A brief history of the traffic light and why we need a new colour

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Online Desk :

The universally known traffic light has not experienced a significant redesign in almost 100 years, ever since William Pott, a Detroit police officer, created the first three-section traffic light in the United States in 1921. Now, say experts, the rise of driverless cars means that a new set of safety guidelines is needed to ensure they interact correctly with traffic signals.

Traffic lights around the world typically use red, amber and green lights to signal to drivers whether they should stop, go or get ready to either stop or go at intersections and pedestrian crossings. Ali Hajbabaie, a North Carolina State University (NCSU) engineering professor, is leading a team to design a traffic system that considers how driverless cars respond to traffic signals.

Hajbabaie told The Associated Press news agency that he proposes adding another light – possibly a white one.

Traffic signals are about more than just safety. They enable better traffic flow, leading to less congestion, and can also be beneficial to the economy when people waste less time and fuel on the roads.

According to the 2022 Global Traffic Scorecard by INRIX, a company that creates products and services related to the transport industry and autonomous vehicles, the combined cost to the economy of road congestion in the United Kingdom, Germany and the US was $2.2bn. Traffic lights make a significant contribution to keeping this cost down.

But what else can we learn from the past to inform the future?

When was the traffic light invented?

The world’s first traffic light was installed on Parliament Square, opposite the Houses of Parliament in London, UK, on December 10, 1868.

The growing congestion of horse-drawn carriages at that specific intersection was making it increasingly dangerous for pedestrians in the area.

The traffic light installation featured a pillar with a top section resembling a cross. It had semaphore signalling arms, which moved up and down to instruct traffic to move or stop, and red or green gas lights.

Designed to replicate the gestures of a traffic policeman, traffic was required to stop when both arms were perpendicular and move on when they were at a 45-degree angle. The red and green gas lamps were used at night. Based on a railway signalling system, it required a policeman to operate. Gas was fed into the mechanism from a pipe in the ground to power the lights. Unfortunately, the first design of the traffic light had a rough start. A gas leak from the supply pipe beneath it triggered an explosion in the traffic light mechanism, injuring the policeman operating it.

Deemed a safety hazard, the traffic light was quickly removed and traffic lights were banned altogether for the next 60 years. They eventually returned to the British streets in 1929, following the 1921 invention of the three-light signalling system in Detroit.

The first traffic lights powered by electricity were invented in 1923 by the African-American inventor, Garrett Morgan. He eventually sold his design to General Electric for $40,000 ($730,000 in today's money, adjusted for inflation).

Why are traffic lights red, amber and green?

The first colour system used in traffic signal systems was based on the navigational lights system used on ships at sea.

Through the use of the red and green lights, crews on approaching vessels can instantly tell which direction a ship is travelling. This lighting system served as an early collision-prevention system, especially at night in low visibility conditions.

The amber light used on modern traffic lights was not introduced until 1921 when inventor William Potts brought the three-colour traffic light to Detroit.

This innovation added a yellow "caution" light to the existing red and green signals – signalling to motorists that the lights were about to change and alerting them to slow down. The first four-way, three-colour traffic light was installed at the intersection of Woodward Avenue and Fort Street in Detroit in 1921 and, by the mid-1930s, this standard had become widespread across the country.

Why do we need a fourth colour now?

Humans and autonomous cars use different sets of visual cues when it comes to interpreting lighting systems. Different colours – sometimes flashing to indicate that a change is imminent – work best for the human brain, while a single light works better for autonomous cars.

Therefore, a fourth light – most likely white – would be added for the benefit of self-driving cars. The white light would be interpreted by a self-driven car as an instruction to "keep going unless instructed otherwise".

Hajbabaie, the NCSU professor, explained: "If the white light is active, you just follow the vehicle in front of you."

What different types of traffic light systems are there?

Although there are various types of traffic signal technology, most traffic systems fall into two categories: traffic signals which operate on a fixed schedule; and traffic signals which can adjust timing based on traffic volume.

Some different models of traffic signalling are:

Fixed-time traffic signals: These are not based on traffic volume. The traffic planner sets the timing of each set of lights based on general research which will move the traffic forward at a predetermined time.

Detection traffic signals: Also known as "actuated traffic signals", these work with devices embedded in the road which detect the presence and volume of vehicles waiting at an intersection and then sync with the traffic signal, indicating when traffic should move or stop.

Split-cycle offset optimisation technique (SCOOT): This traffic management system aims to optimise the volume of traffic at intersections using real-time traffic data. SCOOT automatically adjusts the light sequence based on data collected from traffic signals. This helps to reduce congestion and improve traffic flow.

Pedestrian-activated traffic signals: These are activated via a manual push button or sensor which identifies a pedestrian at the crossing and changes the lights to stop the traffic.

Could AI be used in traffic systems?

Henry Liu, a civil engineering professor at the University of Michigan, has come up with a different approach to solving traffic congestion problems using artificial intelligence (AI).

Having won a $15m grant to establish the Center for Connected and Automated Transportation from the US Department of Transportation in February last year, Liu and his team are testing how traffic lights could be signalled using real-time location and speed data from cars equipped with Global Positioning System (GPS) in the Detroit suburb of Birmingham.

This particular neighbourhood in Detroit has been chosen because all 34 traffic lights in Birmingham rely on a fixed schedule. They do not receive information from cameras or sensors to adjust for traffic flow, meaning they can be adapted to receive information solely from cars, Liu explained, without any interference.