

# ***GNSS Utilization for Intelligent Transportation System***

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Honda Motor Co., Ltd.

***(1) GPS Car Navigation***

***(2) Floating Car Data***

***(3) Vehicle to X Communication***

***(4) Automated Vehicles***

***GNSS Utilization***  
***(1) GPS Car Navigation***

# GPS Car Navigation System

1981

*Honda Electro Gyroator*



World First  
Map display car navigation  
(can not use GPS)

1990

デジタルマップナビ



use GPS

1998

インターネット対応ナビ



2002

*With Communication*

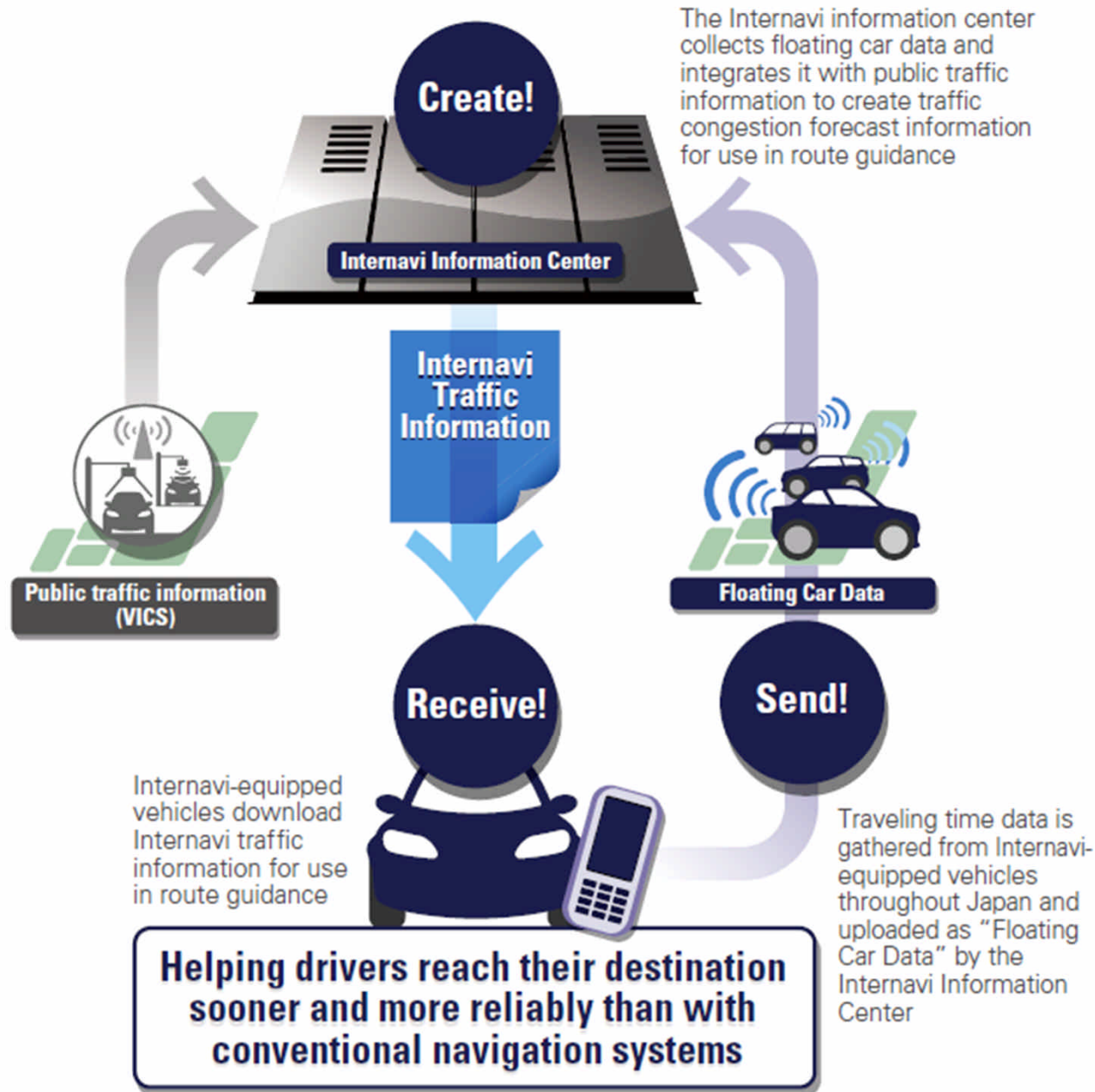


*internavi*  
**Premium Club**



***GNSS Utilization***  
***(2) Floating Car Data***

# Floating Car Data system



Floating Car Data = Probe Car Data

# Minimize gas mileage route

System creates the gas mileage database based on the floating car data.  
System searches “minimize gas mileage route” to reach to the destination.  
Then, deliver that to subscriber.

Gathering the vehicle speed data from floating car system



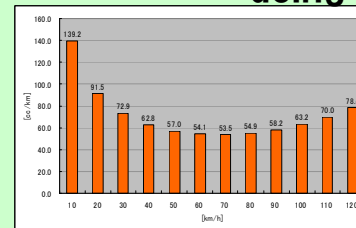
**FCD**



**Gas mileage info.**

Calibrated using actual fuel consumption

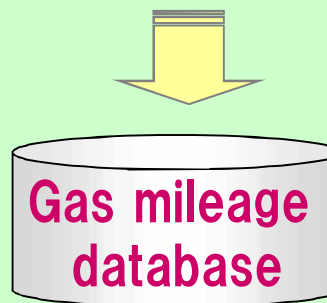
Calculating the Gas mileage using the vehicle speed



Vehicle speed vs. Gas mileage



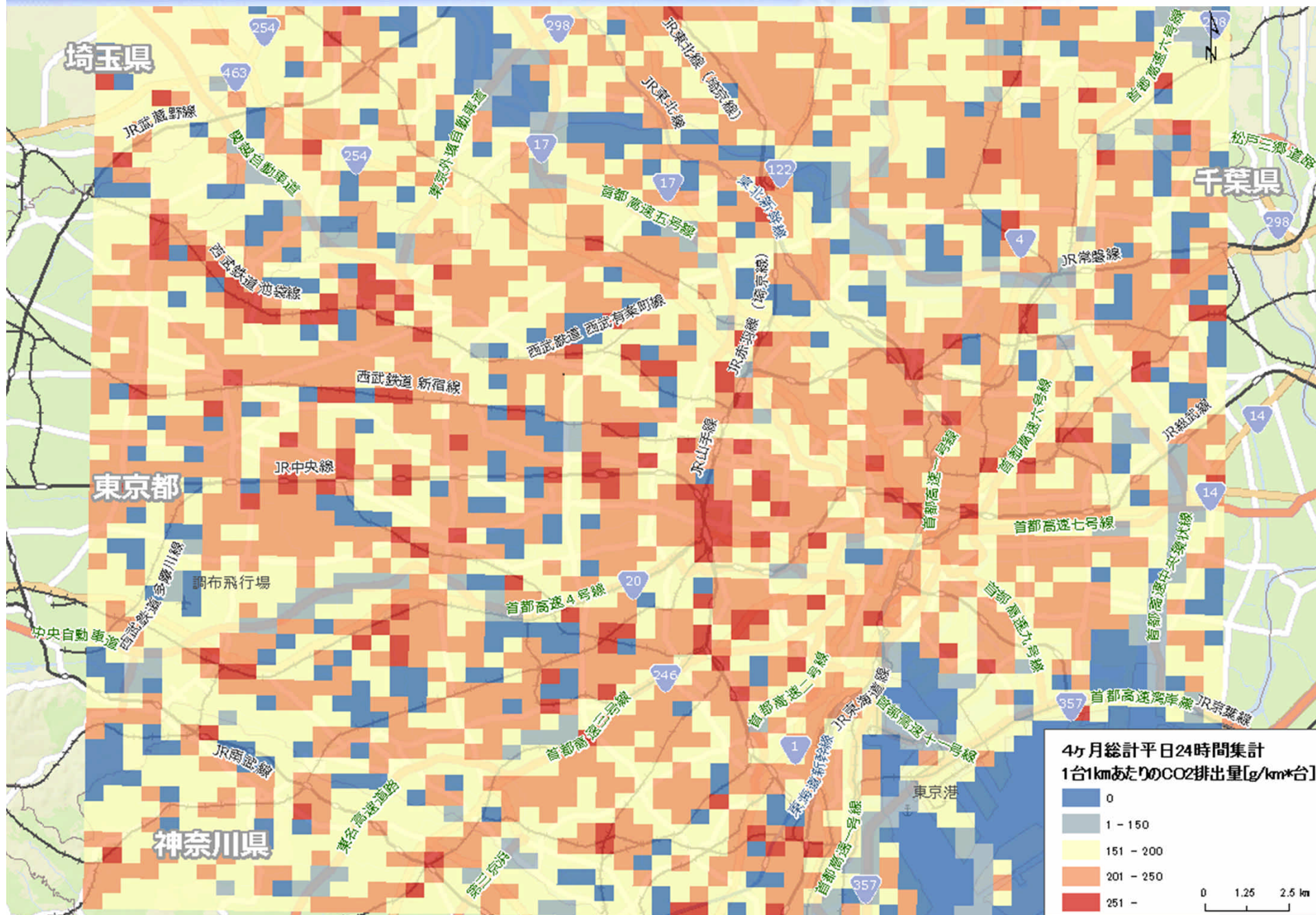
Acceleration vs. Gas mileage



**Gas mileage / Road & Time**

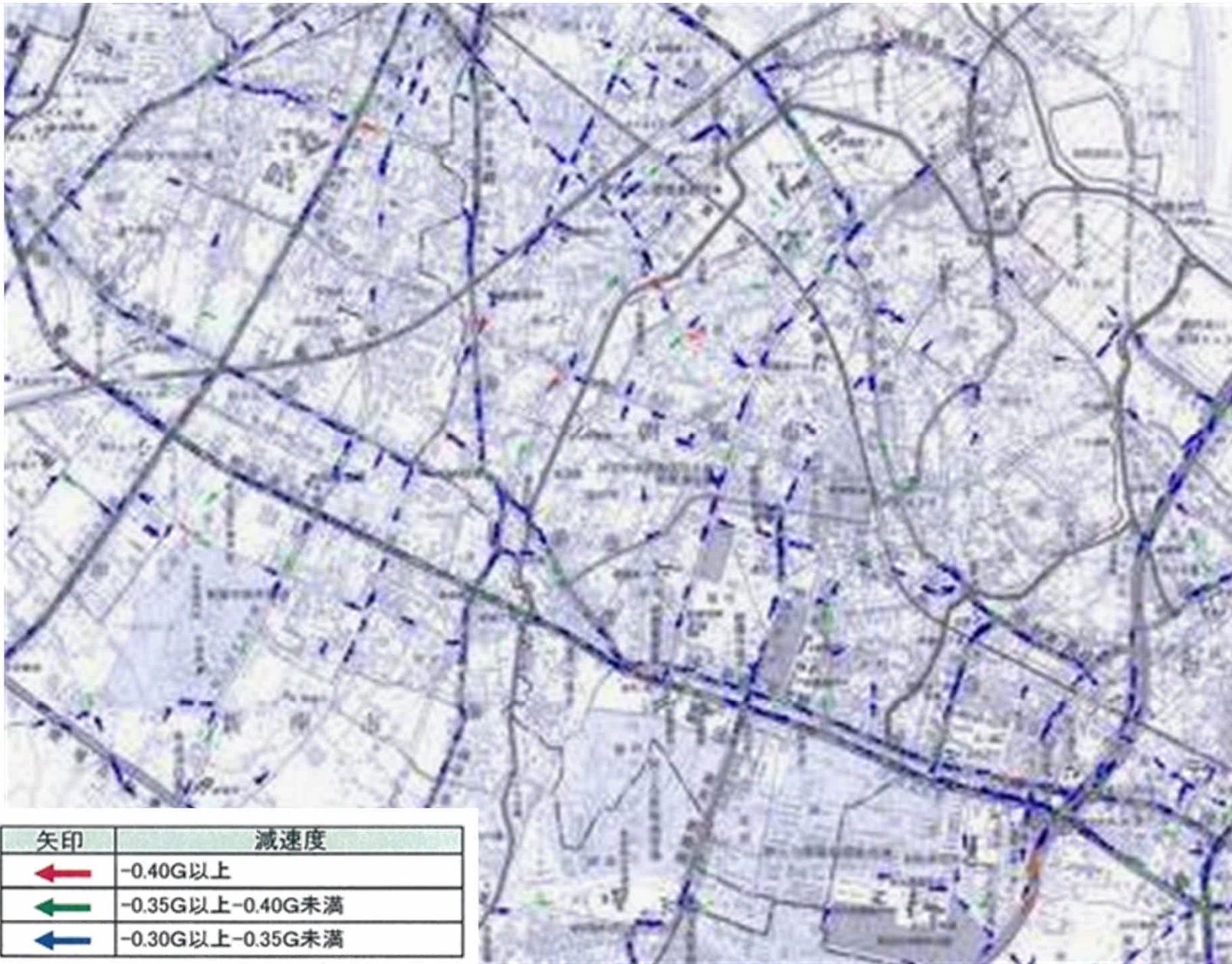
	g	g	...
リンク A	0.3	0.5	
リンク B	0.25	0.44	
...			

# CO2 Map by FCD

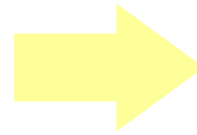




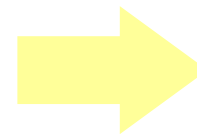
# Visualize Spots Where Hard Braking Occurs Frequently



## Making these spots Safer



Trees trimmed of their lower branches to improve visibility.

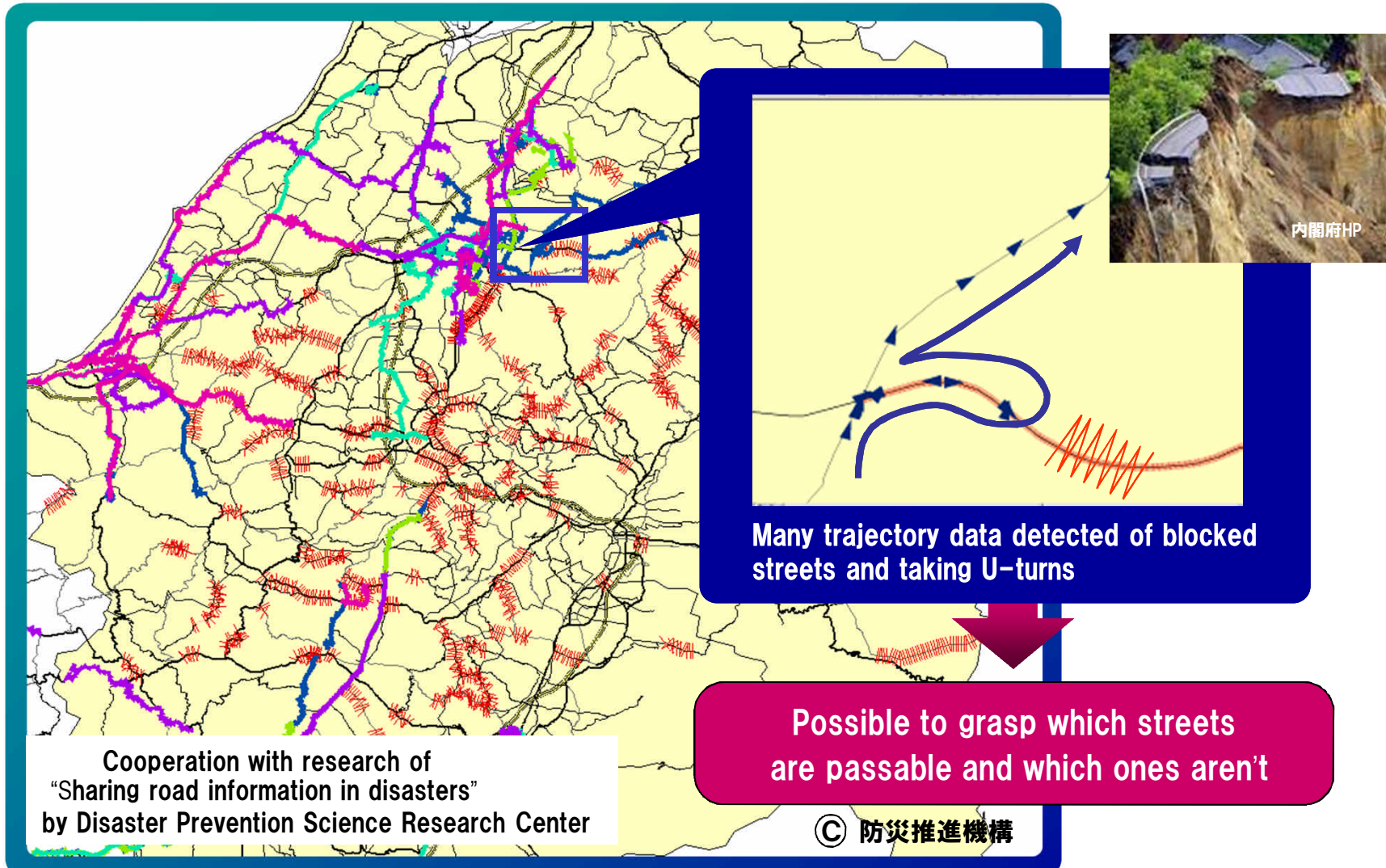


New road markings to lower vehicle speed

The number of hard braking occurred, was reduced to 30%.

# Providing information after huge Disaster

## Passable road information made from Floating Car Data



# Providing information after huge Disaster

## Process of sharing the "Passable road information"

3.11(Fry) 14:46

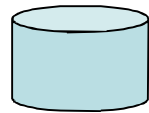
The earthquake occurred

3.12(Sat)10:30

Launched the Passable road info.

3.14(Mon) Collaboration with Google

Google Crisis Response  
a google.org project



Convert KMZ file

3.12(Sat) Announced  
on the Honda social media

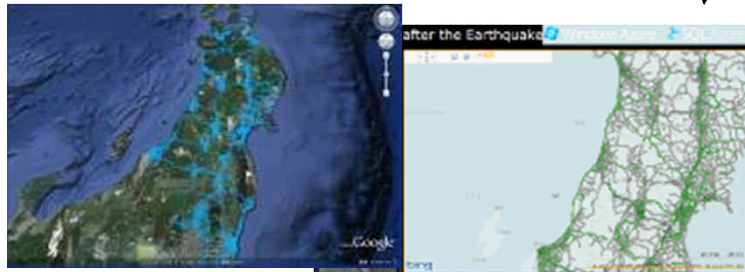


Various institutes use this information



Google 自動車・通行実績情報マップ  
(データ提供: 本田技研工業株式会社)

Geospatial Disaster management Mash-up Service Study  
(Chairman: associate professor Kato Tokyo Univ. MEXT)



National Research Institute for Earth Science and Disaster Prevention (NIED)  
ALL311: West Japan great disaster Coordinating information platform system

Disaster Prevention Research Institute Kyoto Univ.  
Emergency Mapping Team (EMT)



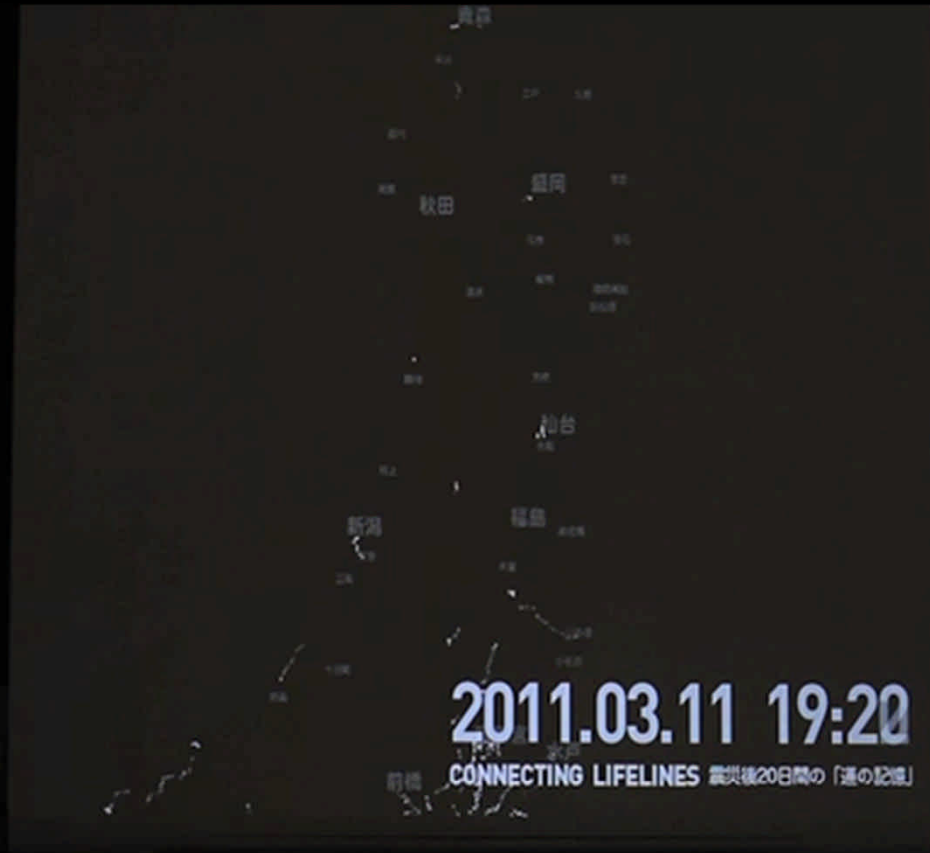
Watanabe Lab.  
Tokyo Metropolitan Univ.



Weathernews



# Passable road map after huge disaster 2011



***GNSS Utilization***  
***(3) Vehicle to X Communication***

# CAR 2 CAR Communication Consortium

**HONDA**  
The Power of Dreams

## ■ CAR 2 CAR Demonstration



**CAR 2 CAR**  
COMMUNICATION CONSORTIUM

...that your skill level,  
...around you is THE  
...road users - if you  
...in big trouble. For  
...less visible on the  
...ter risk of death or  
...at an accident does  
...n more important. In  
...ated to inter-vehicle  
...ed to blowing the  
...radio report of an  
...are changing fast.  
...st innovation in the  
...ed a new Vehicle-to-  
...system aimed at  
...th motorcyclists and  
...es within a defined  
...network to provide



<h3>Emergency Vehicle</h3> <p>緊急自動車の存在情報提供</p>	<h3>Brokendown Vehicle</h3> <p>車車間通信 前方障害物回避支援</p>	<h3>Approaching motorcycle warning</h3> <p>交差点2輪/4輪 衝突回避支援</p>	<h3>Roadworks</h3> <p>路車間通信 道路工事位置情報提供</p>



## EU : C2C の取り組み

(CAR 2 CAR Communication Consortium)

- 1: Approaching motorcycle warning
- 2: Warning of roadworks/cy vehicle



Motorcycles become part of the connected vehicle world: BMW Motorrad, Honda and Yamaha cooperate to further increase safety of powered two-wheelers.

BMW Motorrad, Honda Motor Co. Ltd. and Yamaha Motor Co. Ltd. are now collaborating to enhance Cooperative-Intelligent Transportation Systems (C-ITS) applications in powered two-wheelers (PTWs) and working together to establish a consortium named Connected Motorcycle Consortium. According to the Memorandum of Understanding (MoU), which was signed by all ACEM manufacturing members in 2014, C-ITS features will be introduced from 2020 onwards (ACEM: European association of motorcycle manufacturers, [www.acem.eu](http://www.acem.eu)). In order to accelerate this process, the three manufacturers will begin their cooperation in the field of C-ITS now.



***GNSS Utilization***  
***(4) Automated Vehicles***

## Experimental Vehicle at Demonstration in '14 ITS world congress Detroit

### DGPS + IMU

自己位置測定および  
高精細MAPとマッチングに利用  
信号遮蔽時はジャイロで補正



### 3D LIDER

- ・周辺車両の検出と相対関係算出(デモ用に多重化)
- ・路面マーキング認知により自己位置精度向上(リファレンス)



### Side Rader

近傍の障害物速度および  
障害物までの距離を検出  
※対角に4機搭載



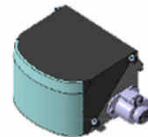
### Stereo Camera

路面マーキング(白線)検出と  
路肩の認識により車線維持  
ステレオ化により前方  
障害物迄の距離も計測



### 2D LIDER

周辺360°の障害物の位置・速度を検出  
白線および路肩の判定も行う(開発中)  
※前後左右 6機搭載



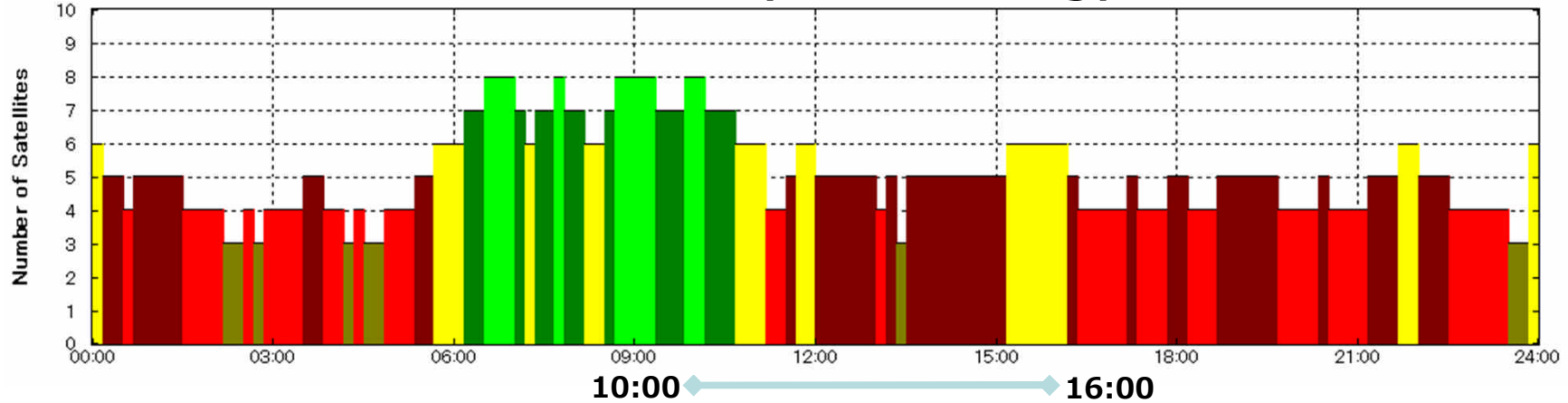
### Front Rader

遠方の障害物の速度および障  
害物までの距離を検出  
※前方,後方に各1機搭載



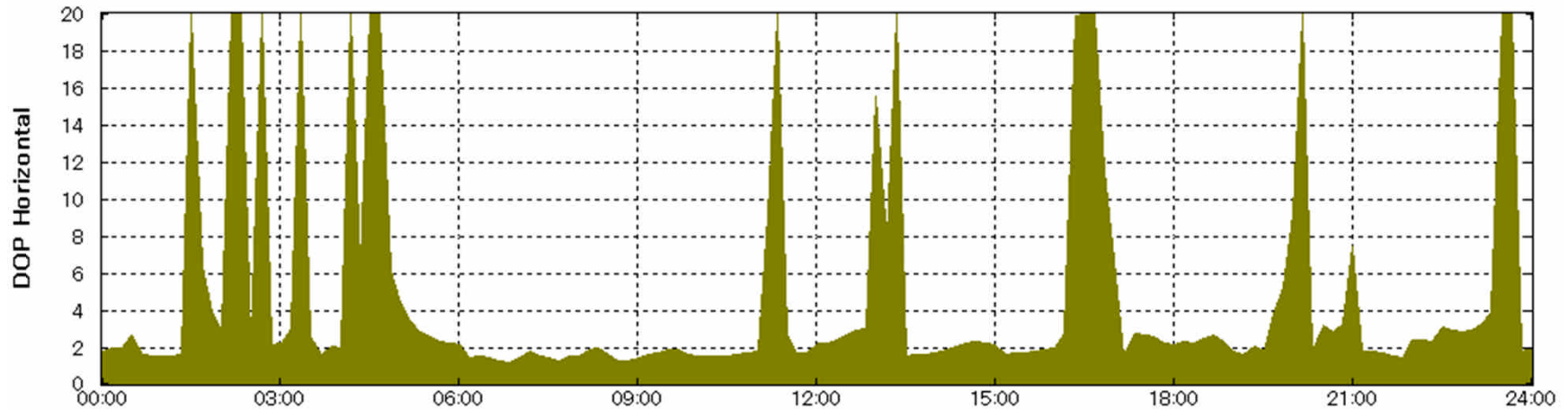
# Estimate an accuracy of GPS in Detroit(2014-09-01)

## ■ Number of GNSS satellite (over 30deg)



10:00 ← 16:00  
独自ショウケースの時間帯にGPS精度が不足する事が予想されていた

## ■ HDOP (dilution of precision 精度低下率 : 数値が高い方が精度低い)

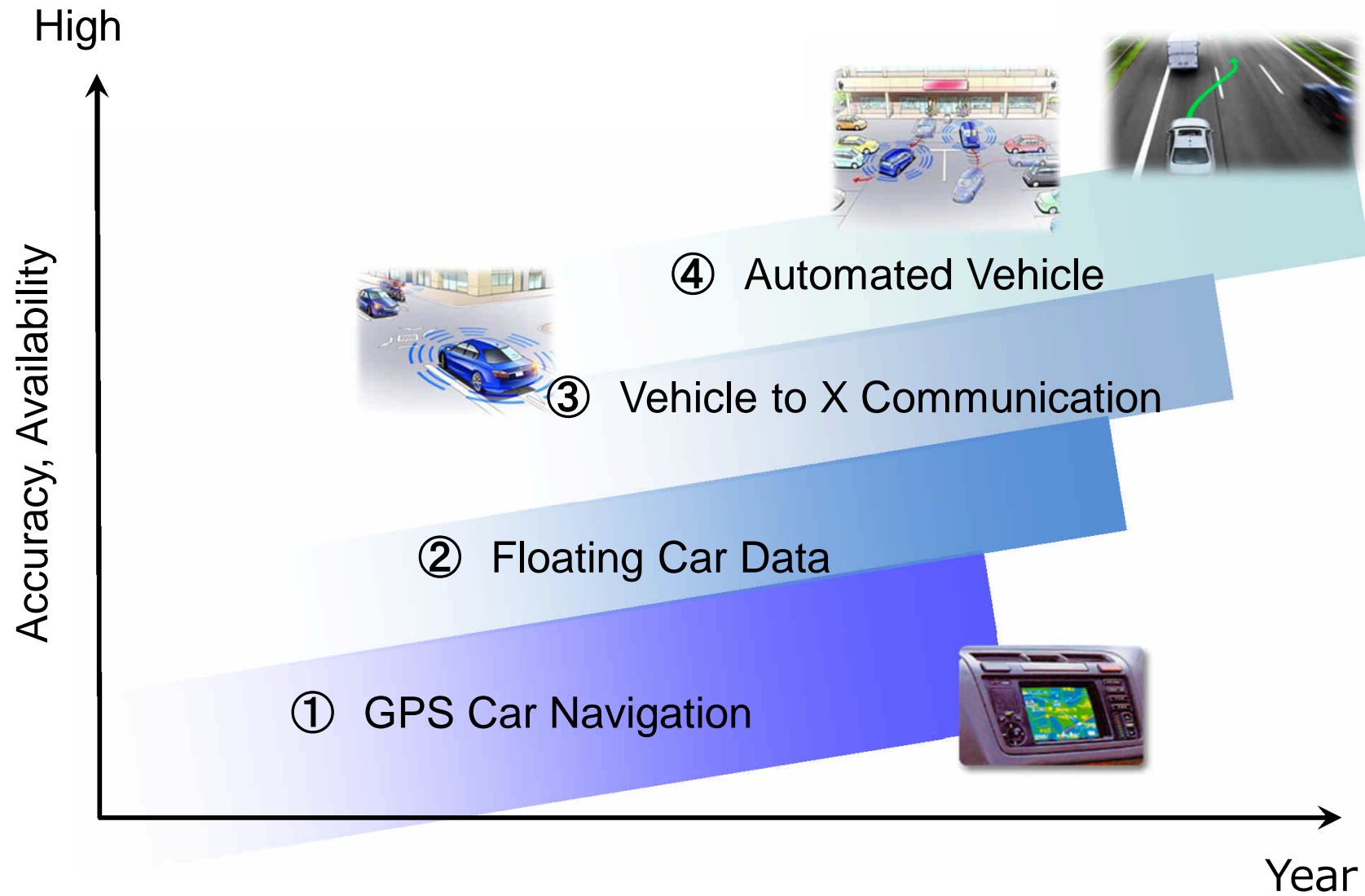




US: '14ITS World Congress Detroit

Honda Automated Vehicle and V2X

# SUMMARY



**The progress of GNSS can evolve the usage and the performance of a car.**

END

*Thank you for your attention.*