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Mount Vesuvius loomed distantly over the small hillside hotel, while faint scents from the many lemon groves crept into the meeting room. This was the place for the third General Assembly meeting in MeBeSafe.

In many ways, it was an ideal place to gather. Not because of the approaching spring or the stunning views of course, but because of what it represents for the project.

"Getting from Naples Airport to Sorrento was the ultimate justification for MeBeSafe", coordinator Stefan Ladwig wittily introduced the event. "We had two incidents and one harsh braking scenario. The car in front of us braked very harshly and the safety margins were rapidly decreasing. We could seriously have used some nudging there!"

Half of the time has now passed for the MeBeSafe project, and results are beginning to pop in as the researchers prepare for the ultimate test in the Field Trial later this year.

This will serve as a final assessment on whether the nudges and coaching measures actually worked as intended. But before that, there is still a lot of work to be done.

The various Work Package leaders all stood up and explained what they have done so far, and what they are up to into the future, accompanied by many a researcher delving deeper into specific topics. One major thing undeniably struck the listeners, and it was not a mild Mediterranean wind. No, it was how well the MeBeSafe projects actually seem to fly.

Most projects have already progressed remarkably far, and only some are still facing a few obstacles that could block the way towards their

Stefan Ladwig

full potential. For the Driver Coaching, all will be totally well as long as a second version of the coaching app is enabled in time.

Plans and ideas for improvement are nevertheless ever so abundant, and the discussion on how to actually perform the Field Trial highly vivid.

There are already solid plans for how to transfer the measures into the verdict of the Field Trial, with mere details left up for decisions.

But everything has to be perfectly clear for the results to make sense, and this is assessed with the greatest care all across Europe.

Two impressive days of presentations and discussions came to an end with a Dissemination Event,

where the general public was invited to get a glimpse of what MeBeSafe is doing.

Around 50 citizens interested in road safety sat attentively and embraced the latest results on nudging and coaching, as well as exciting findings from the local traffic expertise.

With the fresh Sorrento Spring in their mind and new thoughts on how to proceed, the MeBeSafe consortium left, and once again scattered across Europe.

Now six months of intense work to validate all findings will commence, before the team once again will meet eye-to-eye in Graz. And hopefully, everything will have gone just as well as it had this time.





What is MeBeSafe really about?

A General Assembly meeting is a great occasion to let fellow researchers in on what is happening in the project. And a brief summary of that meeting is an ever greater way for anyone to get an overview of the project. Behold!

THE BASICS

Our traffic will not get safer by introducing more regulations.

MeBeSafe aims to change traffic behaviour by nudging and coaching. Drivers and cyclists will be gently nudged in the right direction, to help them make better decisions. MeBeSafe News

Researcher after researcher stepped up in the bright top floor hall at the Sorrento hotel to translate their work into words. As enthralling as the results were, curtains were nevertheless necessary to keep the majestic view of Mount Vesuvius and the Bay of Naples out of the room. There was work to be done.

Anna-Lena Köhler from ika eloquently described a variation of an infra driver nudge, which will give drivers an illusion of increased speed by lighting up lamps in a row so that it looks like the light is moving towards the driver. The already promising results will be complemented by further studies on how light could affect trajectory directly, and why it actually works to nudge people this way.

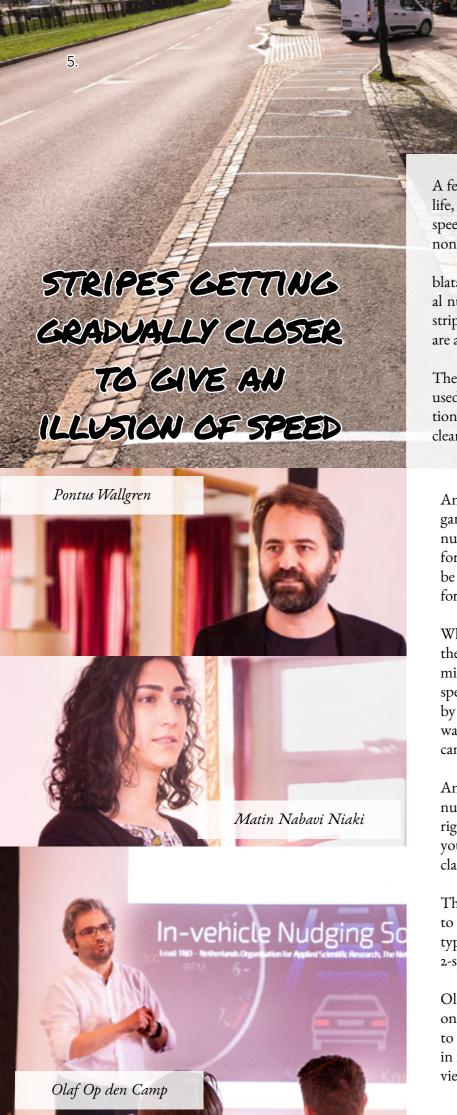


Anna-Lena Köhler

While Felix Fahrenkrog from BMW is still running simulations on how the light nudge will affect the likelihood of a crash, Vincent de Waal and his team from Heijmans have developed the decision control logic on when to activate the nudge based on driver behaviour and are preparing to put the system into real world by the end of May.

ISAC will then be involved in the measurements, and they have previously developed the underlying algorithms for detecting vehicle speed and position from multiple thermal cameras.

Felix Fahrenkrog



A few cyclist nudges have been tested in real life, and it seems possible to affect cyclist speed before intersections simply by using non-haptic stripes on the road.

Pontus Wallgren from Chalmers was blatantly delighted with the cherished visual nudges being more effective than rumble stripes currently used on biking lanes; which are also universally disliked by cyclists.

The simple stripe approach could also be used to steer cyclists right in difficult situations, as Matin Nabavi Niaki from SWOV clearly demonstrated.

An interesting thought was raised regarding whom the various types of traffic nudges actually aim for. The lamp nudges for cars have the advantage that they can be active for speeders only, whereas stripes for cyclists have the high end on simplicity.

While the desire is to affect all fast drivers, the nudges will likely appeal most to the mindless ones; those not aware of their speeding. Of course others may be tricked by the illusions as well, but if you really want to go speeding there is nothing that can stop you.

And this is, after all, the basic core of a nudge. A small and gentle push in the right direction that you still can avoid if you want. Nudges are not mandates, and classically they are totally subconscious.

There are however a few nudges appealing to the conscious decision-making, called type 2-nudges after the reasoning type 2-system present in the brain.

Olaf Op den Camp from TNO described one of these, an in-vehicle nudge aiming to make car drivers more aware of cyclists in real-time scenarios; especially when the view on the cyclist is obstructed. The exact look and feel of the in-vehicle nudge to warn car drivers for cyclists was designed by OFFIS and is evaluated at this very moment in a CRF simulator. Later on, it will be built into real a Fiat car for the Field Trial.

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For this nudge to work, Virtual Vehicle and BMW are developing models that can assess how the nudge is best applied for maximum safety performance, and TNO will create the model for hazard prediction. Finally, Bram Bakker from Cygnify will make it possible for the car to spot approaching cyclists in real time and predict how they will behave.

In a similar more conscious manner, Mikael Ljung Aust from Volvo Cars will also try to nudge drivers with in-vehicle solutions. Cars are now able to detect when drivers get drowsy, but the drivers must accept this fact and react. By exploring the reaction to outright rewards, starting with free cinema tickets and then working all the way down to a free coffee, they are trying to see if this highly active approach will bear fruit.

Volvo also wants to nudge drivers into using adaptive cruise control more often; either by some kind of gamification approach or by using the human desire for preserving nice patterns. However, as many drivers are never even trying to use adaptive cruise control, a bit of a coaching scheme will be brought in to turn non-users into rarely-use-users; whom then can be nudged into using the feature more frequently.







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Engaged Italian

citizens get a brief

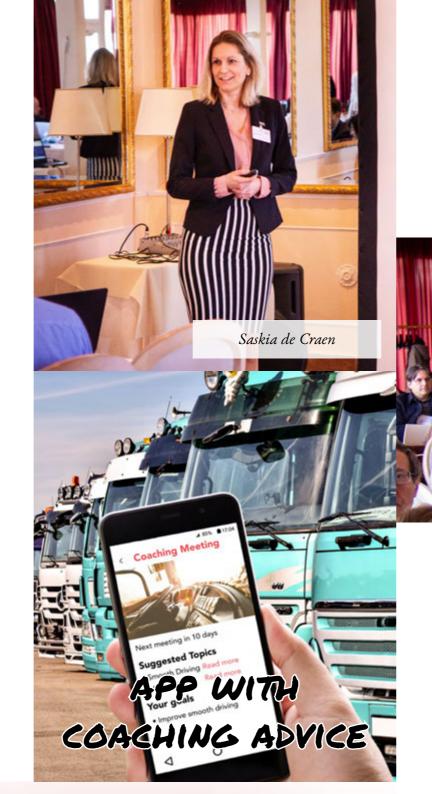
breath of MeBeSafe

Coaching is indeed the other main measure tackled in MeBeSafe, and Saskia de Craen from Shell stepped forward to describe the coaching of truck drivers. The idea is to measure their driving performance with a mobile app, and then inform the truck drivers when time has come to book a meeting with a peer where they can coach each other. Coaching material is then provided by the app together with scores calculated from their driving behaviour. The first version of the app is up and running, but upgrades are being planned by the team. In the future, the app should ideally include even more relevant measurements and also include more positive feedback.

Together, these make up the main aspects of the MeBeSafe project, which is then fulfilled by a work package on Field Trial implementation and supported by communication and coordination, which all presented their work as well. It had taken two days of remarkable presentations and discussions to summarise the project in Sorrento, but it was a full and delightful summary. The summary provided in this text is undoubtedly somewhat more brief, but hopefully just as delightful.

Cheerful and full of hope, the participants left the hotel for a final Italian supper, while the last rays of the sun carefully caressed the edge of Mount Vesuvius. This was the end of the meeting, but the beginning of a new era in MeBeSafe. The era where every measure will be given its final statement.

The era of the Field Trial.



The latest news on nudging and coaching measures to increase traffic safety? Now that's the place to be! More than 50 engaged Italians travelled to Sorrento

for a MeBeSafe Dissemination Event.

Fresh MeBeSafe newsletters were lying all over the tables, getting drenched in the red evening sun peering in from the windows.

They sold like hot cakes, except the fact that they were not actually sold. They were given out as an introduction to MeBe-Safe, and something for the participants to take home and remember the project with.

The eager guests skimmed through the articles, and were given personal introductions by Anita Fiorentino from the FCA, who gallantly had arranged this special event.

The guests had all come here to learn the latest in nudging to battle dangerous traffic situations, and that was what they should get.

In a short afternoon, they were not only to grasp the main themes of MeBeSafe, they

were also to be informed of the latest road safety research done in Italy. Fortunately for the Italians, there were several speakers both from MeBeSafe and local community that could do their presentations in Italian.

Except the MeBeSafe light nudges, coaching and general nudging approach, they also gained insights into local Italian research on driver behaviour, bio-feedback, car automation and 'smart roads as well as sustainable mobility.

Time flew past quickly, and several interesting discussions between researchers and public enriched the evening.

None of the guests seemed to regret getting out in the potentitreacherous traffic situation this day; not to go to Sorrento and the MeBeSafe dissemination event.



A traffic nudge must be considered safe before it is put on the roads. Short tests are however not able to assess if the risk of impact may have increased, as crashes are fortunately far too uncommon in real life. Therefore, MeBeSafe applies computer power to simulate its developments.

9.

It is true that computer simulations cannot mimic reality completely. But it has the advantage that huge amounts of dangerous scenarios can be tried with high accuracy, without the risk of anyone actually getting hurt. This is something Felix Fahrenkrog at BMW is doing for MeBeSafe. It might sound truly fascinating that reality can be modelled artificially like this, but for Felix it is just the order of the day.

"We do simulations all the time, that's nothing new to us", Felix Fahrenkrog says, "What's interesting is if we can model nudges and how drivers react to them. That's very different from what we usually do."

To build a model, Felix first has to define the scenario, including how the road looks and how many road users are to be included. In

an ideal situation, there is already some input data on the distributions of relevant parameters, such as speed. If not, that has to be measured somehow. Hard data such as this are however not the only variables in traffic. No, there is also the far more complex matter of driver personalities. There are not two drivers completely alike. Everyone differs in terms of behaviour when it comes to risk taking, reaction time and perception. In order to simulate a real reality, this really has to be modelled as well. There are a few existing models touching upon this, but they always have to be modified to encompass the actual situation.

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One traffic scenario can play out in many different ways, depending on all the surrounding factors. As the number of variants is so large, the number of simulation runs has to be even larger to get to significant results. A few simulations in MeBeSafe have actually required up to a million runs, something that would be impossible or at least take huge efforts if it was to be made in real traffic.

One example is the motorway exit scenario in that WP3 is dealing with. By using isac's

real world speed distribution for one measurement point, Felix was able to model speed distribution for the rest of the curve. Fortunately, the results from the simulations were rather similar to reality. Only one difference was buggering about.

It seems like the simulated drivers drove a bit faster at a certain part of the curve than the real drivers. How could this be? Interestingly enough, the simulated speed in the middle of the curve was very similar to how fast real people drove in a virtual car simulator for the very same curve with the nudge present. Is there some inherent aspect in simulations that is not captured?

The answer is rather simple. In reality, there is a speed limit sign right in the middle of the curve. This sign does not exist in either of the virtual studies. Naturally, it is likely that the speed limit sign will make drivers go slower at that exact position.

This is one of the aspects not taken into account when doing the simulations. As an outsider, it might seem strange not to include this. Indeed, it may be tempting to just keep on adding variables up until the simulation is as close to reality as possible. But it does not actually work that way.

Each variable added to the simulation increases the number of runs needed for significance. It is simply not feasible to simulate every single grain of dust blowing over the street. And moreover, there is also a risk in introducing too many parameters.

The more detailed the model becomes, the more likely it is to induce mistakes to the concoction. Every aspect taken into consideration must be correctly modelled to contribute to the results. If not, it will make the simulation less reliable than had it been left out.

"When we did the simulations for cars approaching cyclists for WP2, we decided in our simulation that the cyclists should be completely blind and not react at all if a car was about to run into them", Felix says.

This may appear as a morbid simplification, but there are good reasons for it. In case the cyclists were to react, it would be necessary to include different behaviour for the cyclists in the simulation as well. Not every cyclist scans the traffic in the same way, not every cyclist brakes in the same way or uses the same speed.

And if that behaviour was to be included, the comparison between a baseline and the situation with a nudge also becomes much more difficult. Could a decreased number of simulated accidents in the nudge scenario actually depend on the simulated cyclists behaving differently?

The effect could perhaps be neutralised, but only for the price of even more runs. And in this scenario, it would not add any extra value, as the nudge in WP2 that should be investigated only applies to cars. It also intends to work even before the cyclists could respond.

Most of Felix' simulations for MeBeSafe has already been done, but one challenge is left; the simulation of truck driver coaching in WP4. This is something much more complex than the previous models, as it has to include much larger timespans, more drivers and more intricate psychological modelling of the drivers' behaviour. This is an even larger challenge than it may seem, as few input distributions are actually available due to the complexity of the topic. So, the parameters must instead be estimated in order to evaluate the potential effect of coaching.

A broad range of scenarios also make it necessary to use even more simulation effort. A large amount of exciting work and results therefore await, but for Felix Fahrenkrog, the most exciting result of all does not come from the simulations.

No, it will come after the field trial has been done; when reality makes its final statement on whether the true nature of the nudges really can be captured by a computer. Or not.

Judgement of the road users: Is MeBeSafe on the right track?

MeBeSafe aims to make traffic safer by targeting certain specific situations with soft measures, namely nudging and coaching. But are these situations really what the general public finds most dangerous? And are soft measures actually what they desire? Chalmers wanted to find out.

There were three groups of people. All road users, but very different. One was made up of those only cycling, one of those only driving car and the last of those doing a bit of both.

They all got one workshop each, where they were to identify what they found most dangerous in traffic and how they wanted to solve it. And indeed, vast numbers of dangerous situations were found. Only the two situations voted to be most dangerous were up for solving, but the suggestions were certainly plentiful as well.

The results were of course highly mixed. Each group generally identified problems for their own mode of transport, and these problems were naturally mainly thought to be caused by another mode of transport. However, there were some problems found to be universal.

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A negative mood was thought to inherently loom over the entire traffic system, affecting everybody exposed to it. Infrastructure and planning were thought to generally be lacking, especially when it comes to re-

routes during construction works. Most interesting was however that the intersections of roads and biking lanes was a major issue for both cyclists and motorists, albeit from opposite perspectives.

The bank of potential solutions was very wide and included everything from positive hugs, such as reduced congestion tax for cars letting cyclists pass at intersections, to highly negative smacks, such as nails shooting up from the ground to prevent cars from driving further.

It was however really reassuring that all groups suggested much more soft measures than hard. Even for other groups than their own, which is usually not the case.

Furthermore, the main type of 'hard' measure was also based on clarifying the existing traffic rules. This is indeed a lot less hard than many measures actually in use today.

The results from the workshops will now be thoroughly analysed, to find the true meaning of them. However, the very strong focus on softer measures, and the fact that cars and bikes crossing each other's way is a main problem in traffic, is highly encouraging for MeBeSafe.

Soft measures, instead of prohibitions, is what the entire project is all about, and intersection interaction between cars and bikes is a main theme in two different work packages.

Indeed, soft measures are often thought to work less well than harder measures. Early results from MeBeSafe however suggests that the soft nudging and coaching measures really work.

MeBeSafe therefore addresses the one situation found most dangerous in traffic; cars and bikes intersecting each other's way. It does it by soft measures, which found to be preferred by road users. And the measures that are used seem to actually work. It can therefore safely be said that MeBeSafe is on the right track.



12.



Rumble stripes and bumps are popular with lawmakers and despised by cyclists. MeBeSafe has found that solely visual nudges have much better effects on speed and spouts a universal approval by cyclists.

Intersections are dangerous places. Eight of ten accidents between cars and bikes happen there, and the car driver has most often not seen the cyclist. Instead, drivers often believe that cyclists just appear in front of their cars, without any prior hint of their existence. It would therefore make total sense if both cars and bikes adopt their speed before dangerous intersections. Keeping a lower speed for a longer time will of course make it easier to spot one another, and therefore decrease all types of conflicts. Moreover, lower speed will increase the own marginals for braking.

Nowadays, cities often try to decrease cyclist speeds by rumble stripes or bumps on the biking lane. Not only are these stripes despised by cyclists; they are also not really decreasing speed at all. If anything, they seem to decrease the attention to the surrounding traffic. MeBeSafe has tested various haptic measures and indeed found that the effect is almost negligible.

Would it be possible to make cyclists more aware when dangerous intersections approach so that they adapt their speed accordingly – without using any uncomfortable vibrations? Preferably, could they be nudged to do so on a subconscious level, so no active thoughts have to be devoted to the task? This was the question Chalmers wanted to answer.

Bucketloads of ideas were tested in a long session of trial-and-error prototyping. Many were of course not even feasible. Projecting a moving stopline along a sidewalk, how would that even work without a lamp stronger than the sun? But some of them proved to fit like a glove.

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Three types of nudges were tested on 93 cyclists in a real-life scenario. Each nudge type was made in two configurations to find the optimum. The first was an array of totally flat stripes across the biking lane that got closer and closer together.

The second was made of parallel lines gradually narrowing down the marked part of the biking lane. And the third was a digital speed sign showing cyclists their speeds and warning them for a dangerous intersection if a speed was found dangerously high.

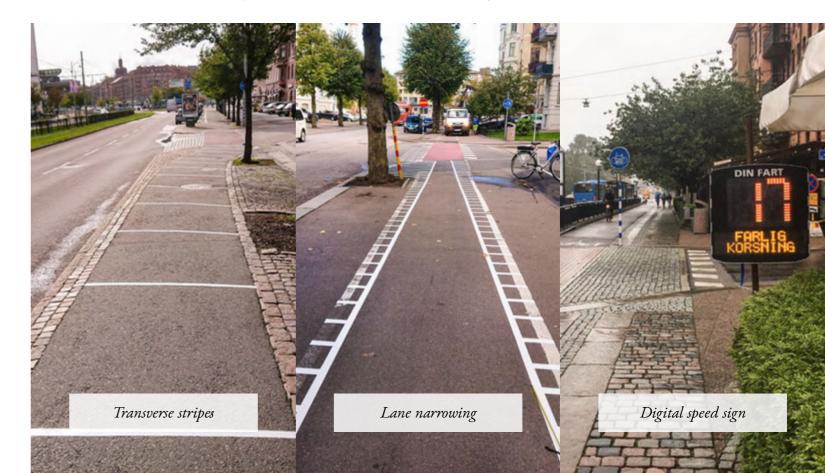
And did they have effect! The effect on speed was dramatic, much more than haptic alterations could achieve. The speed sign would of course only work if the cyclists had seen it, but the other nudges actually worked just as good even if they were not noticed.

Cyclists who always slowed down before intersections and cyclists who never slowed down before intersections; all were actually nudged to an equal and high speed decrease. No matter if they were old, young, fast, slow, risk-taking or safe; all of them were clearly affected to adjust their speed on a subconscious plane.

The effect was remarkable and totally unprecedented, but the appreciation was just as high. The nudges were not only appreciated by cyclists, they were universally approved. Nobody would mind having them on the biking lanes. They did not protrude upwards and seemed like relevant marks in a cluttered traffic environment – that was not even noticed actively.

It is certainly important to use such mindboggling tricks with high caution. They should only be used when the speed really has to be adopted. If the bicycle is to stand as a competitive and attractive mode of transport, the average speed on biking lanes should if anything go up. But for the sake of all road users' safety, speeds of both cars and bikes should decrease in intersection scenarios.

MeBeSafe is addressing the issue both from the car and the cyclist perspective, and this reserarch suggets that the coast is clear on the cyclist side. As the nudges works subconsciously, they likely to work even over an extended period of time. This only needs to be verified in the field trial. So in a near future, lives can hopefully be saved by discrete and comfortable measures that only can be seen. Although they do not have to be seen at all.





You can try to change people's behaviour in a number of ways. You could theoretically outlaw all possibilities but one, and that is a forcing measure. You can inform people about the effect of their choices, and that's an informational measure. But you can also give people a small push towards a certain direction, and that is called nudging.

Nudging is nothing more than a gentle push towards a good direction. All options are still open, so the person who is nudged can make any decision they want. The 'less-good' options cannot be inflicted with any kind of extra fee or extra effort. The nudge is simply a small change in the surroundings that makes it more likely for the desired option to be chosen. An alteration of the choice architecture.

A person who is being nudged is often not aware of it. True type I-nudges appeal to the subconscious type I system of decision-making, which is governed by a large number of

cognitive biases. A prime example of a cognitive bias is how people believe that four heads in row of coin tosses are more likely to be followed by a tail than another head. In reality, they are of course just as probable (if nobody has been tampering with the coin). Another example is that you are much more likely to believe people saying what you already believe yourself, rather than those saying the opposite.

Such cognitive biases are exploited by nudges to make it more likely you make a better decision, while you are still free to do whatever you like. And a nudge is only a nudge if it is pushing you towards something that is better for you or for the world. It is not a nudge if it is only trying to earn more money from you. Therefore, nudging is said to be a part of the school of Libertarian paternalism. Protecting your freedom, but still trying to change you into making a good decision.

A classic nudge is putting the vegetarian option on top of the restaurant menu. All

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the other dishes are still listed, only further down. By doing only that, you can really increase the number of customers selecting the vego dish. The default option is always a safe retreat. Similarly, if renewable energy is listed as the default on an electricity contract, a much larger share will be going green.

Of course this does not affect every single individual, but that is not necessary. As long as it works on a macroscopic scale; increasing the share of people making a good decision; we have reached our goal.

Some nudges instead appeal to the conscious processes, the so-called type 2- system in our brains. They are sometimes unavoidable, as when you want to nudge people into really complex issues; far beyond the reach of a single cognitive bias. Such nudges may work less well over time, as the people subjected to them are actually aware of them; and could decide that they do not want to be affected. But that also applies to an individual level, and some type-2 biases are so strong that many people still want to follow them.

In a urinal at Schiphol Airport, somebody has painted a tiny fly on the ceramic. Some men will find it silly and decide not to aim for the fly. But on the whole, a lot of men will actually chose that very fly as their target and increase their aiming accuracy.

Type 2-nudges are somewhat of a novelty, and there is still a fluid border between them and simple information. If we head back for the menu, you could put up information on carbon emissions for each dish; clearly visible for the hungry visitor. This could make an average eater more likely to choose an environmentally friendly course, but it requires a lot of cognitive processes. It depends on the eater's will, and is classically not a nudge.

Giving people some kind of reward if they are behaving well is another positive measure. You could for example get a free bus ticket if you are using public transport more often. It's nice, but it is not a nudge. It's a hug.

A nudge should not alter the incentives in any way, neither positive nor negative. If you would put a fine on people for behaving badly, such as driving too fast, you are exposing them to a smack. If you simply alter all cars so that they cannot go faster than the speed limit, it would be a shove. A nudge is instead just a very simple push in the right direction.

Nudging was first described by Richard Thaler and Cass Sunstein in their ground-breaking book "Nudge". In this book, they defined the concepts and lay out the ground-work for further nudging. And to illustrate the act of nudging, they decided to use an elephant mother gently nudging her young calf in the right direction. This, of course, became very widespread. You could almost say that the love of very simple but effective illustrations of complex subjects is a cognitive bias. As could the use of animals to illustrate various phenomena, which is evident in our idioms (cunning as a fox, poor as a church rat...).

So this is the simple reason why MeBeSafe is showcasing an elephant nudging a car, as this has become the archetypical way of communicating that we are nudging, among other road users, cars. It is not that we want to let elephants loose in traffic, swinging their trunks towards each and everyone not behaving well. Because that would most likely be regarded as a smack. And MeBeSafe will make traffic safer by nudging.

To learn even more on nudging, see Thaler&Sunstein (2008) and French (2011)





A major advantage of the Infra Driver Nudge is that the dynamic light system can be activated based on intelligent detection, to nudge exactly the drivers who need to be nudged. But this also makes it more complex, and the different underlying systems have now been put together for the first time.

To activate the dynamic lights of the Infra Driver Nudge, several stages of algorithms have to be passed. ISAC developed a software to detect cars from a camera and trace how they are moving along the curve. Heijmans on the other hand made a software to assess which drivers should be nudged and then communicate this to the actual lights on the road.

Except for manually importing dummy data files that resemble the actual output, these systems have never been tried together before. This was of course something that had to be done.

So a rig was set up at the ika test track in Aachen from where the developers of Heijmans and ISAC got out to the road. It was about to get exciting.

Would the camera output be processed correctly in real-time, and could the software track multiple vehicles without interrupting? Luckily, after some minor expected debugging, it all passed with flying colours.

Now, the work will be focussed on what the driver actually sees when encountering the nudge. It is especially important to program the system so that drivers are nudged at the very right point in time. And then, the doors are wide open for the system to work in the real world.



MeBeSafe would be nothing without all the wonderful people behind it, devoting their work and soul to get the best possible results. Read what some of them have to say, and see the full interviews on our website or social media.

As a student I started working on the interaction effect between light and driving behaviour.

We are now exploring this effect even more.

MeBeSafe News

There are people from highly diverse backgrounds working together in MeBeSafe, but throughout the project we have been able to find a common language. It's great to see how engineering and psychology comes together and how it can be used to nudge drivers and cyclists to safer behaviour.



As employee at the Swedish transport administration we are keen on finding new ways of affecting people towards the best behaviour on the roads.

MeBeSafe has a good potential doing so by the nudging philosophy. We are hoping to use the best results from MeBeSafe in real life, and are already discussing how nudging can be a part of the Swedish Vision Zero. This is something we need, not just in Sweden but all over the world.



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