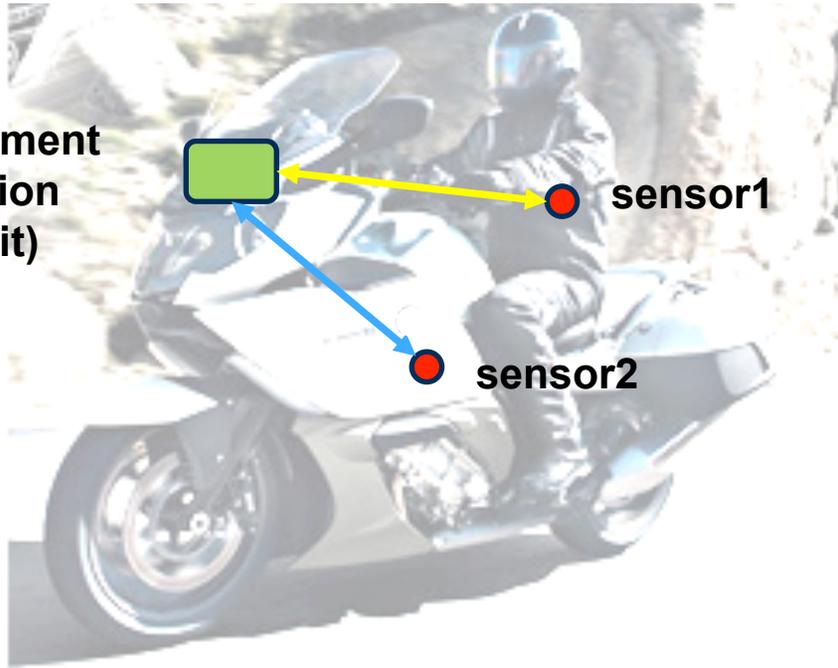
sensor1

sensor2

For after market safety unit and sensor2 are combined

◄─────► wireless   ◄─────► wireless or bus

DoF= Degree of Freedom

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Accidents to detect

Vehicle stands still:
Driver and bike suddenly fall over and driver is trapped. Injuries to hips , knees and rips might occur. Without helmet head injuries are common. Driver is not able to activate help.

Driving conditions:
At all speeds driver loses control of the vehicle dynamic behaviour, driver falls off the vehicle and is injured. If bike and driver go off the road they are not visible.

Crash conditions:
Vehicle and driver crash into an obstacle. High deceleration values occur. In consequence severe injuries, also e.g. for a car driver being involved.

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Detection of accident

How can we identify an eCall relevant accident at start?

After a start of a PTW a driver has to be in an upright position and vehicle has to be in an upright and stable position. Driver and vehicle are in close contact (sit on). Driving is not mandatory.

*If the vehicle is moving out of its upright position **and** the driver is falling into the same direction **and is not** coming back upright after a period of time, an accident has occurred. If the body sensor and the algorithm in the safety unit is detecting a not plausible moving pattern, an automatic eCall is started.*

How can we identify an eCall relevant accident at drive?

All movements of the vehicle have to follow a harmonic pattern of rotations and accelerations.

*If the vehicle movement is **not** ending in a stable upright position, an accident has occurred. From now on, only the body sensor is relevant for the determination whether there is a need for an automatic eCall or not.*

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General statement

Automatic eCall

To get a reliable information whether
an accident of a powered two wheeler
has happened or not
an observation and assessment
of a complete interval of incidents
is necessary.

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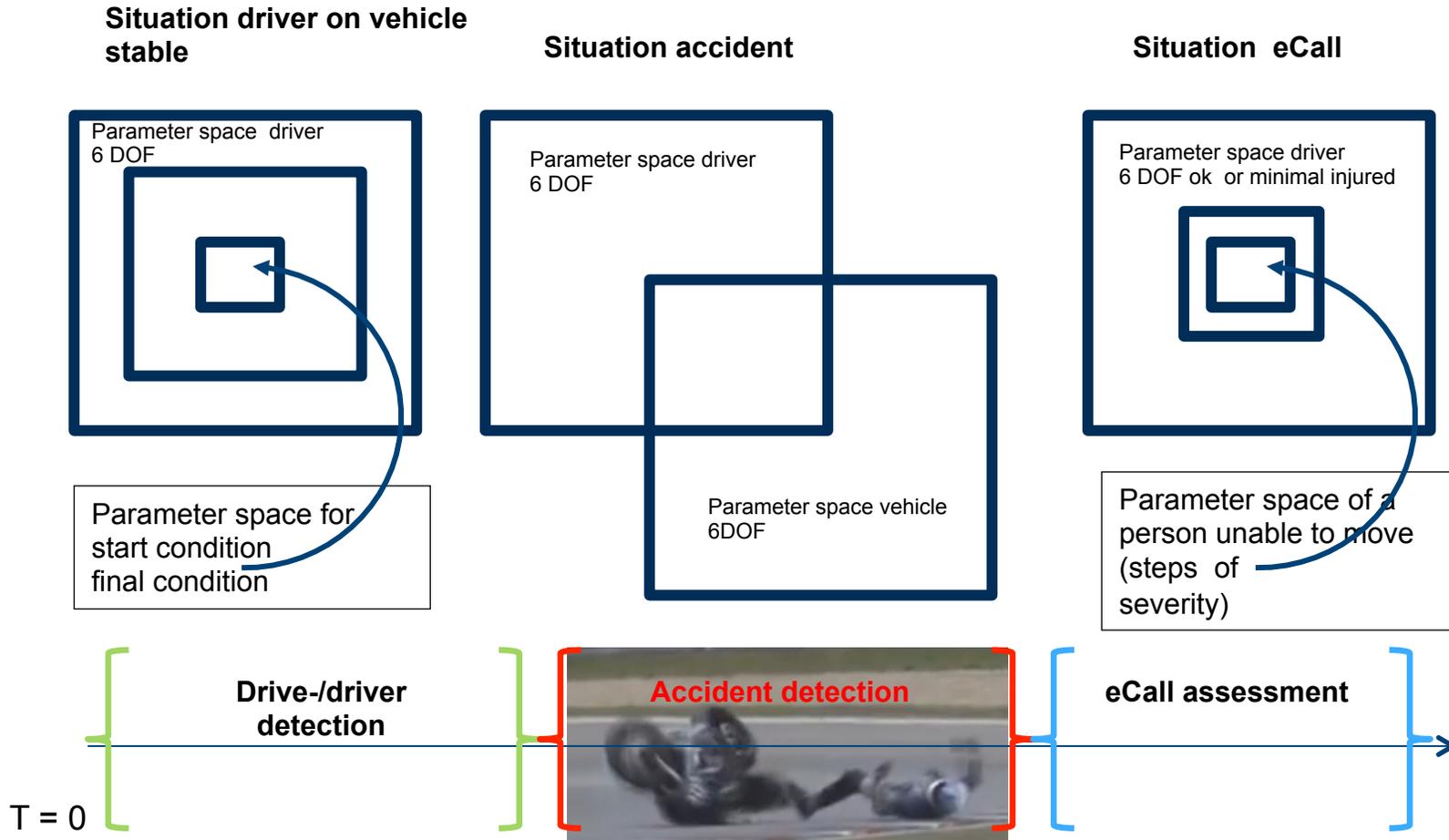
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Description of functional principle

• Every drive starts with a small zone of movements.

• During drive all movements are harmonic and pass across a mean value or pass back to a zero point.

• Every accident free drive is finished in the same zone as it was started.

• Movements of driver and vehicle are synchronized, they belong together.

• In an accident situation movement patterns of driver and vehicle are separated to some degree.

• The movement pattern zone of a seriously injured person is very small.

•Severity of injury can be assessed by space size of his/her move pattern.

• The chronological step flow of incidents is the logical basis and its assessment lead to a release of an automatic eCall.

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Functional principle – parameter space

Situation driver on vehicle stable

Situation accident

Situation eCall

Parameter space driver
6 DOF

Parameter space driver
6 DOF

Parameter space driver
6 DOF ok or minimal injured

Parameter space for start condition final condition

Parameter space vehicle
6DOF

Parameter space of a person unable to move (steps of severity)

Drive-/driver detection

Accident detection

eCall assessment

T = 0
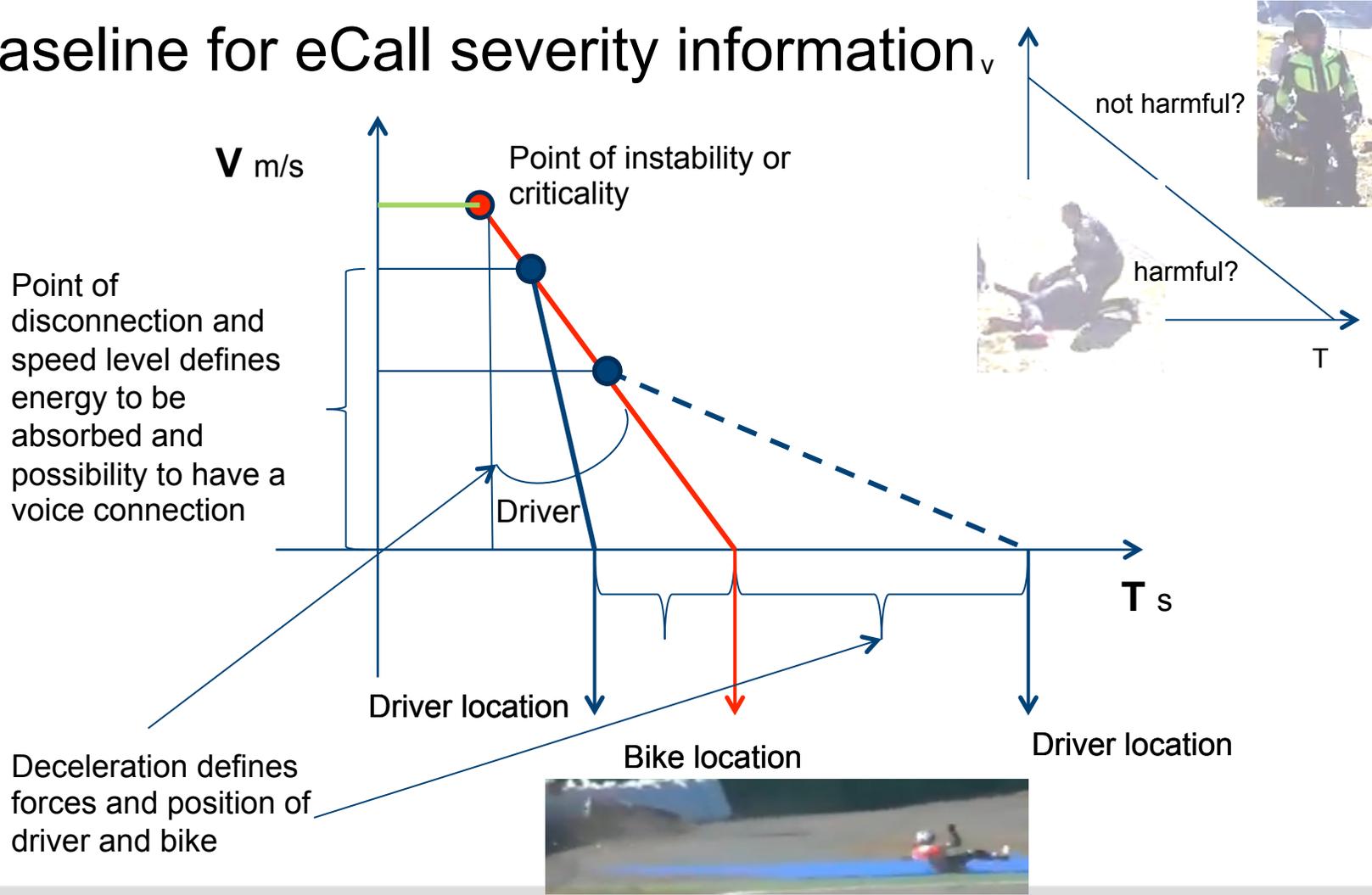
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Baseline for eCall severity information

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Major work packages for eCall

- **Reliable accident detection**

  To maximize coverage of accident detections a reliable method to detect an accident has to be developed.

- **The best possible solution for severity assessment**

  To have the best information base for a rescue team and to avoid false alarm.

- **A safety box which provides best information transmission**

  Transmission of data as defined in the best possible quality with maximum reliability.

- **An international functional eCall chain**

  This eCall chain has to work in all European countries and also in very remote areas.

- **A business case which generates a high penetration rate**

  Functional limitations have to be reduced as much as possible to gain customer acceptance.

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Conclusion

To introduce an eCall system with automatic alarm feature:

• a reliable accident detection is required;

• a driver sensor is needed to determine the severity of the injuries;

• a hardware with high reliability and a good transmission line is mandatory;

• minimum of false alarms could occur;

• an acceptable business case has to be in place;

An automatic eCall will save life's!

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