Tips from racing for the race track

Beitrag von „Albert Motorsport“ vom 30. Juni 2022, 11:15

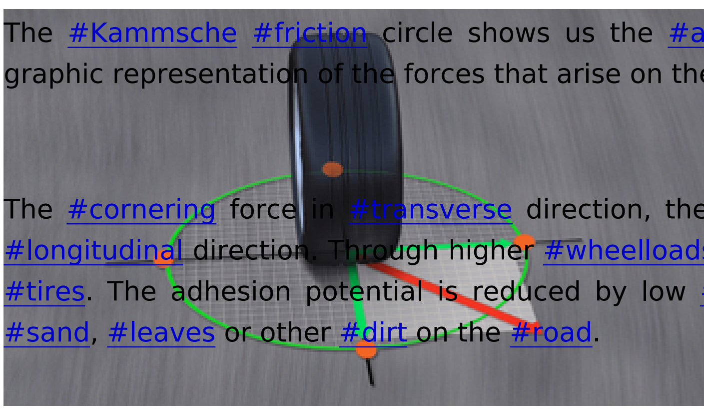
Dear all,

we Porsche drivers often have the desire to drive our cars on a race track.

Inevitably, we then ask questions that would hardly arise in normal everyday traffic.

Here are some of them, the answers to which I will provide directly.

The grip potential of tires - the Kamm circle:



The #Kammsche #friction circle shows us the #adhesion potential of our tires through the graphic representation of the forces that arise on the wheel of our #Porsche.

The #cornering force in #transverse direction, the #braking force and the #driving force in #longitudinal direction. Through higher #wheelloads we expand the #adhesion potential of our #tires. The adhesion potential is reduced by low #friction values, in #wet, #snow, #mud, #sand, #leaves or other #dirt on the #road.

When we #overstress our tires, the vehicle starts to slide.

The most important statement of the Kamm's circle is that the longitudinal force and the cornering force are directly dependent on each other, and that the #total force resulting from these individual forces cannot exceed the available maximum #frictional force. This insight results from the #forcesparallelogram from the "Theorem of #Pythagoras".

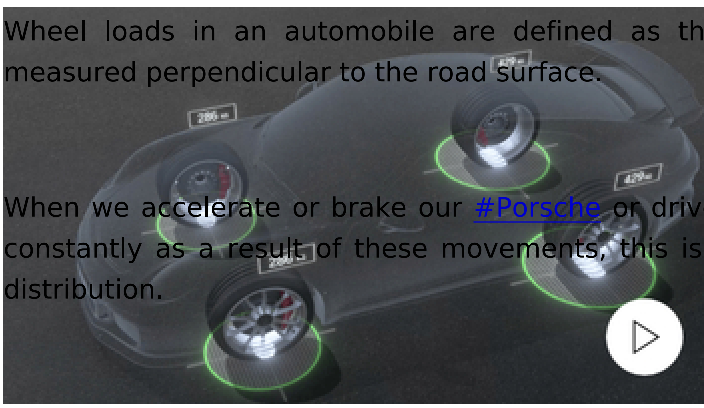
When increasing the longitudinal force in the #acceleration phase and when

#Braking, we have less #cornering force available.

Conversely, the maximum acceleration and deceleration at

non-guided vehicles is only possible when driving straight ahead.

Axle weights and the dynamic wheel load distribution:



Wheel loads in an automobile are defined as the forces acting on the wheels and tires, measured perpendicular to the road surface.

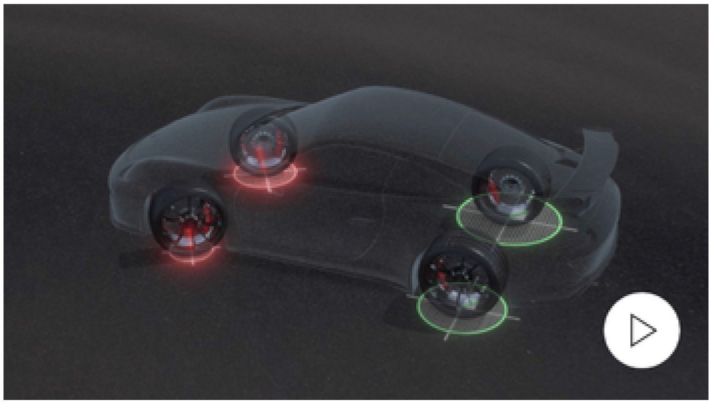
When we accelerate or brake our #Porsche or drive through a curve, the wheel loads change constantly as a result of these movements, this is referred to as the #dynamic #wheel load distribution.

When braking, especially when braking hard, a #wheel load shift takes place forward, the vehicle compresses on the front axle and rebounds on the rear axle, when #accelerating it is the other way around.

In the event of #emergency braking on a straight level, one can assume a #wheel load shift of 80% to 20% as a rule of thumb. And that is exactly the reason why the brakes on the front wheels are significantly larger than on the rear wheels.

The wear of the #brake pads and the #brake discs on the front wheels, even in rear-wheel drive Porsche #911 #vehicles, in relation to the braking surface of the discs and pads, is approx. 70 - 80% at the front and approx. 20 - 30% at the rear. .

Understeer, pushing over the front wheels:



If our Porsche has too little grip on the #front axle and thus steers less into the #curve than the steering wheel specifies, then it understeers and pushes into the curve via the front wheels.

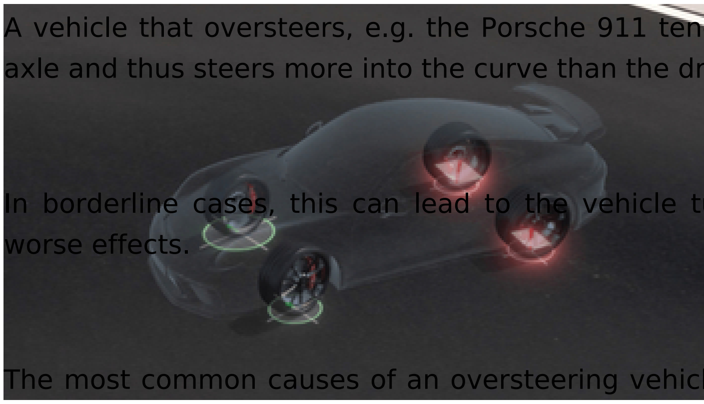
At the steering wheel, we feel the understeer due to a reduced #steering resistance and a less precise #steering.

If our vehicle understeers when driving briskly through the curve, we can counteract the understeering by lightly braking or lifting the gas pedal.

Finally, if we are controlled and don't accelerate out of the corner too early, then we can drive through the entire corner cleanly and thus improve our lap times.

We always set up our race cars to produce marginal understeer, because that way we can generate maximum cornering speed without fear of being #thrown out of the corner.

Oversteer, the unwanted rear skid:



A vehicle that oversteers, e.g. the Porsche 911 tends to do this, has too little grip on the rear axle and thus steers more into the curve than the driver specifies at the steering wheel.

In borderline cases, this can lead to the vehicle turning and hitting the crash barriers or to worse effects.

The most common causes of an oversteering vehicle are braking too hard when turning into a corner, abruptly decelerating while cornering, or restless and excessive cornering.

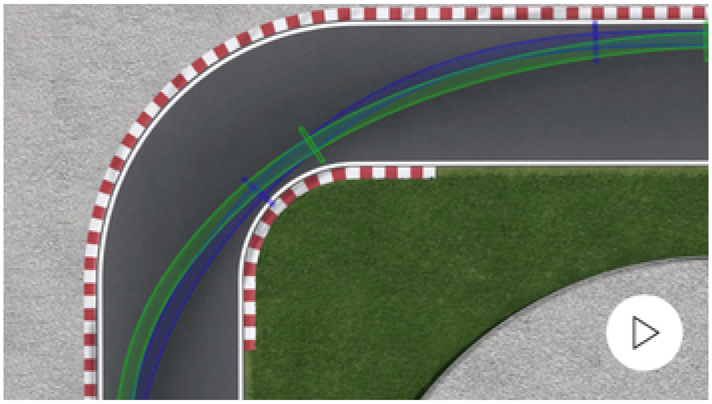
In vehicles with #rear-wheel drive and engine and transmission on the #rear axle, such as the Porsche 911, significant oversteer can also occur due to strong #acceleration at the #corner apex and #corner exit.

In addition to the necessary experience, controlling an oversteering vehicle requires excellent #reactions and should by no means be underestimated by the danger it poses.

To compensate for oversteer, Porsche has developed a special front axle geometry and special N tires.

Here are a few lines about it.

Braking optimally, that is the art of the right dosage:



During braking and the resulting #deceleration process, we can gain a lot of time on racetracks if we brake properly and cleanly.

Our goal here is to fully utilize the #adhesion potential of the #tires available to us during the entire #braking process.

For this reason, the change between #accelerator and #brake pedal should be as short as possible. Then we initiate the #braking process with the right intensity.

Towards the end we reduce the #brake pressure slightly to reduce the #tendency to understeer when turning into the corner. We can optimize the braking process by using the #reference points on the track to slowly and in a controlled manner approach the right braking point and our ideal line for the upcoming curve.

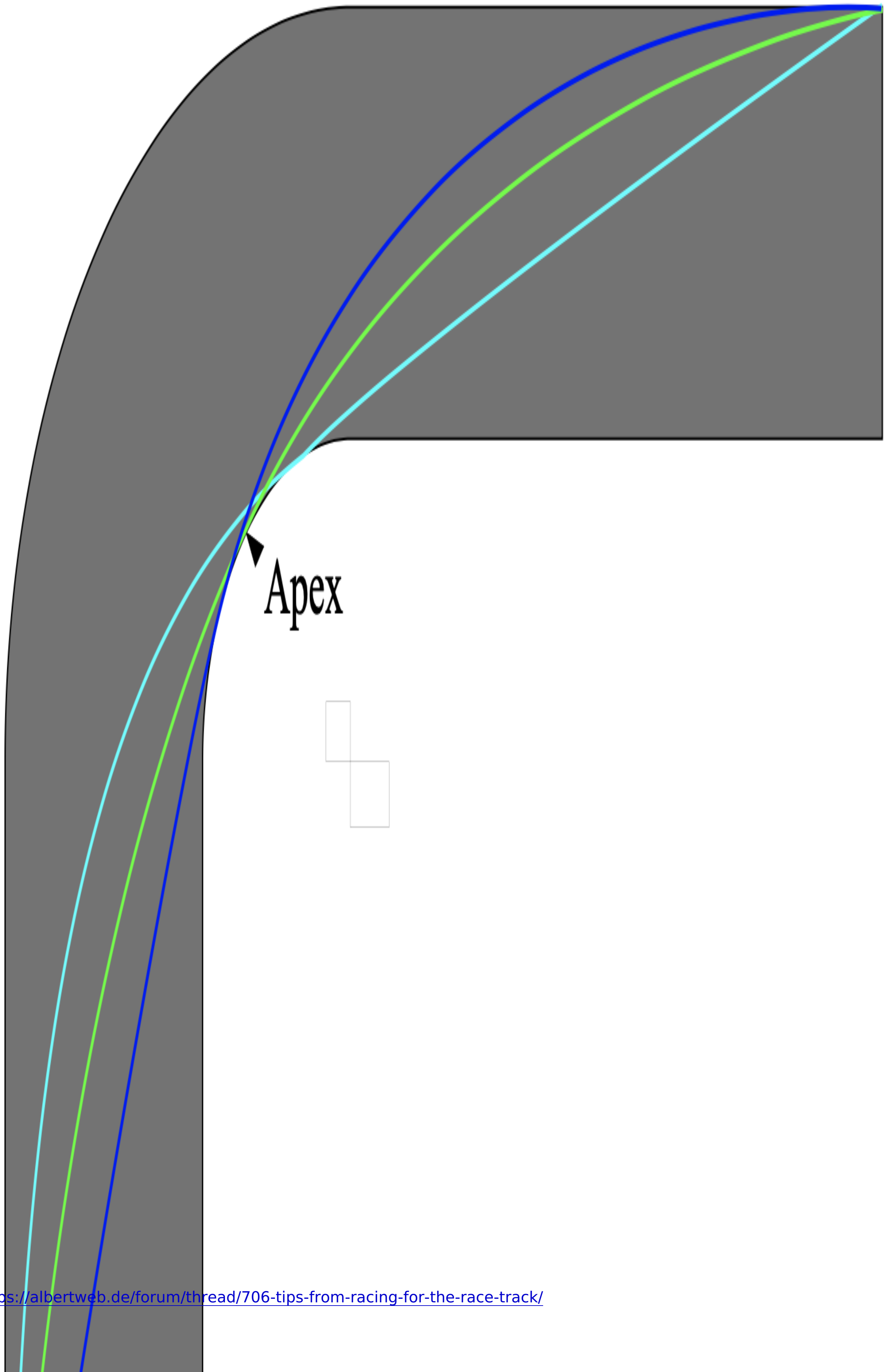
First we bring the brakes to the optimal operating temperature in a "#warm-up lap" and only then do we call up the maximum deceleration performance of our brakes. In poor track conditions, we are particularly careful and drive a minimum of 2 test laps to bring the brakes and tires to the correct #operating temperature.

What is the correct ideal line through the curve?

A hotly debated topic on #racetracks and at #beer tables is:

What is the right #ideal line through the curve and who is when and where on the #ideal line and who has the right of way there?

Again and again, especially during my last #race, there were heated #discussions about who behaved wrong when and where:


Apex

The fact is that an ideal line is always an "imaginary line" that describes the fastest possible route through a curve on a race track and not a priority road for racing drivers from which you can then assert #priority claims.

This fastest possible route is different for different #vehicles, #drivers and their #driving styles. Different tunings (setups) of individually tuned racing cars also require different fastest lines on racetracks.

Therefore, in my opinion, there is no generally valid ideal line for any racetrack worldwide, which would apply to every vehicle, every driver and for every weather and road surface condition and from which one can derive analogous claims to "right of way".

The ideal line is rarely the shortest route through a curve. The #strategy of the fastest line is rather to increase the radius of the curve and to accelerate out of the curve as early as possible in order to achieve the optimal time.

Most drivers brake on the outside of curves on #racetracks, turn in late, and approach the #apex on the inside and then use them across the entire #road width in order to then have the vehicle carried out again under #acceleration.

In a #duel, the #man in front chooses, instead of the ideal line that is faster for him,

to defend his position, mostly the #fight line blocking the pursuer.

Driving on this battle line is slower than the ideal line, although it blocks the most favorable path for an #overtaking maneuver by the #competitor, it preserves the #leading #maneuver in his own leadership position.

The faster, closely following man behind has the opportunity to overtake the man in front next to the ideal line - usually on the inside of the upcoming curve - due to his excess speed. In order to prevent this, the person in front deviates from the ideal line before a curve and drives the curve further inside in order to leave no room for his competitor on the inside of the curve and so to speak cut him off.

Therefore, exactly in the #apex of the #curves (apex), #accidents happen very often, as happened to me in the last race.

An attempt to overtake on the outside line rarely leads to success with equally fast vehicles, since the #distance is longer there.

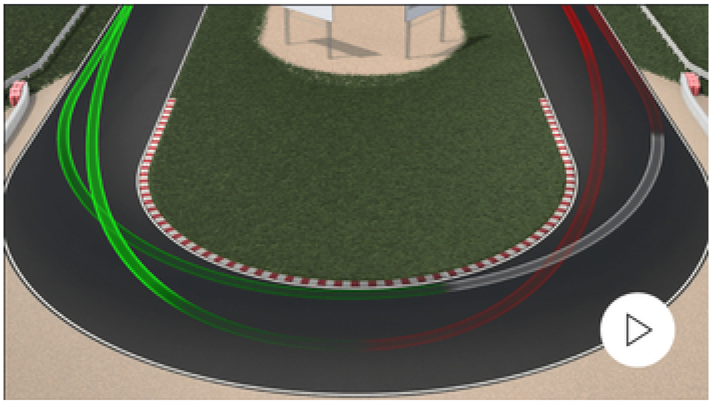
Because driving on the fighting line is slower than driving on the ideal line, the man in front also loses time in a duel.

The line of battle is always driven by the person in front when the pursuer is preparing an overtaking manoeuvre. For the first in a race, the #time loss is relatively insignificant as long as the second and the following vehicles cannot get past him.

Battles for positions at the back often mean that pilots driving further behind can suddenly overtake both vehicles fighting with each other at the same time and thus participate in the #duels of the #competitors driving in front and improve their #positions.

But further on the topic ... how do we drive?

On the ideal line or the time-optimal line through the curve?

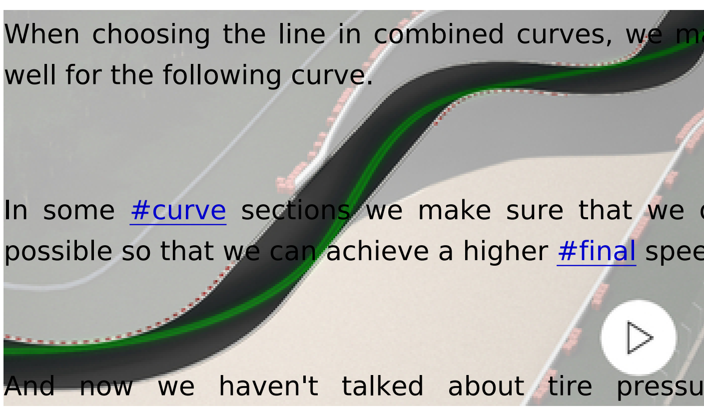


The #time-optimal line brakes very late, which significantly reduces the #rolling phase in the curve.

The #braking process is extended deep into the #curve, then it is immediately accelerated again.

This line should only be chosen by advanced #drivers with good #track and vehicle knowledge and depends on the vehicle, its performance and the condition of the tires.

Combined curve line:



When choosing the line in combined curves, we make sure that we always position ourselves well for the following curve.

In some #curve sections we make sure that we drive through the last curve as quickly as possible so that we can achieve a higher #final speed on the straight.

And now we haven't talked about tire pressures, anti-roll bar settings, rebound and compression settings of shock absorbers and many other points that I'll be happy to discuss on another occasion.

Warm greetings

Jurgen Albert

master mechanic

** Pictures: PorscheAPP

** WIKIPEDIA

** Text: Jürgen Albert