Focus on Pedestrian Protection: MESSRING Develops New Test System

MUNICH -- June 10, 2015: Target Development for Testing of Integrated Safety Systems (TargETS)/joint research project with TH Ingolstadt/Active Safety Testing for Pedestrian Protection Assistance Systems

According to the German Road Safety Council (DVR), the approximately 34,000 accidents involving cars and pedestrians each year are mainly the fault of the drivers, who in most cases are driving a passenger car. Car manufacturers around the world are therefore working on new active safety systems that, like existing systems, activate before a potential accident to prevent or reduce the severity of crashes.

But how do you test these kinds of systems and realistically simulate dangerous situations? In just such a research project, crash-test facility manufacturer MESSRING is working with TH Ingolstadt university to address this complex issue. The project proposal was approved by the Federal Ministry for Economic Affairs and Energy and the project officially launched in October 2013.

The research project was named TargETS (Target Development for Testing of Integrated Safety Systems), and is setting new benchmarks in test systems. The aim is to develop a test system that can cope with the complexity associated with early recognition and classification of road users and that can be used unconditionally for all assistance systems in the automotive industry, from radar and infrared to stereo camera systems and laser scanners.

The project comprises two components: a pedestrian dummy and an innovative motion system, which are synchronized with each other using a software program. The coordination and interplay of the motion system (macroscopic aspect) and pedestrian dummy (microscopic aspect) have resulted in a test system that is like no other and will take on a pioneering role in the further development of active safety testing and autonomous driving. "Our motto is 'action instead of reaction.' With TargETS, we demonstrate that MESSRING is also an innovative partner in research. We'd like to get more involved in this area in the future too," explains Wolfgang Rohleder, Manager of Sales and Application at MESSRING.

The university is doing research involving the true-to-life pedestrian dummy, which along with its movement patterns is correctly recognized as a pedestrian by vehicle assistance systems every time. There are currently 21 muscle groups in the pedestrian dummy responsible for moving the extremities and head - a maximum number that does not necessarily need to be maintained in the future.

At the same time, MESSRING is developing a motion system (6D Target Mover) that realistically moves the pedestrian dummy without confusing the assistance systems. The term "6D" of the motion system represents six degrees of freedom, which means three translational and three rotatory movements in space. Earlier test systems have often failed to simulate human movement patterns in realistic conditions. Moving platforms on which pedestrian dummies are mounted require a very flat surface and often fail on a curb. Linear cross-beam systems suspend the dummy from a type of bridge and track construction. This only facilitates movement in a straight line and therefore does not simulate the actual movement of pedestrians crossing the street, as two-thirds of all pedestrians do not cross the street in a straight line.

The 6D Target Mover motion system developed by MESSRING, on the other hand, can move in any direction. Much like a marionette, the pedestrian dummy is attached to a rod and moved throughout the entire area of activity using cables.

The 6D Target Mover facilitates an area of movement measuring 9 x 9 meters, and the masts can be installed at a fair distance from the test area. When the system is lifted, the required space immediately becomes available again for further testing.

The test space features three masts arranged in a triangle, with a cable attached to each. Made from a thin plastic, these primary cables span from the masts to an attachment rod in the center of the activity space, to which the pedestrian dummy is attached. To avoid confusing radar-supported assistance systems in particular and prevent inaccurate test results, the attachment rod is made from electrically non-conductive materials, just like everything else in the driving space. Four stabilizing cables (thin plastic cables), which also meet at the attachment rod, stabilize the pedestrian dummy, so that, even in the case of spontaneous changes in direction, there is no risk of a swinging motion. These cables are also responsible for the lateral rotation and upper-body tilting of the pedestrian dummy. In accordance with human movement when spontaneously sprinting or suddenly stopping, an angle of inclination of up to 35° is currently possible. The pedestrian dummy, which weighs up to 50 kg, can therefore achieve up to 10 m/s.

A motor is mounted on each of the three masts to move the pedestrian dummy and each of the four stabilizing cables is also attached to a motor. Two out of these four cables are arranged as a pair forming a turning mechanism around the Z-axis.

Using a computer program developed by MESSRING, all of the seven electric motors are synchronized with each other. The program is based on CrashSoft, the test software for system control developed by MESSRING. Using this program, the movements of the pedestrian dummy are also incorporated and coordinated with the other components.

The pedestrian dummy is currently being developed at TH Ingolstadt and will authentically simulate the movement of the extremities and head rotation of a real pedestrian. "Combined with Bowden cables and 3D-printed joints, artificial muscles facilitate movement patterns from slow ambling to spontaneous sprinting. The muscles comprising plastic pneumatic tubing and powered by pneumatic valves are placed in the spine of the pedestrian dummy," explains Igor Doric, who as the doctoral candidate at the CARISSMA research center is in charge of the project.

Human movement patterns can be recorded using a motion capture system and read into a software interface. The control software then uses these movement patterns to create data records for the pedestrian dummy and the Target Mover.

Assistance systems will take on a more important role in the years to come and the complexity associated with recognizing and classifying road users will also continue to grow. As a result, the importance of test systems will increase and innovations such as TargETS will be indispensable in this segment.