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FORCE MEASUREMENT FOR CONTROL UNITS FOR DRIVER OBSERVATION

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FORCE MEASUREMENT FOR CONTROL UNITS FOR DRIVER OBSERVATION

Technical task:
The integration of emotional aspects is the basis for natural and future-oriented interaction in the vehicle. Currently, a number of modalities exist that are basically suitable for the recognition of emotion. Traditionally, these modalities are mainly used to measure physiological data such as skin conductivity, heart rate, temperature or blood pressure. However, these measurements require direct measurement on the driver. Contactless measuring methods are more suitable. Such as image-based methods for the recognition of facial expressions and gestures or speech analysis.

The recognition of the driver's emotion is a complex process and generally not error-free. The broader the basis of signal processing and the more input data can be processed, the better the quality of the statement can be.

Initial situation:
Interaction in the vehicle is increasingly taking place via touchscreens. Some touch screen systems evaluate not only the pure touch (Touch) but also the touch or actuation force (Force). In some applications graphical elements are displayed on the touch screen, which behave like mechanical keys. This means that the function is only triggered when a defined operating force is pressed. The force is measured analogously and at a defined threshold value a haptic impulse (Force Feedback) and the respective function is triggered.

Solution:
As a further factor in the recognition of emotions, the operating force of the controls is evaluated. The operating or touch force is measured directly on the touch screen and used as an additional input parameter for emotion recognition.

As a rule, the customer presses harder than the threshold value required to trigger the function. Depending on the emotional state (annoyed, excited, distracted, tired ...) the customer will press the control panel more or less and press the threshold value more or less. Even pressing without exceeding the threshold value (where the function is not yet triggered) can be evaluated and used for emotion recognition.

The same idea can also be used for other force-sensitive controls. For example, the operating force of the light button module and the switch bar is measured. Here, too, a haptic impulse (force feedback) and the respective function is triggered at a defined threshold value.

Using machine learning approaches, supervised learning algorithms, pattern recognition or artificial intelligence (AI), the driver's emotional state is determined from a series of input parameters. As a further input parameter, the operating force of touch screens and force-sensory controls is evaluated and included in the evaluation algorithms. Common methods can be used for force detection. E.g. capacitive, piezoelectric, inductive force measurement as well as strain gauges or electropolymers. The evaluation is done in a suitable electronic unit, which triggers the desired action in the vehicle.

Advantages:

- Based on measured values, physiological data and behavioral data, emotions can be analyzed in real time in the vehicle. Emotion recognition technologies can help to analyze the driver's mood. This can make driving safer. If a car is able to recognize the emotional state of the driver, it can help to prevent potential accidents. It can give the driver signals to stop the car, initiate a break or change the temperature, for example. If the driver's emotional state is recognized, the interior can also be designed accordingly, e.g. through lighting, smell or activation of the seat massage. Many other emotionally dependent vehicle adaptations are conceivable: Driving characteristics, empathic feedback of the speech dialog system, early warnings, etc.
- The inclusion of the operating force as a further input variable does not require new sensors, but only the logical linking of the existing control units, since the force values are determined anyway.