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12-4-2019

Sensor Emulation with Physiological Data in Immersive Virtual Reality Driving Simulator

Jungsu Pak

Oliver Mathias

Ariane Guirguis

Uri Maoz

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Jungsu Pak^{2,3}, Oliver Mathias^{2,3}, Ariane Guirguis³, Uri Maoz^{1,2,3}

¹ Crean College of Health and Behavioral Sciences, Chapman University;

² Schmid College of Science and Technology, Chapman University;

³ Institute for Interdisciplinary Brain and Behavioral Sciences, Chapman University

Question

Can we enhance the safety and comfort of AVs by training AVs with physiological data of human drivers?

Goal

Train and compare AV algorithm with/without physiological data.

Introduction

Autonomous vehicles (AV)

- Reduces road accidents
- Reduces driving related stress
- Became possible with advances in sensor technology and machine learning

Machine Learning

- Uses various sensors to read the surrounding environment as data.
- The data is used to train NN offline.
- NN makes driving decisions in real time.

Material

The immersive virtual reality driving simulator has several components:

Oculus Rift

- The Virtual Reality headset that allows tracking of rotation and position of head
- Provides realistic feedback for visual system
- Full control of participant's visual perception

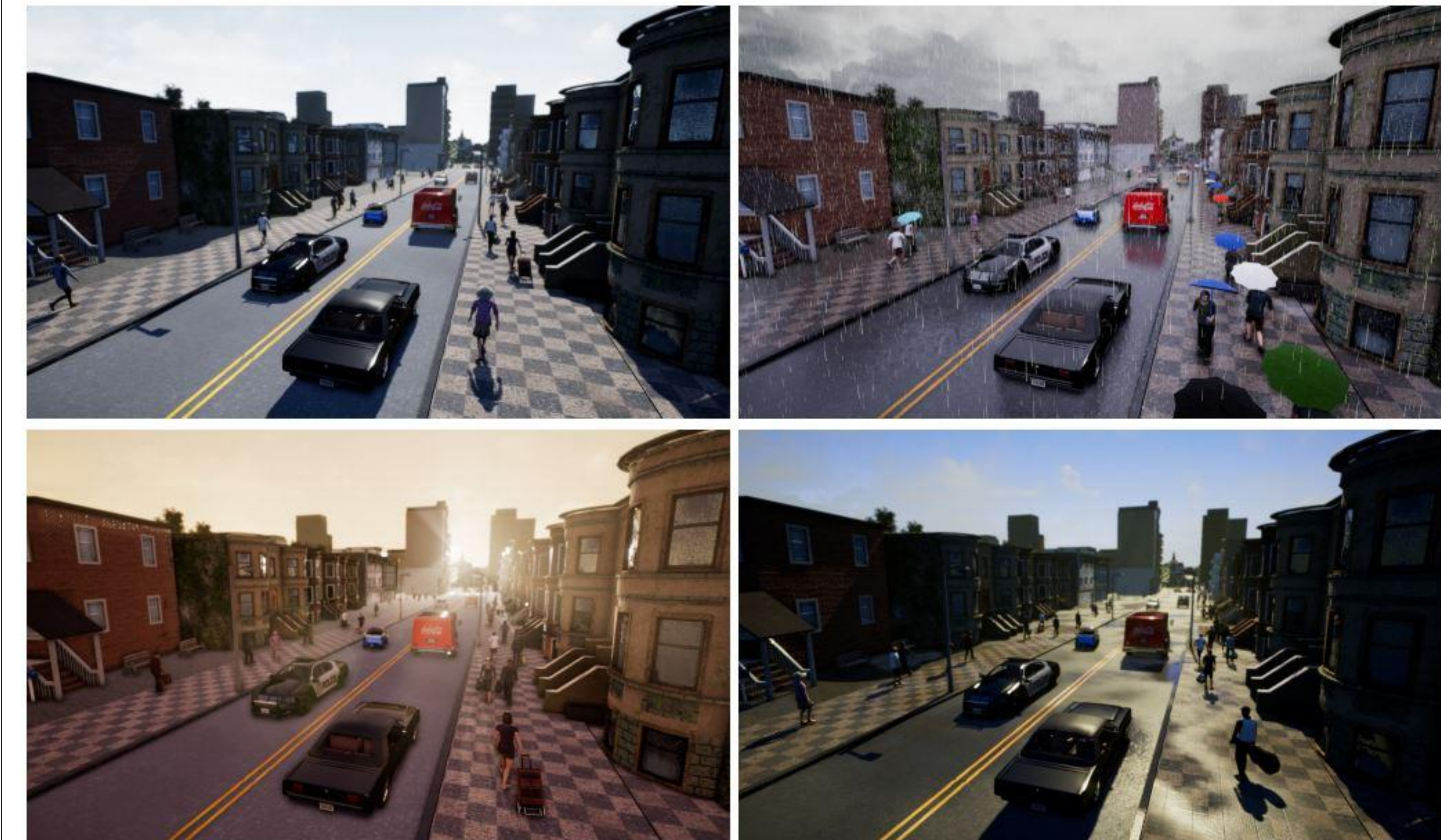
Logitech G920

- A wheel, pedals, and a shift provide realistic driving control
- Tactile feedback from the road

DOF Reality 3D

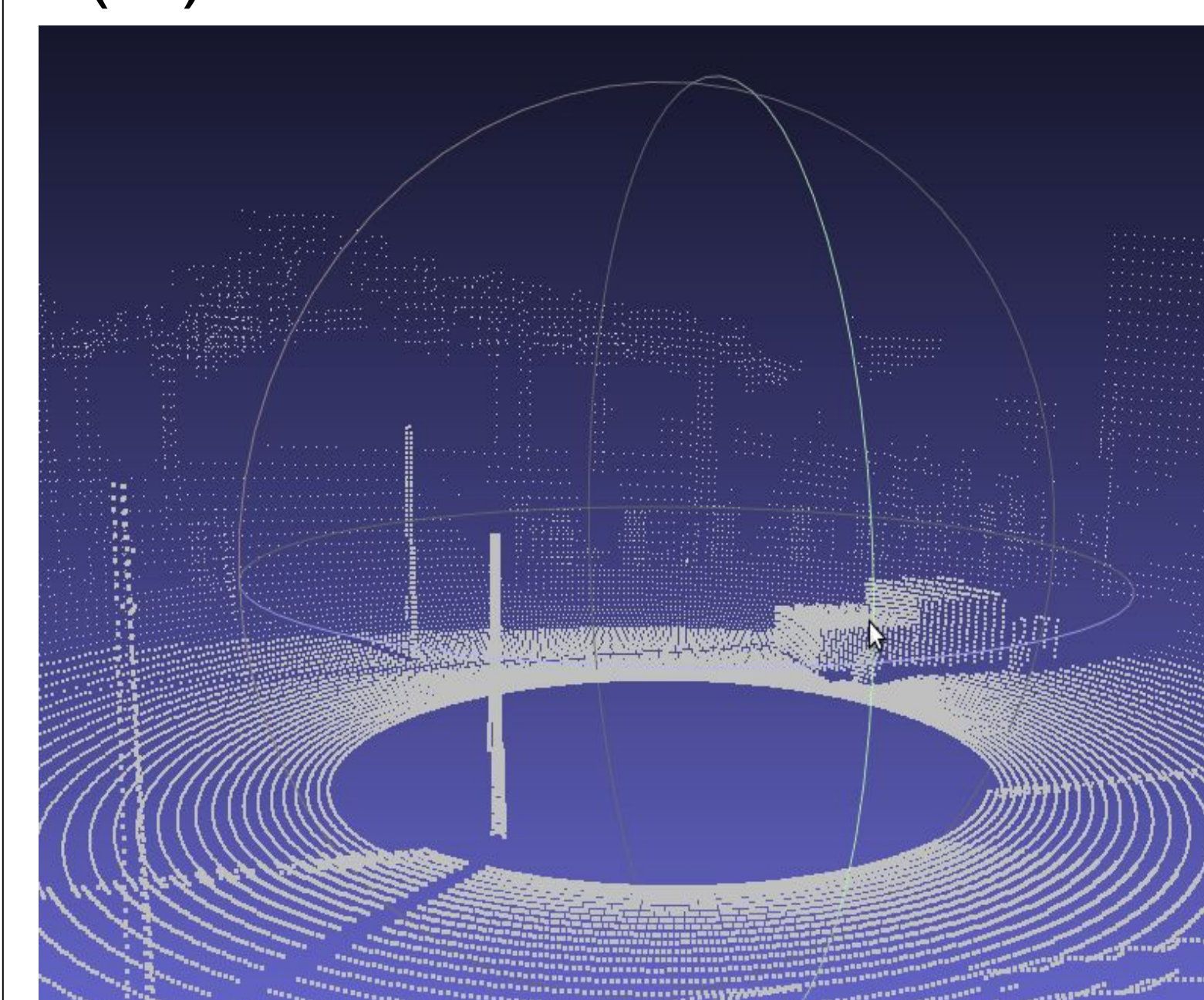
- Motorized platform with 3 degrees of freedom (pitch, roll, and yaw)
- Mimics vestibular feedback for acceleration, braking, and turning

CARLA environment

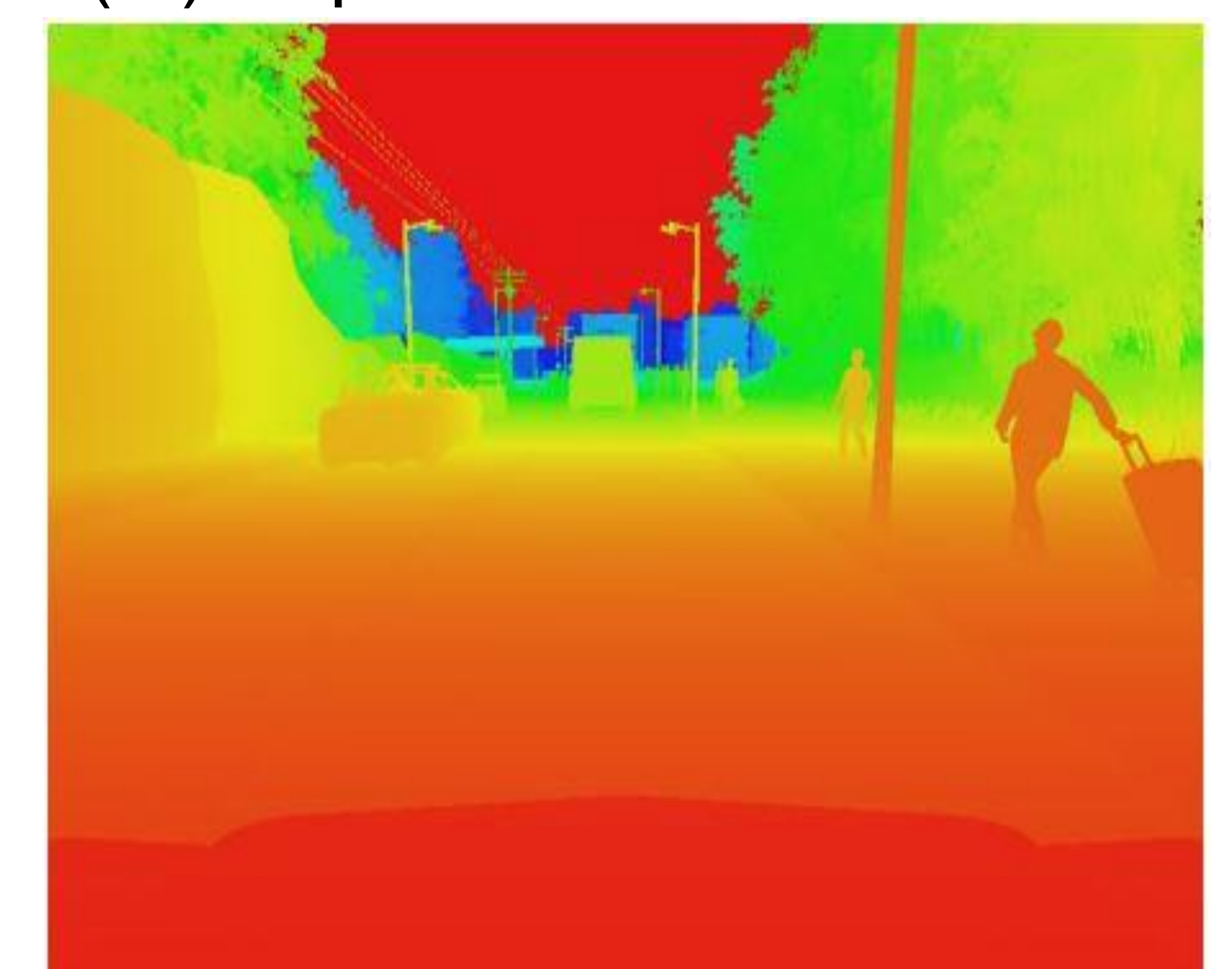


Sensor Types

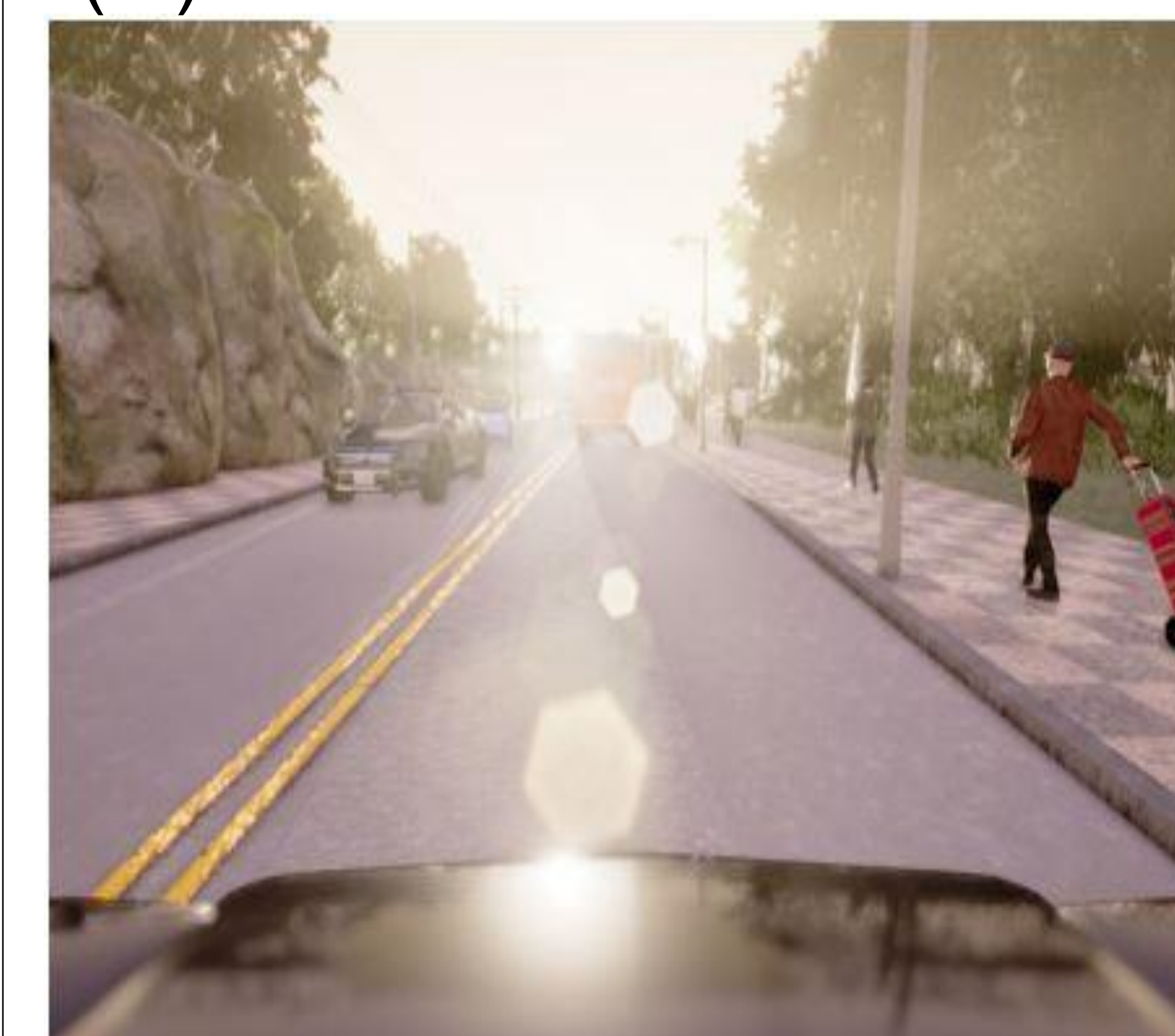
(1.) Lidar Visualization



(3.) Depth Camera Feed



(2.) RGB Camera Feed



(4.) Semantic Segmentation

