CARS

ADAPTIVE, PROGRAMMABLE HEADLIGHTS CUT THROUGH RAIN, ILLUMINATE WITHOUT BLINDING OTHER DRIVERS

EACH LIGHT CONSISTS OF ONE MILLION TINY INDEPENDENT BEAMS

By **Francie Diep** Posted September 10, 2014

Prototype Headlight at Work

Carnegie Mellon University

The headlight senses oncoming cars and automatically dims beams of light reaching those cars' drivers' eyes.

This is perhaps the only optical illusion you would want to see while you're driving. A team of university engineers has created a vehicle headlight that adjusts itself so that drivers can keep their high beams on

even when other cars are coming toward them. To the driver, the light still looks extra-bright. But from the point of view of the oncoming driver, it's automatically dimmed.

That's not the only thing the prototype headlight is able to do. It's also able to project arrows or lane markers onto the road. It can sense upcoming street signs and shine more light onto them. And it can make raindrops or snowflakes seem to "disappear" from its beam, to clear the vision of the driver—a trick that this team of engineers, from Carnegie Mellon University, has been working on for a few years now.

How does it all work? The headlight is actually made up of not just one beam of light, but one million tiny, individual beams. The individual beams are created the same way pixels on a projector are. There's a semiconductor chip that has an array of a million tiny mirrors on it. The mirrors flip to modulate each pixel's brightness.

This way, the system can turn off some beams sometimes without the driver noticing too much. To make raindrops "disappear," the system tracks falling rain, predicts where the drops are going, and then turns off the beams that would otherwise

reflect light off the drops. To make headlights appear dimmer to oncoming drivers, the system tracks other cars and turns off only the beams that are aimed at those drivers. To make arrows on the road, the beams project their light accordingly. It's like having a football field full of dorky marching-band players that you can rearrange into whatever patterns you like. (I was in marching band in high school).

Throwing Shade

Carnegie Mellon University

Illustration showing how the prototype headlight is able to look dim to others while bright to the driver.

The headlight's on-board computer reacts to what it senses—whether it's cars, raindrops, street signs or anything else—within 1 to 2.5 milliseconds, according to Carnegie Mellon University. That's an improvement from last year, when the university had only a raindrop-disappearing light, that worked with a 13-millisecond delay.

Some car companies have already

created and sold high beams that appear dimmer to other carss. (Although they seem to be illegal in the U.S.) Those adaptive high-beams work in much the same way, aiming many beams of light at the world and dimming only those that point at other drivers. However, CMU emphasizes that its programmable light is able to project any number of custom arrangements, not just the dim-for-others program.

CMU's versatility comes at a price. It's too large (and probably too expensive and delicate) to go into cars now. The university plans to install it into a truck for testing next year. It will take a few more years yet to miniaturize the light enough for ordinary cars.

TAGS: CARS, HEADLIGHTS, HIGH BEAMS, SELF-DRIVING CARS, ROBOT CARS