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INTELLIGENT SPEED ADAPTATION BASED ON PAY AS YOU DRIVE PRINCIPLES

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ABSTRACT

The paper describes an Intelligent Speed Adaptation (ISA) project in Denmark called *Spar på Farten*. The project is based on Pay As You Drive principles, which means that the ISA equipment both gives a warning when the driver is speeding but also gives penalty points which reduce a promised bonus of 30 % on the insurance rate. In the project we have developed an On Board Unit (OBU) for ISA with mobile telephone (GPRS) connection to a web server, an advanced map matching program, and an air based map update function. We have developed a speed map for 22,000 km roads, including a web based maintaining tool. The project will proceed in a three year test period with the goal to involve 300 car drivers as participants in the project, and we have some very promising preliminary results from the first 3 months of driving, e.g. showing that the percentage speeding more than 5 km/h on 80 km roads is reduced from 28% to 2%. Until now 90 OBU are installed.

INTRODUCTION

Europe's grim road accident statistics compelled the European Commission in 2001 to set a target of halving the number of road deaths in Europe by 2010, but still in 2005 41,000 people were killed and 1.7 million were severely injured in the 1.3 million accidents that occurred only on Europe's roads. To achieve this ambitious goal of the European Commission the efforts to prevent the accident from occurring in the first place has been increased. Intelligent Speed Adaptation (ISA) and other ITS-systems will certainly be a key factor to achieve the target. [1].

ISA is a general term for systems that establish the geospatial position of a car, compare its current position and speed with a digital road map which includes the local speed limits, and it prompts the driver if the speed limit is exceeded. The prompting can take various forms; it can be as a visual and/or audio signal; ISA can register the speed limit violation in an on-board car computer; there can be a built in resistance in the accelerator when the speed limit is exceeded; and eventually it can be made impossible to exceed the speed limit. The different ISA-systems can be classified as informative, advisory, recording, or intervening systems [2].

In the last 10 years many ISA projects in several European countries have shown the potential of ISA. The large-scale Swedish trials in Borlänge, Lidköping, Lund and Umeå during

the period 1999-2002 involved between 4,000 and 5,000 cars. One of the main findings was an average speed reduction of 3-5 km/h and if everyone had ISA, the Swedish findings show there could be 20% fewer road injuries. The Swedish trials were limited to urban areas. [3] [4]. Also field trials in Belgium, UK, France, Australia and the Netherlands have shown promising results, but in all ISA projects until now the participants have been volunteers and with a bias in the age distribution against the older age groups[5][6][7].

The first ISA project in Denmark was with an informative and advisory ISA-system and called INFATI. It was carried out at Aalborg University from 1 July 1998 to 31 June 2001. The advisory system was a friendly female voice telling the speed limit and the sentence *You are driving too fast* every 6 seconds when speeding. The project was small consisting of only 24 drivers tested for 6 weeks, but the results from INFATI were promising. The INFATI pilot project resulted in speed reductions of about 5 to 6 km per hour corresponding to approximately a 25 % reduction in the risk of road accidents [8]. Compared to other ISA projects the INFATI project took place in both urban areas and rural areas and it showed that the decrease of speed was largest in rural areas, an interesting result due to the fact that most severe accidents and fatalities happen in rural areas.[9]. The INFATI project also showed that the female voice was very effective as a speed reduction tool [10].

The general problem for a voluntary implementing of ISA and other technology to get drivers to have a more safe attitude in traffic, is that the most drivers did not realize there driving as risky – and that the statistics support this understanding. Form the individual drivers' point of view: Speeding is not dangerous: He can speed every day year by year without being involved in an accident. If he for example is driving 18,000 km/year, he will in average be involved in an accident with seriously injured in the car once every 700 years. Thus, from his point of view speeding is no problem so why gets an ISA equipment installed? Only when we as society are summing the consequences – over 40,000 deaths in traffic in Europe every year - speeding gets unacceptable. In other word: The traffic is a bad teacher – there is no relationship between a wrong act and the consequences. To overcome this problem, there have been trials where different kinds of incentives have been linked to good behaviour in traffic. Traksure was a trial carried out in Ireland in 2001, where AXA Insurance used a GPS/GSM OBU to monitor young male drivers speeding [11]. In the Belonitor trial in the Nederland's 62 lease cars was equipped with ITS equipment, which continuous tracks and gave feedback on driving speed and following distance. Furthermore rewards were given by the preferred behaviour. The results show a very strong influence of rewarding. [12].

STUDY DESIGN

The target group for this project is primarily young drivers aged 18 - 27 years. This group is known to be overrepresented in road accidents. Taken as a whole this age group is less likely to adhere to speed limits, they are less experienced and they also pay a high insurance rate on their car. The overall purpose of the project is to examine whether equipment for ISA installed in drivers' cars, in combination with discounts on insurance rate, can motivate drivers to reduce speed and thus possibly save lives.

Getting insurance cover for a new, young car driver is very expensive in most countries – in Denmark about 2,000 €/year. Based on the insurance companies' experience with the total amount of indemnifications for this group of young people, insurance rate will probably be even more expensive than today's rate. For every 100 € paid as insurance fee 130 € are paid back to the young drivers as indemnification. This fact gives the reason for the design of the project; you can meet the young car drivers' need for cheaper insurance rate by rewarding

them for respecting the speed limits.

The project is a collaborative project carried out by Aalborg University, the County of North Jutland, the large Danish insurance company "Topdanmark", the computing services company M-tec and Department of Psychology at Copenhagen University.

As in the previous *INFATI* study the ISA equipment, the so-called "On Board Unit" (OBU) receives the cars position from the GPS receiver. This position is matched onto a digital speed map stored in the OBU. By matching the position and the speed map the system calculates the current speed limit, which is shown in a display and compared to the actual speed of the car. If the car exceeds the speed limit by more than 5 km/h, the OBU gives the driver a verbal warning e.g. *"50"*. The warning will be repeated every 6 seconds until the speed is below the speed limit + 5 km/h, and after the second warning the system will ad the sentence *" you are driving too fast"* to the speed limit and give penalty points every 6 seconds. The penalty point numbers are related to the size of the speeding in the same way as the Danish police have prepared their structure of speeding fines. The method has a progressive structure so that a small violation is not punished as severely as a serious and dangerous violation. From a starting point the driver will get 30 % discount on their insurance rate, and every 6 months the discount will be sent to the driver, but with a deduction of 7 cents (€) for each penalty point they have received in the period. The discount can never become negative.

In this way the main research questions for the project are:

- *Can Intelligent Speed Adaptation support drivers in keeping the speed limit and thereby contribute to saving lives in traffic?*
- *Will the results of the project have a permanent effect on traffic behaviour?*
- *Can Pay As You Drive principles contribute to young people's development of safer behaviour in the traffic?*

The project contains three sub projects:

1. The development of a second generation of the ISA equipment, both an OBU with GSM and a web server to handle log files from the OBU.
2. The development of digital speed maps and a web application for local authorities to update the position of speed signs.
3. A three year test period involving 300 car drivers as participants in the project.

In the following the three themes will be presented separately

DEVELOPMENT OF ISA EQUIPMENT

Figures 1 and 2 shows a system diagram and the OBU placed in the car, respectively.

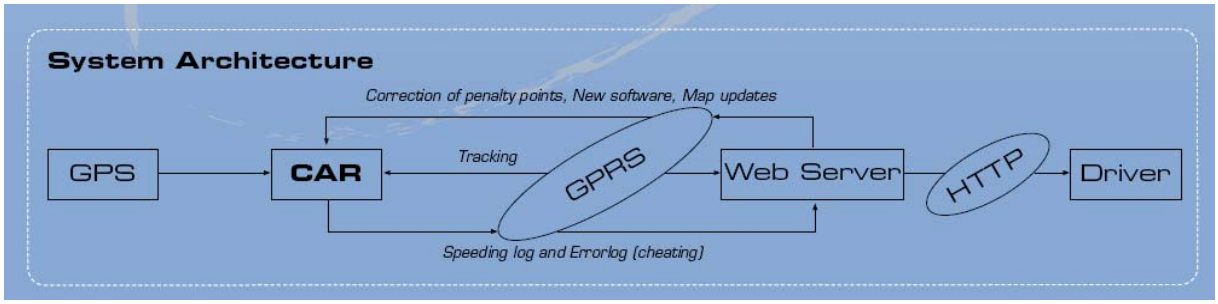

Figure 1 System diagram for the ISA equipment

GPS Antenna placed behind the rear-view mirror

GPS/GPRS unit with the digital speed map on a memory card – placed under the dashboard

Display and loudspeaker placed in air nozzle

Figure 2 — The On Board Unit

The OBU is made up of three components:

- GPS/GPRS unit with a memory card where the digital map with the speed limits are stored, this unit is placed under the dashboard
- 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
- GPS antenna placed behind the rear-view mirror.

The system works in the following way:
Every second the OBU receives a position from the GPS. The OBU calculates a position on the digital map, the so-called map matching, and shows the actual speed limit in the display, it also compares the speed limit with the actual speed of the car, and as mentioned before, if the car is speeding the system will give penalty points. The penalty point numbers are related to the size of the speeding. The penalty points for the actual trip are shown in the display in the lower right corner, and the total number for the actual period is shown in the lower left corner of the display. In the project a new and advanced map matching algorithm with high performance has been developed, and for every map matched position the system also calculates a map matching quality. If the map matching quality is too low the best guess on the speed limit is shown on the display, but in brackets, and the system does not react on speeding [13].

After each trip the OBU uploads information about any speeding to a web server, and the driver can immediately log in on a personal web page and see where and why if he/she has got penalty points. Figure 3 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. The speed limit at this place is 90 according to the system. He got points four times with 6 seconds 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 112 and 111, respectively (the number of points depends on the size of the speeding). The fourth time he had slowed down to 102 and only got one point.

The purpose of this web page is to give the car driver an opportunity to check the system. If the driver thinks, that the penalty points are wrong maybe because the digital map has a wrong speed limit or the system has map matched to a wrong road, he can check the system on the web and call the project's hot line to make a complain. If he is right the hotline can

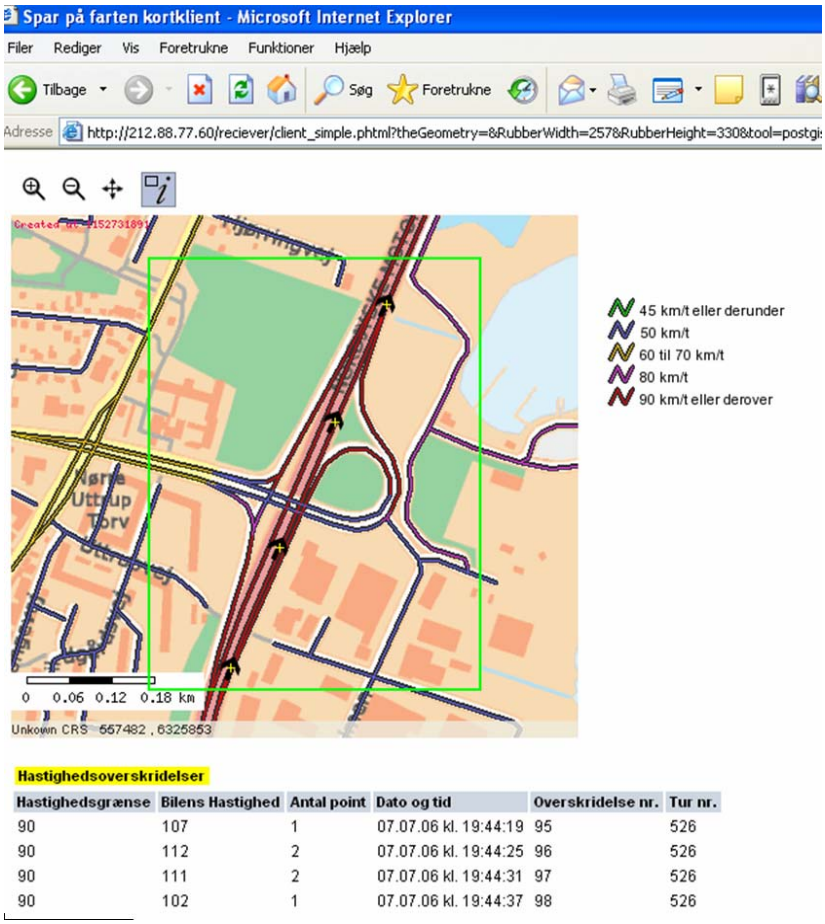

Figure 3 — Screen dump from the web server showing details about penalty points from a trip

remove his penalty points and the next night the correction will be sent from the web server to the OBU.

The OBU uploads an error log every night where, amongst other things, attempt on cheating is logged. The OBU also uploads a *one second log*. This log is for research purpose only and holds all information logged every one second. When there is this night connection between the OBU and the server, the server can also upload software update, modification to the digital speed map and correction to the penalty points to the OBU. Finally the OBU has a tracking function. If the car is stolen, the owner calls our hot line, and the hot line will send an SMS to the OBU, and the OBU will return the position of the car.

THE DEVELOPMENT OF DIGITAL SPEED MAPS AND A WEB APPLICATION FOR LOCAL AUTHORITIES TO UPDATE THE POSITION OF SIGNS

The digital speed map is based on the registration of road signs regarding speed restrictions on the roads for the whole county of North Jutland, about 22,000 km of roads. This registration was done with a GPS-logger connected to a specially designed keyboard with a symbol for each speed sign (figure 4)

Figure 4 — Special designed keyboard for registration speed sign

The local road authorities are updating the speed map via a web application developed in the project (figure 5). They can put up new speed signs, delete existing ones, make changes of speed limits or change the positions of the signs. In this way, in theory, we always have an updated digital speed map. Practice has shown that maintaining the

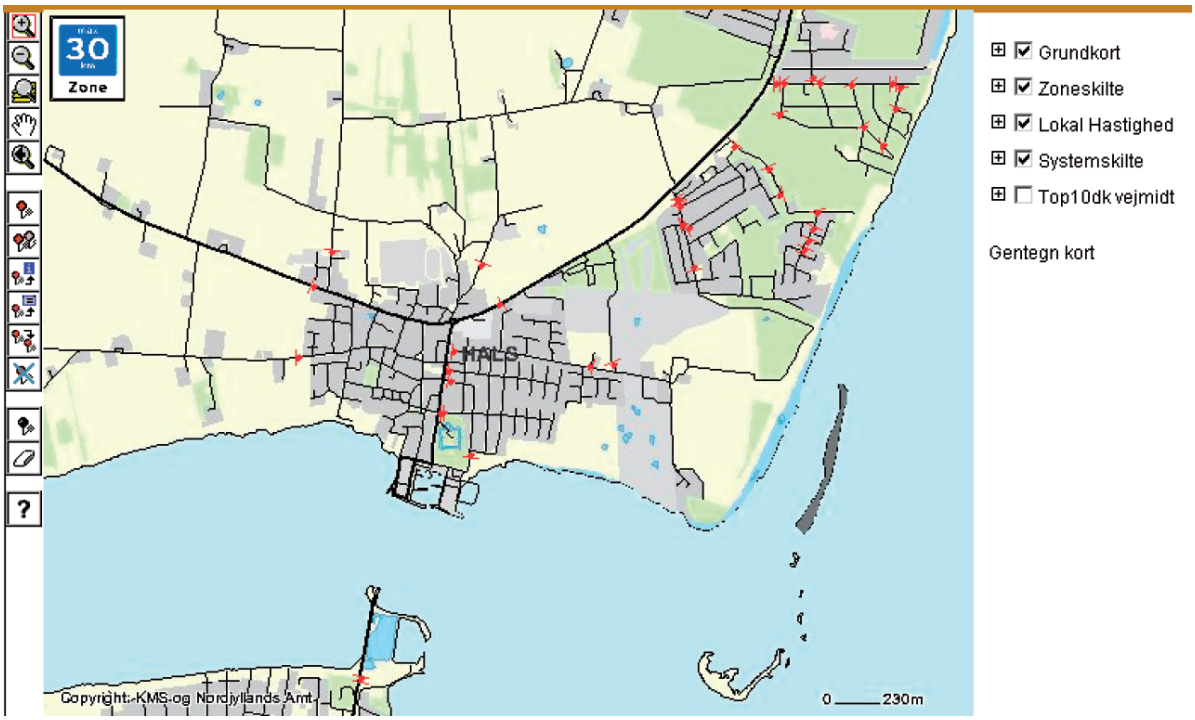

Figure 5 — Web application for maintaining speed map

speed map gives many administrative problems. [14].

The detailed digital speed map, covers only the county of Northern Jutland. In the rest of Denmark the speed map includes all roads with a speed limit of 90 km/h or more, and only on these roads the drivers are allowed to drive faster than 80 km/h. On all other roads in the rest of Denmark the OBU will react if they exceed 80 km/h, which is the general speed limit in rural areas in Denmark. In this way we can prevent the drivers from speeding in rural areas, when they are outside North Jutland. We cannot prevent them from driving too fast in urban areas for example, where the general speed limit is 50 km/h. If the car is outside Denmark we have no speed limits, and the system will not work. [15] [16].

A THREE-YEAR TEST PERIOD INVOLVING 300 CAR DRIVERS AS PARTICIPANTS

From the starting point the goal was to have 300 young car drivers between 18 and 24 to drive three years in the project. The criterion for participating is that they are car owners and also that they are insured with the participating insurance company, Topdanmark.

The basis for this goal was that all implemented ISA projects have until now only been running for a relatively short period, e.g. the Lund trial with the Active Acceleration Pedal had a total test period up to 11 months [17], and many others have been running for an even shorter period. In this project we therefore wished to investigate the development in effect over time. A long test period will also ensure that a large amount of empirical data is collected, and give experience with maintenance of speed maps. Finally, it will give much operational experience with the ISA equipment.

The three years are divided in 6 periods of 6 months. After every period the drivers get the bonus on their insurance rate. In the first 6 month period, however, the drivers are divided randomly in four groups with different modes. The idea is to test the impact of the two fac-

tors in the project: the display with the female voice when speeding (information), and the penalty points (incentive). The 1½ month is for all drivers a before period, where the OBU logs their driving, but with the display turned off, and no penalty points calculated. After the 1½ month period the drivers are driving in the following groups for the rest of the six month period:

Control group: As for the first 1½ month, the OBU logs their driving but the display is turned off, and no penalty points are given. This group will after six months get the 30 % bonus without any subtraction for penalty points independent of their speeding.
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, the lower line on the display will be empty. After six months the group will get the full 30 % bonus
Incentives group: The display is turned off, but even so the speeding is logged, and the driver gets penalty points. The driver cannot see the penalty points when he is driving, but the next day the driver can see the points he got yesterday on the web. After the six months the drivers get 30 % bonus on their insurance rate subtracted 7 cent for each penalty point in the past 4½ month period.
Combination group: The display is turned on and the driver receives visual and auditory information about the speed limits and speeding, the lower line on the display is also turned on and the drivers will 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 in the last 4½ month period

After the first six months of driving in different groups all drivers are transferred into the same group, the combination group, and they stay in that group for the remainder of the 3 years. In this way it becomes possible to compare the relative effect of ISA information and ISA incentives.
In the evaluation of the experiment we will use both qualitative and quantitative methods. We will examine the drivers' attitudes towards respecting the speed limits, and we will compare their attitudes with a control group. A first evaluation is already done [18]. We will analyse the log data from the cars to examine whether they have changed their choice of speed, when driving with the OBU. Also here a first evaluation is already done, and the results are described in the next paragraph.

PRIMARY RESULTS ON SPEED BEHAVIOR

DATA

Since the project is still being expanded, it has been decided that the "after period" similar to the "before period" with a duration of 1½ months will be used for this survey, in all two times 1½ months. In this survey, the number of participants in the four groups is as follows: Information: 9, Incentive 10, Combination 10 and Control 9. Total 38 participants who are randomized distributed in the four groups. The survey is based on GPS-data, which is collected once a second. This log file contains information about among other things date, time, speed, position, road number and speed limit for each second. Driving in areas with speed limits less than 50 km/h is very limited, and the results are assessed as too uncertain and therefore they are only used as part of the general results. However, 11.9 million GPS-positions are used and the 36 participants have a mileage of 156,000 km in all. For an overview of the mileage in each group see table 1.

Group/Speed	<50 km/h	50 km/h	60 km/h	70 km/h	80 km/h	90 km/h	110 km/h	130 km/h
Incentive before	404	3,082	502	405	9,596	886	2,663	1,987
Incentive after	399	3,768	937	473	9,437	833	2,979	1,558
Information before	188	3,357	1,768	652	8,027	570	2,023	2,034
Information after	243	3,973	2,263	744	8,827	1,019	1,400	1,809
Combination before	197	3,186	1,061	451	10,963	776	2,728	3,255
Combination after	258	3,075	945	364	11,817	773	2,801	4,152
Control before	134	2,521	679	376	8,599	179	414	573
Control after	155	2,745	795	466	8,908	435	1,357	1,861

Table 1: The mileage (km) in the four groups in the before and after periods. The distribution in mileage in some groups is partly caused by some data errors in the before period.

Mileage in table 1 is the participants' total mileage, but in relation to speeding only speed in free flow situation is interesting, *free flow speed* mean when a driver's speed choice is not depending on the speed of other road user. It is not possible from the log file to see when the drivers speed choice is *free flow speed*. But it is possible to separate out speeds, where the speed has been significantly under the speed limit, and the driver most likely have not been in a *free flow speed* situation. This is done in Table 3, and the calculations in this paragraph are based on this dataset. The amount of data in some of the groups in Table 3 is limited. For that reason calculations are only done on the following speed limits: 50, 80, 110 and 130.

Speed limit	15	20	25	30	35	40	45	50	60	70	80	90	110	130
Minimum "Free Flow Speed"	5	10	15	20	20	25	30	35	45	55	65	75	90	100

Table 2. All speeds under the Minimum "Free Flow Speed" are removed from the dataset in table 3.

Group/Speed	<50 km/t	50 km/h	60 km/h	70 km/h	80 km/h	90 km/h	110 km/h	130 km/h
Incentive before	-	2,201	384	314	7,470	819	2,477	1,798
Incentive after	-	2,663	685	367	7,411	754	2,760	1,383
Information before	-	2,280	1,472	440	6,313	524	1,881	1,899
Information after	-	2,665	1,897	513	6,824	943	1,294	1,632
Combination before	-	2,341	871	364	8,574	676	2,318	2,908
Combination after	-	2,179	779	268	9,283	682	2,479	3,713
Control before	-	1,874	558	287	7,141	148	375	553
Control after	-	2,009	641	357	6,994	352	1,257	1,811

Table 3. "Free Flow Speed" mileage (km) in the four groups in the before and after periods.

Before presenting the results, a brief description of the Danish speed limits follows. In general the speed limits in Denmark are 50 km/h in urban areas, 80 in rural areas and 130 on motorways. Apart from general speed limits urban areas roads can have a reduced speed limit of 45, 40, 35, 30, 25, 20 or 15 km/h and some of the main roads can have a speed limit of 60 or 70 km/h. In rural areas the speed limit can be reduced e.g. close to small villages or near accident intersections with a high number of accidents and in areas with holiday homes. Half of the motorways have a speed limit of 130, the majority of the other half has 110 and a few motorways with very high traffic intensity have 90.

METHODOLOGY

All results concerning speeding are based on mileage and not time. Based on a GPS-position each second the mileage pr. second is calculated by dividing the speed in km/h with 3,600. Then all GPS-positions pr. km/h pr. group are summarized and the following calculation can be done:

- Mean speed and statistical variance before and after.
- 85 % fractile for the speed distribution before and after. In traffic planning it is gener ally accepted, that if the 85% fractile is below the speed limit the location has no speeding problems
- Since the ISA-equipment informs and gives penalty points when the speed limit is ex ceeded by more than 5 km/h the percentile mileage with higher speed violations than 5 km/h is calculated. By this presentation the specific impact of the ISA-equipment can be defined very precisely because it measures the percentile of driving resulting in penalty points
- Frequency curves before and after for the different speed limits.

Only “Free Flow Speed” are used in the calculations.

RESULTS

Mean speed

		50 km/h		80 km/h		110 km/h		130 km/h	
		speed	variance	speed	variance	speed	variance	speed	variance
	Before	45,7	7,7	79,2	8,5	110,2	9,1	119,9	10,8
Incentive	After	45,2	7,1	78,4	8,4	109,1	7,6	121,1	9,1
	Before	45,7	7,4	79,7	10,2	109,4	9,0	119,9	7,2
Information	After	45,2	6,1	78,1	6,7	106,7	6,3	120,2	7,4
	Before	47,3	9,2	81,8	10,9	106,3	9,3	115,9	10,1
Combination	After	45,2	6,3	77,4	5,5	106,6	6,7	116,0	9,2
	Before	48,0	9,2	82,2	10,4	109,3	7,9	119,0	10,6
Control	After	47,9	8,8	84,0	12,5	111,5	9,4	121,2	8,2

Table 4: Mean speed (km/h) and standard deviation before and after for the four groups.

In Table 4 the speed is based on mean speed and variance distributed with different speed limits. As expected the greatest impact is in the combination group, followed by the information group and at last the incentive group. The control group shows an increase in the mean speed.
On 50 km/h roads the effect is limited, but not surprising; it is well known, that acceptance of speed limits among road users is higher in urban areas than in rural ones [19]. The biggest effect was observed on rural roads with 80 km/h, the combination group has the biggest decrease in speeding, followed by the information group and with the smallest positive effect for the incentive group and a speed increase for the control group. The 110 km/h roads show an unexpected result: as expected there has been a decrease in the incentive and information group and an increase in the control group. But in the combination group there has been a minor increase on 0.3 km/h in the mean speed. On 130 km/h roads we see minor increases in the mean speed, but the increases are small and probably within the uncertainty related to the measurement.

The variation in the control group speed can be related to both uncertainty in measurement and the limited amount of data in this primary calculation of speed changes in the project. Another hypothesis is that the drivers in the control group – even when the equipment has been turned off in the whole period - have been influenced on thier speed behaviour. An influence which can be presumed to decrease over time – they forget that the OBU is logging their speed behaviour as time goes by.

		50 km/h		80 km/h		110 km/h		130 km/h	
			Diff.		Diff.		Diff.		Diff.
	Before	51.0		86.6		118.7		131.1	
Incentive	After	49.7	1.3	84.7	1.9	114.7	4.0	130.8	0.3
	Before	50.9		87.0		118.1		125.6	
Information	After	49.9	1.1	82.1	5.0	112.4	5.7	126.6	-1.0
	Before	54.2		90.8		115.1		126.6	
Combination	After	50.1	4.1	81.5	9.3	111.8	3.3	127.4	-0.7
	Before	55.8		91.7		114.9		130.2	
Control	After	54.8	1.0	94.0	-2.3	120.9	-6.0	130.0	0.2

Table 5: 85 % fractile speed (km/h) before and after for the four groups in the trial

85 % fractile

Table 5 shows the speed changes computed as 85 % fractile. The overall picture is similar to the mean speed results, but the numerical changes in the speeds are bigger. Measured on the 85 % fractile the combination group — in contrary to the mean speed — shows a decrease in speed on 110 km/h roads. The results must probably be related to the fact, that data in this primary investigation is limited.

	50 km/h		80 km/h		110 km/h		130 km/h	
		Diff.		Diff.		Diff.		Diff.
Incentive before	10%	4%	19%	4%	22%	9%	7%	3%
Incentive after	6%		15%		13%		4%	
Information before	9%	5%	18%	14%	22%	17%	2%	1%
Information after	4%		4%		5%		1%	
Combination before	16%	13%	28%	26%	14%	13%	4%	4%
Combination after	3%		2%		2%		0%	
Control before	19%	2%	29%	-5%	13%	-16%	7%	3%
Control after	17%		34%		29%		5%	

Table 6: Percentage which is exceeding the speed limit by more than 5 km/h before and after ISA activation for each the four groups.

Percentage speeding

In table 6 the speed changes are described as changes in the percentage, which are exceeding the speed limit by more than 5 km/h before and after for the four groups in the trial. The table shows much undisputed effect from two factors – both the information (feed-back on speeding) and the economic incentive. When calculated this way, there is consistency between the groups, in that the combination group as expected shows the biggest effect. Calculated in this way the combination group has decreased their speeding on 80 km/h roads from 28 % of the mileages to 2 % - a convincing effect. Thus, the big deviation for the control group on 110 km/h roads shows that the uncertainty of the results is still significant.

Speed distribution on 80 km/h roads

Speed distribution indicates the range of speed on a road. If the distribution is small it means that most of the traffic is driving with an almost similar speed. Some older traffic safety studies have shown that increased speed distribution results in an increased number of acci-

dents [20]. The speed impact on the speed distribution for the four groups is shown on the next page.

In the incentive group only minor changes in the distribution has been observed from before to after. The distribution is a little closer to the 80 km/h limit after than before and it is especially the speeding part that is reduced. The distribution has changes from 8.5 to 8.4 km/h. See figure 5.

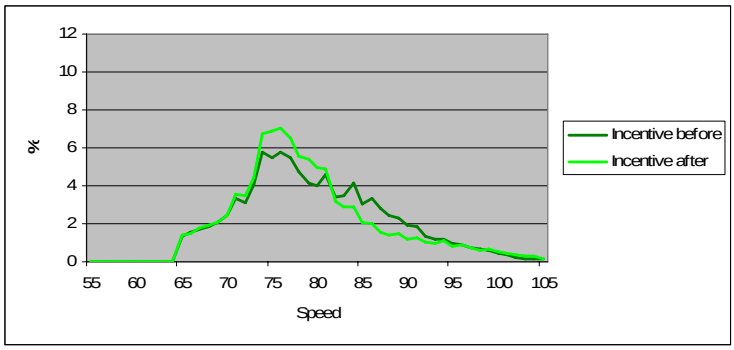

Figure 5 Speed distribution on 80 km/h roads for the incentive group before and after

In the information group some changes in the speed distribution has been observed from the before to the after group. The distribution is closer to the 80 km/h limit after than before and it is especially the speeding above 5 km/h that is reduced. The distribution has changes from 10.2 to 6.7 km. See figure 6

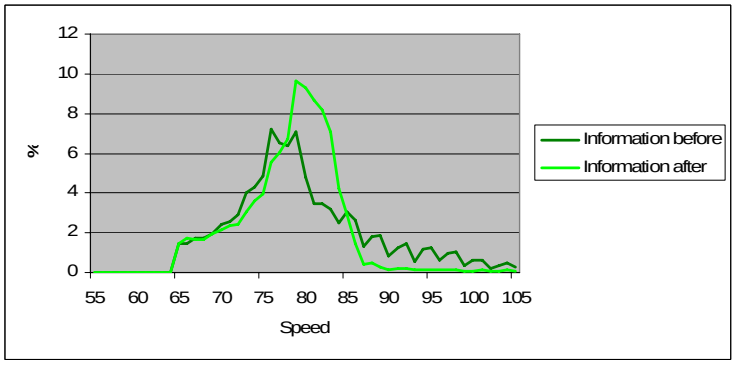

Figure 6: Speed distribution on 80 km/h roads for the information group before and after

In the combination group the distribution has decreased the most, from 10.9 to 5.5 km/h. Especially speeding is reduced and speeding with exceeding speed limits by more than 5 km/h has almost disappeared. See figure 7.

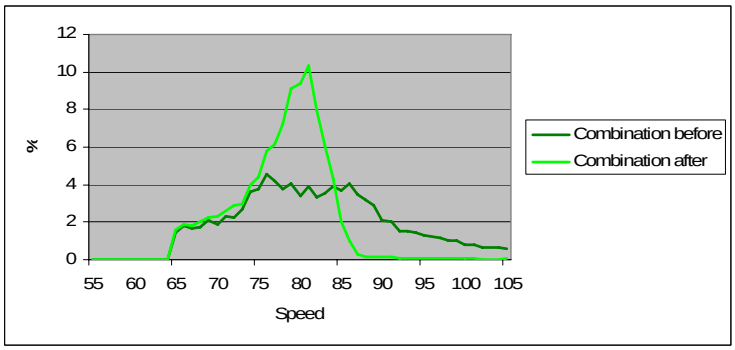

Figure 7: Speed distributions on 80 km/h roads for the combination group before and after

Only minor changes have been observed in the control group, but the speed distribution has increased from 10.4 to 12.5 km/h. See figure 8.

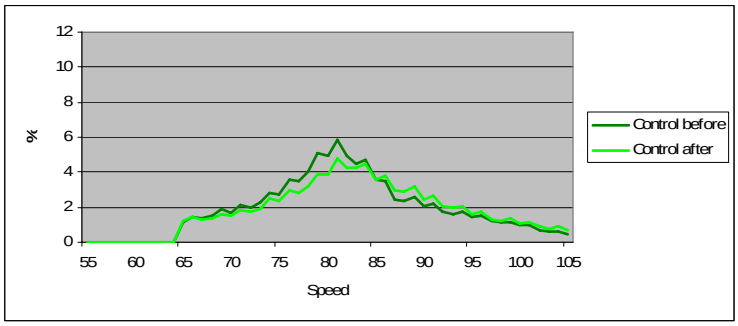

Figure 8 Speed distributions on 80 km/h roads for the control group before and after

The study of the speed distribution curves for the four groups shows that the ISA equipment gives a significant decrease in the speed distribution, most significant for the combination group, then the information group and least for the incentive group. A decrease, which with reference to the literature will give safety benefits

CONCLUSIONS

This paper describes the first primary results from the *Spar Paa Farten* project. The first ISA project based on Pay As You Drive principles. The results are based only on a small group of participants and are therefore very primary. When data from all participants will be part of the survey, it might give more reliable results, but this first result shows that both economic incentive and information about the speed limits reduce the test drivers speeding. The combination group showed the biggest decrease, then the information group, and the smallest decrease showed by the incentive group. It is interesting that it seem to be so that information gives more effect than economic incentives. However, the impact of incentive might increase over time, when the test drivers have got there first bonus check from the insurance company, whereas the impact of information with no penalty points might diminish over time, when the drivers get used to it. The result from the control group shows, that there is some uncertainty in the results. But anyhow, even though the results are only founded on a short period and on a minor number of participants the main results are with good likelihood reliable.

Drivers with both information and economic incentives have reduced their mean "free flow speed" by 2.1 km/h on urban 50 km/h roads and by 4.4 km/h on rural 80 km/h roads. Furthermore, on the 50 km/h roads they have reduced the percentage driving when exceeding speed limits by more than 5 km from 16 to 3 % and for the rural 80 km/h roads the change has been from 28 to 2 %. So it seems that the *SPF* ISA-project has the best impact on 80 km/h roads. Moreover, the speed distribution on 80 km/h roads is reduced from 10.9 to 5.5.

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