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Accelerating into the Horizon of Automotive Design

As the automotive industry is one of the largest in the world, this vast fabrication comes along with many errors whether it may be within the car's electric software or the car's physical components. These issues eventually boil down to the designers who start the actual process of a car's production. The design process is an integral aspect of the development process. The designers integrate research, coordinate, and refine vehicle dimensions, including material concepts and production processes as well as the final test runs. Although, technical issues can only be controlled and avoided to a certain extent when external variables can impact the car's physical body and electrical system. These outside variables; infamously known as car accidents, can vary from a simple dent to total destruction of the car's body. In order to prevent this serious dilemma, all car companies should start utilizing descriptive, predictive, and prescriptive analytics to prevent and solve these insufficiencies, ultimately saving money and more importantly, lives.

Regarding a car's outer material, most people resort to the question, "why can't cars be made out of an indestructible material?" due to the fact, around the world, about 1.25 million people die in car crashes, in the United States by itself, more than 2 million crashes result in injuries or even become disabled. In the article, "What if all Cars Were Indestructible?" the author suggests the idea of making every car made out of stainless steel alloy or driving cars made from the same materials as tanks and spaceships. Obviously, this would be an extravagant issue for the economy and industry to afford financially in order to produce. Let alone, most individuals would not be able to afford, well maybe the cheap insurance. If this was a new reality, sure, the cars would face little to no damage at all, but passengers inside aren't indestructible. They'd still be flung around and even more violently if the car wasn't indestructible. An indestructible car that crashes would not absorb impact causing passengers to move around more violently resulting in a higher and almost 100% probability of severe injury if not death. This was learned from some of the first car models that were entirely indestructible. Cars today are made of a strong material to protect the passenger called the frame, then the outer shell is made of lightweight material so when they crash the body of the car may be destroyed but they absorb most of the force of impact, allowing the passengers' probability of injury and death to reduce, although laws of physics can still cause substantial effects. Overall, accidents in either car will result in damage to the car but more importantly injury or death to the occupants, so car companies need to come up with solutions to fix damages and even possible; avoid accidents.

Today, many cars are becoming more advanced with driver assistance. Cars can detect with weight whether or not the driver is using both hands or neither. Cars can also detect with their front sensors if the car is within the road lines or too close to the approaching vehicle. If the car is too close to crossing the line the car then alarms the driver or if the car is approaching the object ahead too fast the car then also alarms but then automatically breaks for the driver. This is done by analytical data. First, descriptive analytics is applied to in-time driving patterns and road behavior. These patterns are assessed and then associated with safe or hazardous behaviors in combination with external sources and vehicle demographics. Next, predictive analytics uses data from descriptive analytics to assess patterns and driving behavior to create an assumption of the probability of various future risks. Finally, the descriptive and predictive data is transformed into prescriptive analytics to suggest solutions to issues instantly to guide the driver to maintain safety. Only a portion of tech companies uses prescriptive data. For example, Sirius XM has employees that manually solve issues as they come, while Ericsson is starting to use prescriptive data through connected cars using 5G in order to send out solution codes based on which pattern is detected.

Even though connected cars seem like a solid solution to control damage and accidents, the grass isn't always greener. Harold Kilpatrick's article, "The Dangers of Connected Cars" helps bring this possible and realistic to light. He suggests the risk of cybersecurity as these cars would be connected through the internet and would be ably vulnerable to hacks like any other device. His biggest concern is "Once cybercriminals get their hands on your vehicle's controls, they can disable the car's brakes to cause a crash. Or they can activate the vehicle's microphone to listen to your conversations and turn off the car's security mechanisms to steal it." He then argues that these cybercriminals aren't the only threat to users' safety-rather, the car itself. The vehicle would be advanced enough to use GPS history to know where you live, where you shop, and travel routines. Cell phones already use this data to predict which ads would interest users, remembers which music you played last, and suggest what you should listen to next. Apples'iMaps blue tooth to apple CarPlay can now remember where you parked your car and even which route you take home or to work every day. All of these pre-existing factors are stepping stones to building a smart car, so we can assume these suspicious actions would accompany our new reality. No matter how much we try to avoid this possibility there will always be outside factors out of our control, so in an attempt to prevent this customers should keep software up-to-date as software is always being improved as hackers develop new methods, stay alert to recalls, and be careful when connecting third-party devices, which may allow viruses to transport hackers into the system.

To go above and beyond, utilizing this data to adapt to road conditions, driver habits, and system issues would prevent injuries, fatalities, and overall costs for both the companies and customers. Prescriptive analytics can be used to advance and bring self-healing cars to our reality. Currently, researchers at Harvard University as explained in the article, "Self-healing Materials to Shape the Cars of the Future" have created a sustainable-self healing rubber much like a cutting mat. This was created by combining covalent and reversible bonds to create a molecular rope then resulting in a transparent rubber that can repair itself by dispersing absorbed stress throughout the material. This material would be best for the car tire after a puncture to the interface. Regarding the body of the car, the article, "Terzo Millennio: Lamborghini and MIT's Self-healing Car." explains how MIT is working with Lamborgi’s Terzo Millennio to create the world's first self-healing car. This car is claimed to be able to repair damage to its carbon fiber components. Nanotubes are embedded within the fibers and are able to send resin to where any damage has occurred to prevent cracks from prolonging much like how white blood cells rush to any cut of the human body, in order to build scab tissue to prevent further damage and infection. Although this uses a lot of energy for modern car batteries, so they have developed the use of supercapacitors, which already exist but are limited in quantity. MIT expects to spend three years on developing these supercapacitors into something more superior, to be able to capture and discharge energy more efficiently. MIT has also mentioned allowing the carbon fiber material to absorb energy, but they do not have an idea of how they are going to make it happen. In addition, my proposition is to use ultrasonic waves embedded into the carbon fibers. These ultrasonic waves are used in technology like touchscreens that can detect touch and even pressure. The car's system will include an overall 3D model of the car that can detect and highlight which part of the car is being affected. Using this can then send a code that correlates with the mathematic-degree of pressure from impact collected by the system to send signals to the affected area in order to reform the panel matching the original degree angles. Then the system would send the signal to the area and reverse the indention by sending the liquid resin to the affected area. Even without the self-healing material, ultrasonic waves will allow the car to detect which part of the car is causing malfunction. Tesla Motors already utilizes this, the car can detect the part that is causing an error and automatically places an order for the part. For very minor flaws such as a scratch can be fixed if each exterior panel that is most likely to be affected is covered with a thin shell consisting of various PVC layers within. PVC is the component found in self-healing cutting boards that permits scratches to be absorbed into the particle-pressed material and once separated, the particles slowly retake their original form.

With all things considered, car companies such as Tesla, have already begun production and many speculations are being made of connected cars while being discouraged due to the risk of cyberattacks is reasonable but is incomparable to the number of people who die from car accidents from unconnected cars. Although we do not yet know the percentage of those possible cyber hacks that could cause an accident, that is just a part of development. Overall, our current, relatively ‘primitive’ car technology is so outdated to where the leading cause of death is due to car crashes. To fix this, automotive designers and engineers need to put their heads together and use developing knowledge and capabilities with analytical data in order to expedite the development of our new future and ultimately save money and more importantly, lives.

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