

Informative ISA combined with incentive for speed compliance

Traffic Research Group, Aalborg University and Topdanmark



- 1.** GPS/GPRS unit with a memory card where the digital map with the speed limits are stored, this unit is placed under the dashboard.



- 2.** GPS antenna placed behind the rear-view mirror.



- 3.** Display and loudspeaker placed in the air nozzle, the display shows the speed limit, penalty points for the actual trip and the total number of penalty points.

Cooperating partners: M-tec, Webhouse, Copenhagen University



Introduction

The purpose of the project is to examine whether equipment for Intelligent Speed Adaptation installed in drivers' cars combined with insurance discounts can motivate drivers to reduce speed.

The project contains three sub projects:

1. Development of ISA equipment e.g an On Board Unit (OBU) in the cars and a web server to handle log files.
2. Development of digital speed maps and a web application for local authorities to update the position of speed signs.
3. A test period of three years with 300 test drivers.

Development of ISA equipment

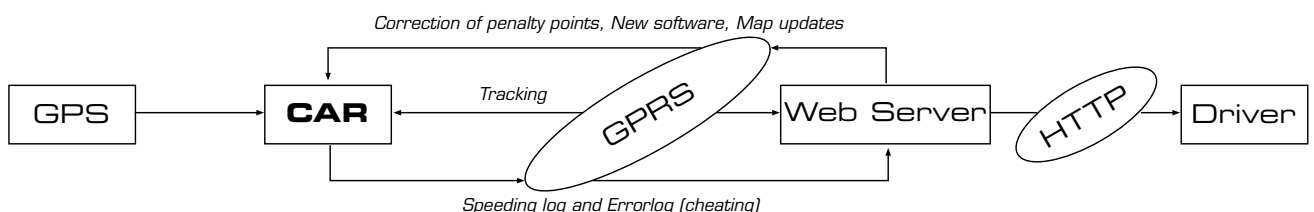
The OBU is made of three components.

1. **Display and loudspeaker** placed in the air nozzle. The display shows the speed limit, penalty points for the actual trip and the total number of penalty points.
2. **GPS/GPRS** unit with a memory card where the digital speed map is stored. The unit is placed under the dashboard.
3. **External GPS** antenna placed behind the rearview mirror.

The system works in the following way:

Each second the OBU receives a position from the GPS. The OBU calculates a position on the digital map, using a special technique called map matching, and displays the actual speed limit. The system then compares the speed limit with the actual car speed. If the car exceeds the speed limit by more than 5 km/h, the OBU gives the driver a verbal warning e.g. "50 – you are driving too fast". The warning is repeated every 6. second unless the speed is lowered to the actual criterion. After the second warning the system starts to calculate penalty points. The number of penalty points are related to the amount of the speeding. Penalty points for the actual trip are displayed in the lower right corner of the display, and the total number for the full period in the lower left corner of the display.

System Architecture



Screen dump from the web server showing details.

For every map matched position, the system also calculates the quality of the map matching. If the quality is too low the speed limit is shown on the display in brackets, and the system does not react on speeding. The map matching algorithm developed for the project has many parameters tuned for specific map and shows high accuracy and performance.

After each trip the OBU uploads a log file to the web server, if penalty points were earned during the trip. At nights the OBU uploads an error log where, amongst other things, attempt on cheating is logged. The OBU also uploads a one second log; this log is used for research purposes. During the night connection the server also uploads software updates, modifications to the digital speed map and corrections to the penalty points to active OBU's. Another option is to use the OBU for tracking stolen cars. Test drivers can call our hot line: By sending a SMS to the OBU, the OBU will return the position of the car.

Drivers can log in to a personalized project web page and see where and why penalty points have been calculated. The screen dump above shows a driver, who has driven in the northern direction on the motorway the 7th June 2006 at 19:44 when he got penalty points.



Web application for maintaining speed map.

The speed limit on this place is 90 km/h according to the system. He had got points four times with 6 second in between. The first time he got one point because his speed was 107, the second and the third time he got two points because his speed was respectively 112 and 111 (the number of points depends on the size of the speeding) the fourth time he had slowed down to 102 and he got only one point. Thus, the web page gives test drivers an opportunity to control the system. They can check their speeding and report the errors if any occurs.

Development of a digital speed map and a web application for maintenance

The digital speed map is based on the registration of all speed signposts in the county of North Jutland including approximately 22,000 km of roads.

A GPS logger with a special designed keyboard has been used for this purpose.

The local road authorities updates the speed map via a web application also developed in the project. Road Authorities can insert new speed signs, delete existing ones and they can change speed limits or change the positions of signposts.



A three-year field test with 300 test drivers

The project aims at having a total of 300 test drivers for a full three year period. A precondition for participation is that the car insurance is held in the insurance company Topdanmark, which accept to offer a discount of up to 30% of the insurance rate. The three years are divided in 6 periods of 6 months. After each period the drivers are payed 30 % bonus on their insurance rate minus 7 cent for each penalty point registered in the period.

Different groups

In order to estimate the relative effect of ISA information and economic incentive an experiment is conducted during the first 6 month period of the project. Drivers are randomly assigned to one out of four groups. The first 1½ month of this period serves as a baseline condition with speed registrations only. Thus the OBU logs their driving speed but the display turned off, and no penalty point is calculated. After the baseline period the drivers are randomly assigned to one out of four treatments for the next 4½ month:

Combination group: The display is turned on and the driver receives information about the speed limits and speeding. The lower line on the display is also turned on. The drivers get penalty points depending on their speeding. After the six months the drivers get 30 % bonus on their insurance rate subtracted 7 cent for each penalty point.

Information group: The display is turned on and the driver receives visual and auditory information about the speed limits and speeding, but no penalty points are given. After six months the group will get the full 30 % bonus.

Incentives group: The display is turned off, but the speeding is logged, and the driver gets penalty points. The driver can not see the penalty points when he is driving, but after the trip he can see the points on the web. After the six months the drivers get 30 % bonus on their insurance rate subtracted 7 cent for each penalty point.

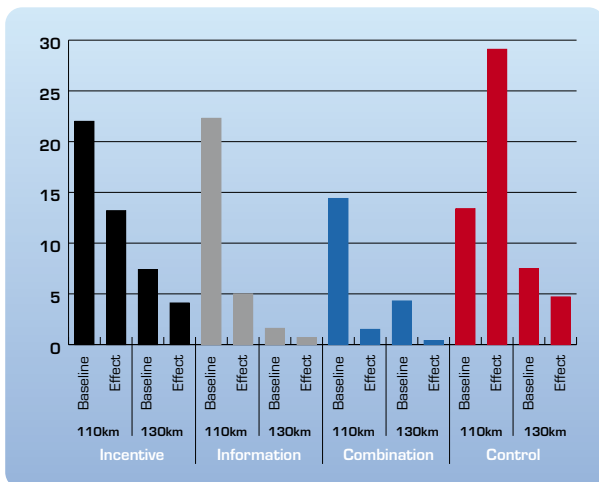
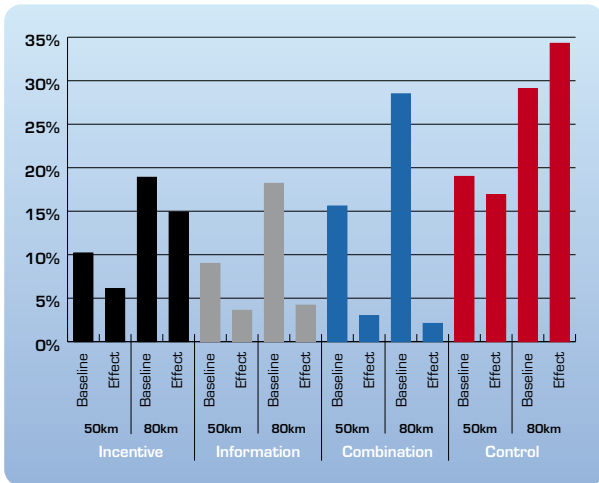
Control group: As for the first six weeks, the OBU logs their driving but the display is turned off, and no penalty point are given. This group will after six months get the 30 % bonus independent of their speeding.

After the first six months of driving in different groups all test drivers are transferred into the combination group for the remaining 2 ½ year of the project. of the 3 years.

Primary results

By May 2007 results from a small group - 38 test drivers - were available for analysis. The baseline period (1½ month) have been compared with the next 1½ months. In the following presentations of preliminary results we use the terms "baseline" and "effect" for the these two periods.

In these first three months the 38 participants drove approximately 156,000 km. corresponding to 11.9 million GPS positions.



The figures below shows the percentage of mileages driven with more than 5 km/h over the speed limit in the four groups. The largest impact from ISA is on rural roads in the combination group with a speed limit at 80 km/h with a registered decrease of speeding from 29 % to 2 % of the total kilometres driven.

More information

On the website: <http://www.sparpaafarten.dk/en>

- you can also send a request for the following project papers from the proceedings of the 6th European Congress on ITS, Aalborg. ERTICO:

Lahrman, Harry et. al; (2007) ; "Spar på Farten" an intelligent speed adaptation project in Denmark based on Pay As You Drive Principles

Tradisauskas, Nerius et. al.; (2007) Map Matching for Intelligent Speed Adaptation;

Agerholm, Niels et.al., (2007) Speed map maintenance – experiences from the Intelligent Speed Adaptation project, Spar paa Farten

Harms, Lisbeth, et.al.; (2007) Effects of ISA on the driving speed of young volunteers. A controlled study of the impact information and incentives on speed

Agerholm, Niels et.al.; (2007) Preliminary Results From the Danish ISA Project "Spar paa Farten".

Klarborg, Brith et.al.; (2007); A new perspective on ISA-Equipment: Assistive devices for drivers with acquired brain injury.

	50 km			80 km			110 km			130 km		
	Baseline	Effect	Impact	Baseline	Effect	Impact	Baseline	Effect	Impact	Baseline	Effect	Impact
Incentive	48	47	-1	81	80	-1	112	111	-1	128	127	-1
Information	48	47	-1	81	79	-2	111	109	-3	124	125	1
Combination	50	47	-2	84	79	-5	111	109	-2	109	127	0
Control	50	50	0	84	86	-2	111	113	2	113	127	-2

The table shows the impact on free flow speed defined as the average speed when all speed below the speed limit is removed. Also this comparison shows a higher impact of ISA in combination group on 80 km roads with 5 km/h.