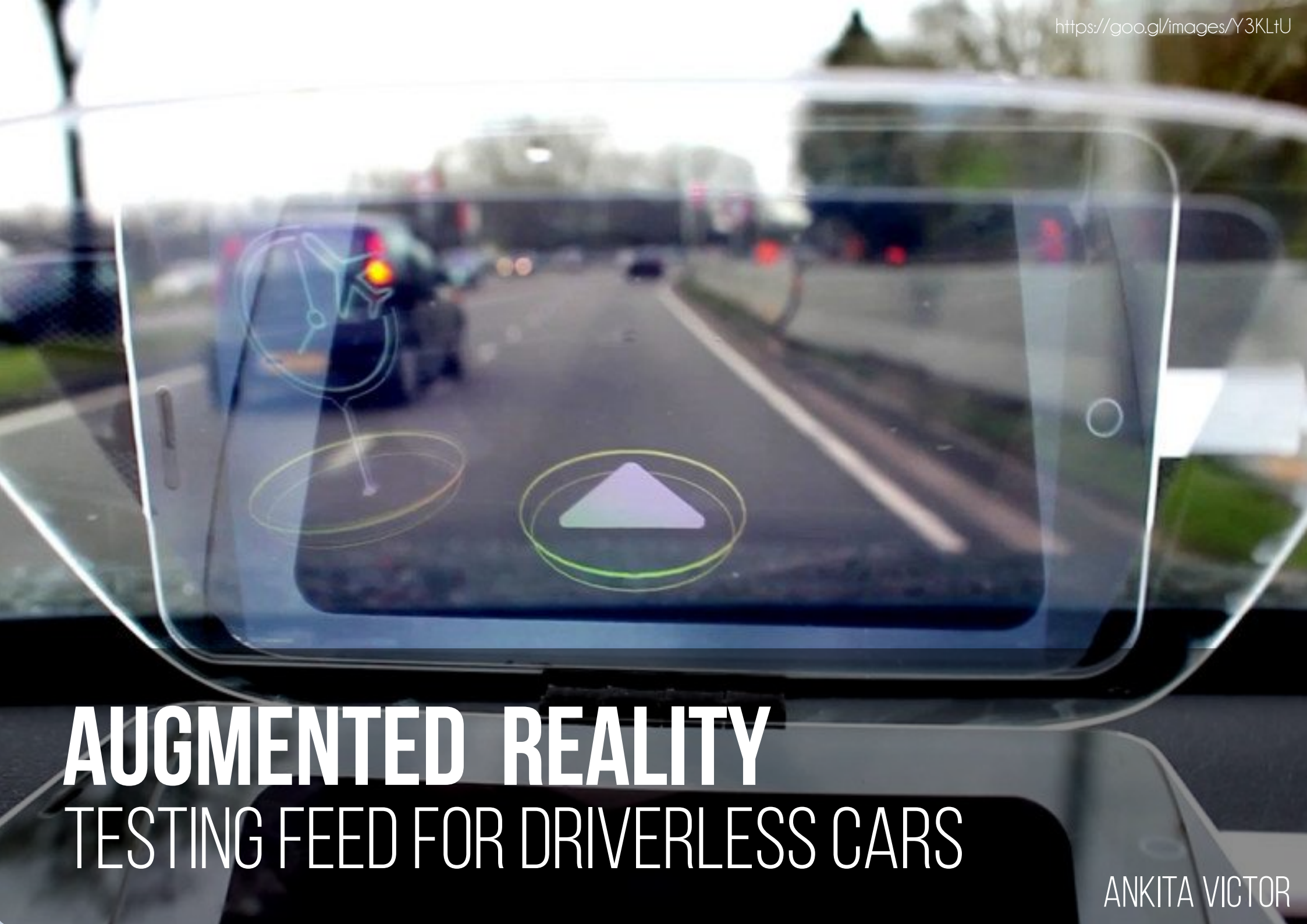


https://goo.gl/images/Y3KLtU

AUGMENTED REALITY

TESTING FEED FOR DRIVERLESS CARS

ANKITA VICTOR

HOW DO DRIVERLESS CARS WORK?

Radar sensors around the car monitor the position of vehicles nearby

Video cameras detect traffic lights, read road signs and keep track of other vehicles and look out for pedestrians and other obstacles

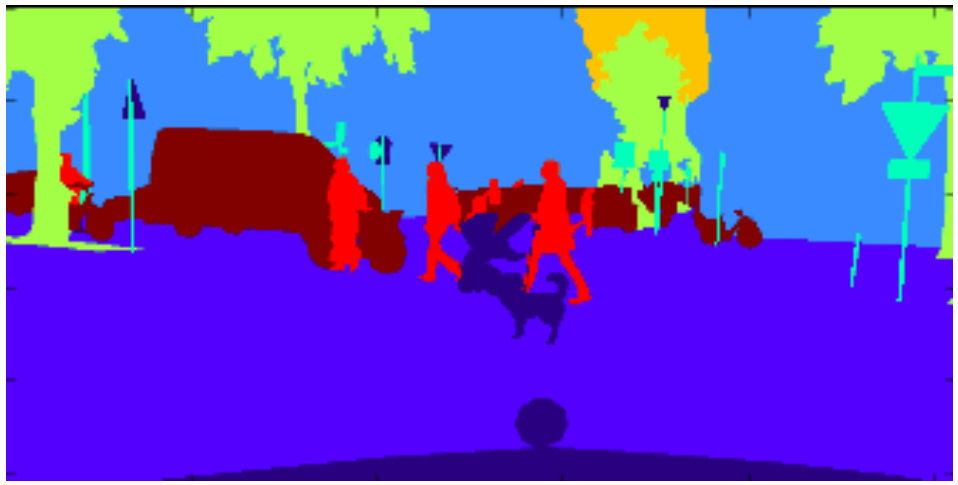
Lidar sensors detect the edges of roads and identify lane markings by bouncing pulses of light off the car's surroundings.

Ultrasonic sensors detect the position of curbs and other vehicles when parking.

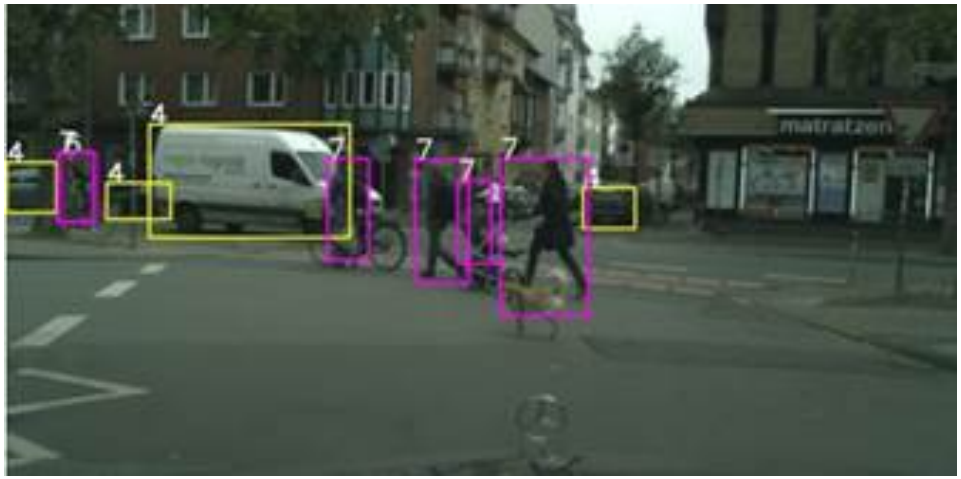
A central computer analyses all of the data from the various sensors to manipulate steering, acceleration and braking.

http://www.telegraph.co.uk/cars/features/how-do-driverless-cars-work/

THE TWO CATEGORIES OF RECOGNITION

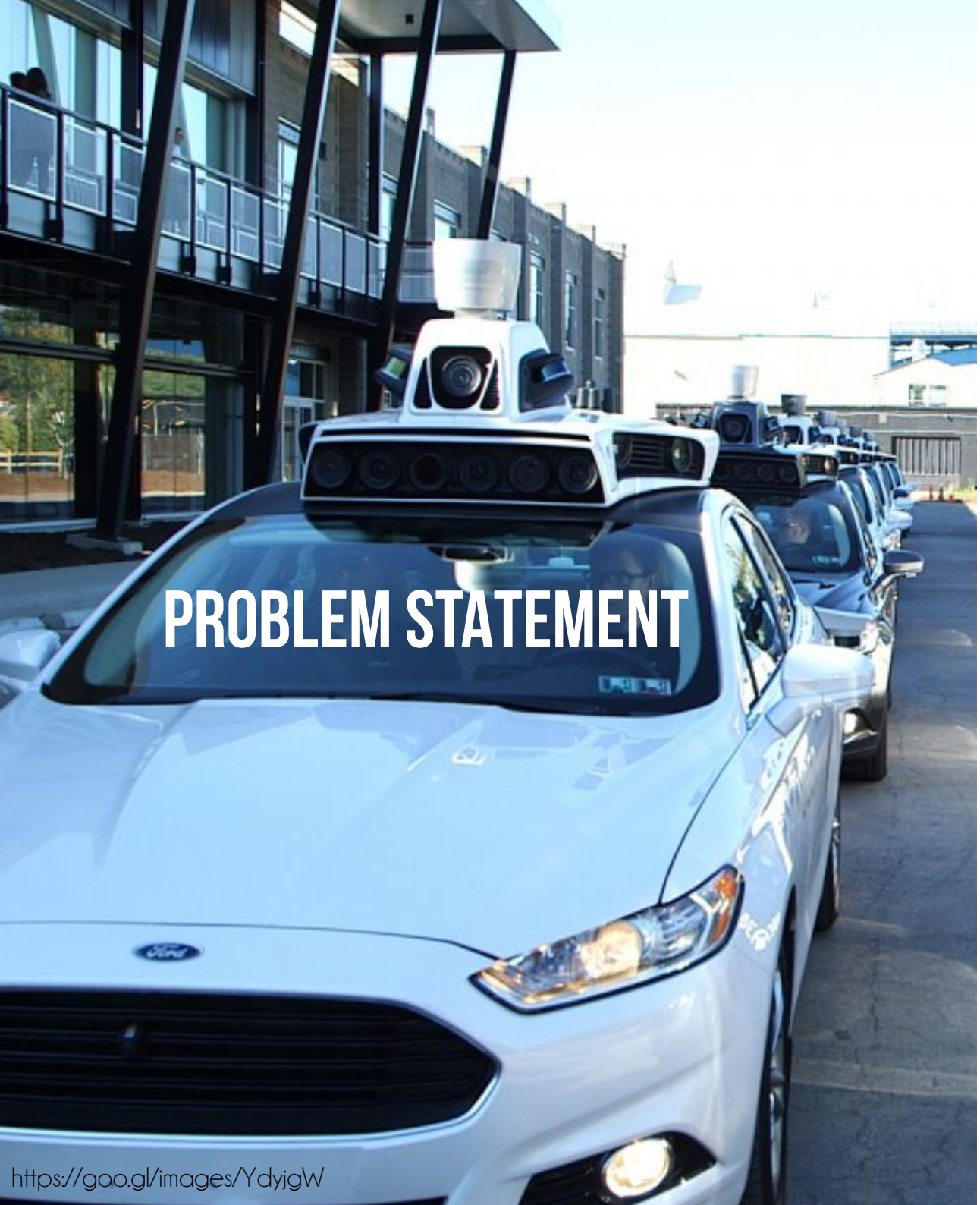


Semantic segmentation or the ability to label the pixels that belong to particular classes of object.



Object detection or the ability to bound the location of an object with a box and detect classes of objects.

https://blogs.nvidia.com/blog/2016/01/05/eyes-on-the-road-how-autonomous-cars-understand-what-theyre-seeing/



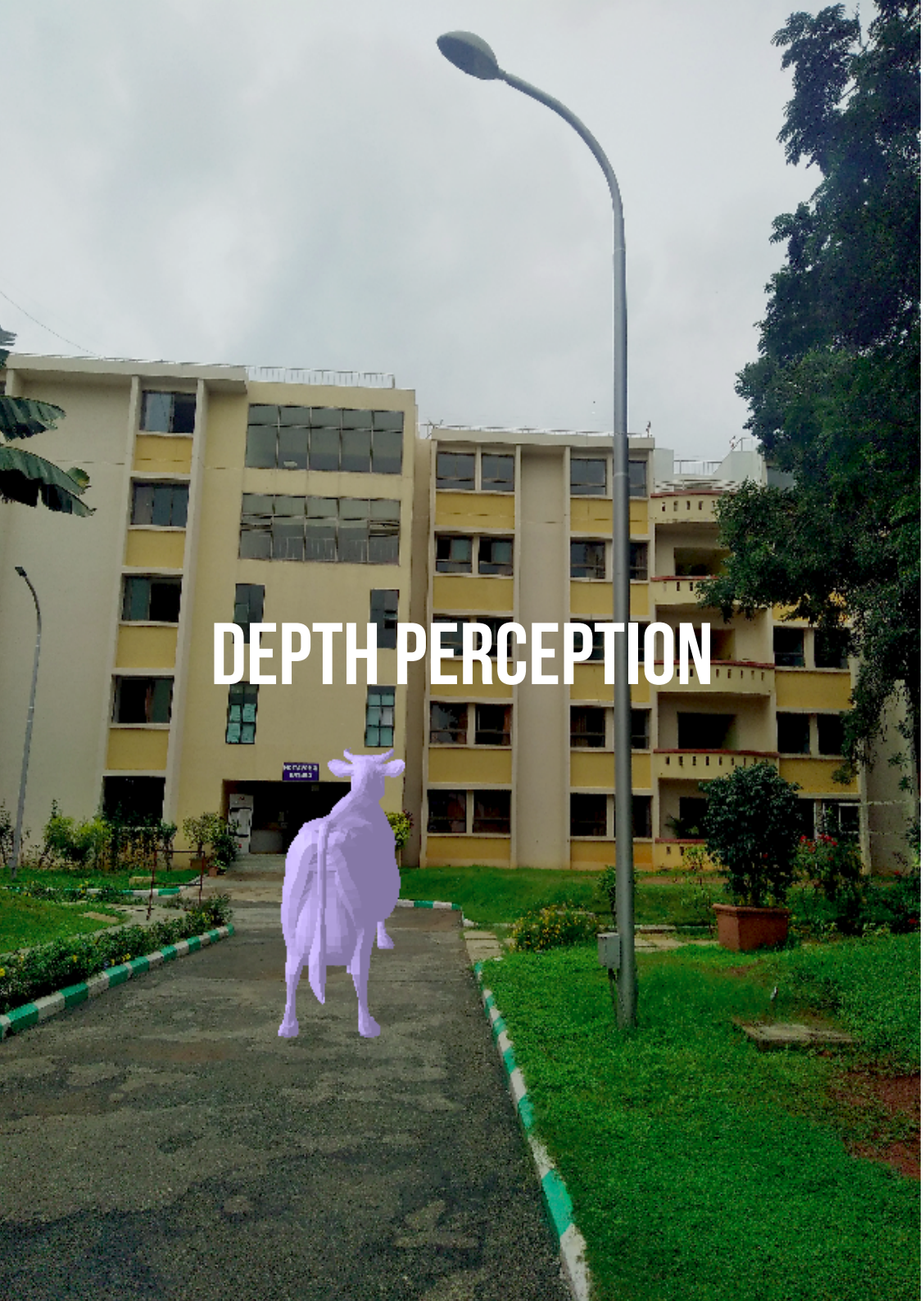
PROBLEM STATEMENT

https://goo.gl/images/YdyjgW

Simulate testing feed for driverless car systems by introducing a 3D object into a regular video input.

KEY CHALLENGES

The video input is a flat 2D image while the introduced object, to look realistic, needs to be occluded at the right places.



Where must the virtual object be placed?

How will it's size change with moving into the scene?

At what height must it be placed?

SOLUTION APPROACH

OCCLUSION

RIGHT SIDE VIEW

FRONT VIEW

A *billboard* is a texture mapped polygon, which always faces the viewer.

Using billboards results in the illusion of a 3D world in which the object gets occluded.

Ideally - the objects to be made into billboards are picked by some image analyzing tool.

DEPTH

POSITION AT T

POSITION AT T+ T Δ

The video input moves into the scene (as if the car is moving forward).

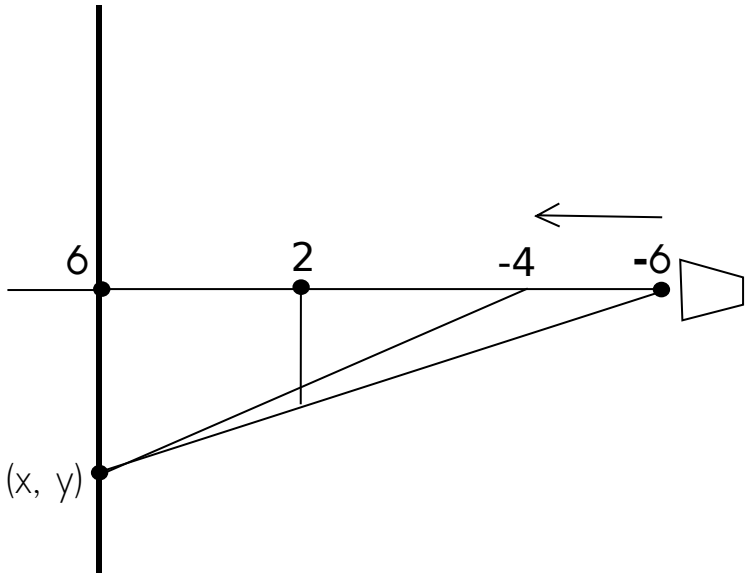
Depth of the billboards are inputted by the user.

The billboards and the virtual object move towards the eye of the camera to make it appear larger.

KEY IDEAS INTRODUCED

Picking billboards

Using similarity of triangles to account for perspective distortions between the actual position of the selected billboard on the frame and its position at a different depth



Interpolation of billboard control points across frames

Interpolation of depth and rendering billboards closer to the camera eye

LIMITATIONS OF CURRENT IMPLEMENTATION

Billboards across frames have to be manually selected by the user (some frames can be omitted since interpolation of position is done)

The position of the virtual object, height of the camera above the ground and path of the object are video input specific and require manual intervention.

FUTURE WORK

Using computer vision to perceive depth and identify a particular object across multiple frames


FONTS USED -
BEBAS NEUE
CUPRUM
CHAMPAGNE & LIMOUSINES
PRESENTATION MADE USING INKSCAPE
122 km/h
https://goo.gl/images/NHBQuw