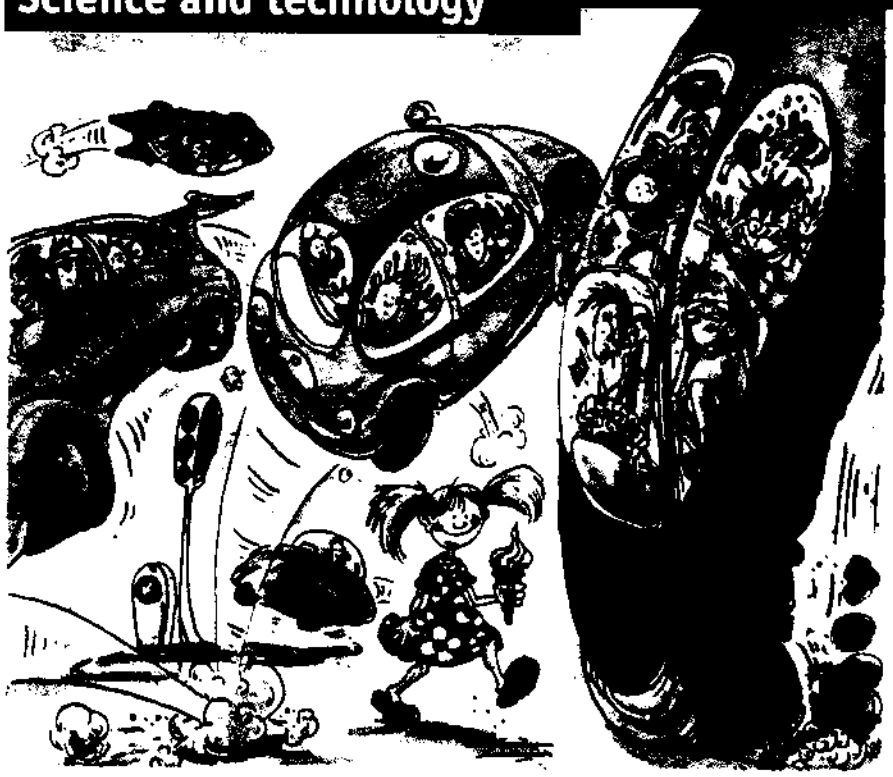

2024-1

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Vehicle-safety systems

Stopping in a hurry

Cars are getting better at avoiding collisions. Before long they may be communicating with each other to make roads safer

VOLVO'S new XC60 sport-utility vehicle comes, as you might expect of the safety-conscious Swedish carmaker, with a number of features designed to look after its occupants in the event of a collision. It has airbags, rollover and side-impact protection and so forth. But it is also fitted with mechanisms to help avoid a crash in the first place, including an automated braking system. As more cars acquire features that can assist a driver in a dangerous situation, or even take control, the rules of the road may need rethinking.

The Volvo system, called City Safety, operates at up to 30kph (19mph). This speed range was chosen because it is when most collisions take place, especially rear-end shunts in slow-moving traffic. City Safety uses a laser sensor fitted behind the windscreen to scan the road ahead, calculating relative speeds and distances. It applies the brakes if a collision cannot be avoided. (The system switches off at very low speeds, so that drivers can park close to other vehicles.)

A number of carmakers already have or are introducing automated-braking systems. Germany's Daimler uses a radar-based one in some of its Mercedes-Benz vehicles. Called Distronic, it also operates at high speed and adjusts both braking and acceleration to maintain a constant distance from other cars. If a collision seems likely a warning is given. When the driver puts his foot on the brake pedal the system automatically applies the optimum pressure required to avoid hitting the car in front. If the driver fails to respond, the brakes come on automatically.

Staying on the road

These so-called "intelligent" vehicle-safety systems have the potential to make roads a lot safer, according to a new study by VTT Technical Research Centre, a big contract-research organisation based in Finland. It reckons the most promising is electronic stability-control, which can improve a car's handling by detecting and helping to prevent a skid. The centre calculates that if this system alone were fitted to all the vehicles in Europe it would reduce the number of people killed on the roads there by almost 17%. Devices designed to prevent a driver straying from a motorway lane would reduce deaths by about 15%. Those warning drivers about speed limits and other hazards would cut fatalities by 13%. Some of these systems may be combined; the forward-facing camera that monitors road markings for the lane-departure system in the new BMW 7 Series, for instance, is also capable of recognising speed signs and displaying the limit on the dashboard.

Eventually these safety systems will make their way from expensive cars to most models, just as anti-lock brakes have. This will make cars much more "aware" of their surroundings. Even smarter stuff is coming. Jan Ivarsson, head of safety at Volvo, believes it should be possible to build a car in which people will not be killed or injured. The company is experimenting with devices that would automatically steer away from an oncoming vehicle. Such a car would also spot a pedestrian stepping into the road and brake.

In 2009 Daimler will introduce a device that warns drivers of fatigue. It uses multiple sensors to set up a profile of the way someone drives and sounds the alarm if he departs from it. In particular, it monitors steering behaviour—which, when it becomes a bit erratic, is a good indicator of tiredness. Daimler is also working on ways to make cars brake at red traffic lights.

Many of these safety systems at first give warning of impending danger before taking over. Despite that potential delay they still provide what Rodolfo Schöneburg, Daimler's head of passive safety, has described as an "electronic crumple zone": applying the brakes a bit late rather than not at all will at least reduce the impact of a collision.

Yet sometimes there is no room for any delay in avoiding an accident, for instance when a vehicle jumps a stop sign at a busy junction. This means safety systems will need to become even more autonomous in ▸▸

order to act faster—faster, probably, than people can. But because cars will be acting independently of each other, this raises safety concerns of its own.

Researchers worry, for example, about what might happen if a child ran into a busy road. If one car automatically slammed on its brakes and swerved, it could prompt others to take evasive action. The result of all these automatic, independent decisions could be a pile-up causing more deaths, injuries and damage than there would have been had drivers remained in charge. So some researchers are now looking at ways in which vehicles could co-ordinate their crash-avoidance manoeuvres. This means that in an emergency cars would have to tell each other at once what they were about to do, says Thomas Batz of the Fraunhofer Institute for Information and Data Processing in Karlsruhe, Germany.

His work is part of a broader project on "cognitive automobiles" involving other groups, including the University of Karlsruhe and the Technical University in Munich. Last year some of the researchers entered the Urban Challenge, an event organised by the American government's Defense Advanced Research Projects Agency (DARPA) to produce vehicles capable of operating autonomously in a city. DARPA wants to use such technology to produce robotic vehicles for military convoys in areas of conflict.

Taking charge

Mr Batz and his colleagues are devising software that can gather information from vehicles' sensors and use it to co-ordinate group behaviour in an emergency. Although the project is still at the simulator stage, it has already shown that one car in a group driving along a road will have to be nominated as co-ordinator. This shortens the lines of command for split-second decisions. The group co-ordinator could, for instance, order two vehicles travelling in adjacent lanes to swerve in the same direction and another to brake sharply or even run off the road if no obstructions or pedestrians were detected. The system would also have to cope with the presence of cars with no autonomous functions.

Carmakers are thinking about such things too. Daimler, for instance, believes that if details like the weight of vehicles and their rigidity could be communicated in the instant before a crash, then protection systems, like pre-tensioning seat belts, could adjust optimally in anticipation. Volvo's engineers envision cars being able to warn each other of hazards such as slippery roads. Some GPS units already tip each other off about traffic jams.

Collaborative anti-collision systems will encounter not only engineering problems, but perhaps legal ones too: whose insurer pays when one vehicle instructs another to take emergency action, causing it to bump into a third? And no one is yet sure what the effect will be if semi-autonomous systems relieve the driving load to such an extent that motorists become less alert—a problem which airline pilots face in computerised cockpits.

The answer, eventually, may be to let computers take over completely and drive cars robotically. An S-Class Mercedes with all the extras can already be left largely alone to make its way along a moderately busy and fairly straight *Autobahn*. The experience of the DARPA challenge has shown that dealing with road junctions and traffic queues in cities is becoming possible too, especially with advances in machine vision. Bit by bit, the day is coming when it will be possible to jump into an empty car and say: "Home, James." ■

Malaria and Alzheimer's disease

A jab of hope

Vaccines may help defeat both a scourge of the poor and a rich-world affliction

FOR much of the 19th century, Bagamoyo was a dreadful place, at the heart of the east African slave trade. The very name of the Tanzanian port means "lay down your heart" in Swahili. But that tragic association may be supplanted by a happier one, thanks to an important new study done in the city that shows how to tackle a killer that has long outlasted Bagamoyo's trade in human beings.

Most malaria experts have pinned their hopes of tackling that disease with new drugs, such as artemisinin-combination therapies, and the use of bed-nets impregnated with long-lasting insecticides. However, the Bagamoyo study suggests that vaccination deserves a serious look. By coincidence, an unrelated report suggests that vaccines may also have an important part to play in tackling Alzheimer's disease, which tends to afflict longer-lived people in richer countries.

Joe Cohen of GlaxoSmithKline, a British drugs giant, and his colleagues present their case for the speedy development of a malaria vaccine in this week's *New England Journal of Medicine*. In earlier studies, researchers have shown that RTS,S (as the vaccine is known) showed promise, although doubts remained. Christian Loucq of the PATH Malaria Vaccine Initiative, a charity that co-sponsored the study, says some naysayers have pointed to historical difficulties in getting African governments to accept and distribute new vaccines as grounds for scepticism.

Which is why the work in Bagamoyo tested whether the malaria vaccine could be integrated into African countries' existing system for inoculating infants with a group of established vaccines. It showed that giving all the jabs simultaneously did not affect the safety or efficacy of any of the vaccines and that the malaria vaccine reduced the risk of infection by over 60%.

Dr Cohen points to novel adjuvants (ingredients that increase the body's response to vaccines) as one of the reasons why the vaccine works when many earlier versions failed. A second study in the same journal was conducted in both Tanzania and Kenya, and it shows the vaccine is indeed improved by using a better adjuvant. The researchers are keen to push ahead with this improved version of RTS,S early next year, but Dr Loucq worries about funding a big final-stage clinical trial that may cost $500m or more.

Funding also worries Ruth Itzhaki of the University of Manchester. She is the lead author of a striking paper in the latest issue of the *Journal of Pathology*. It suggests that the herpes simplex virus, which leads to cold sores, may be important in the de- ▸▸

A safety net until a vaccine arrives