

GESTURE RECOGNITION: USING A MULTI SENSOR APPROACH

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JAN KAUTZ

NVIDIA RESEARCH

DRIVER DISTRACTION



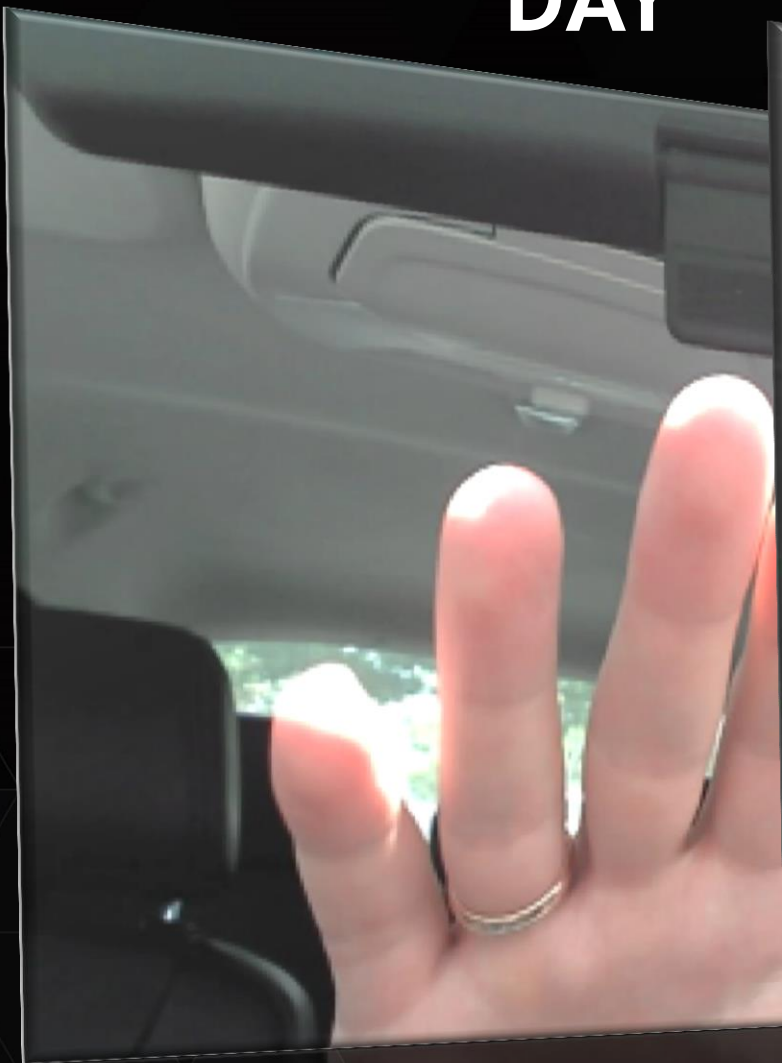
GESTURE INTERFACE



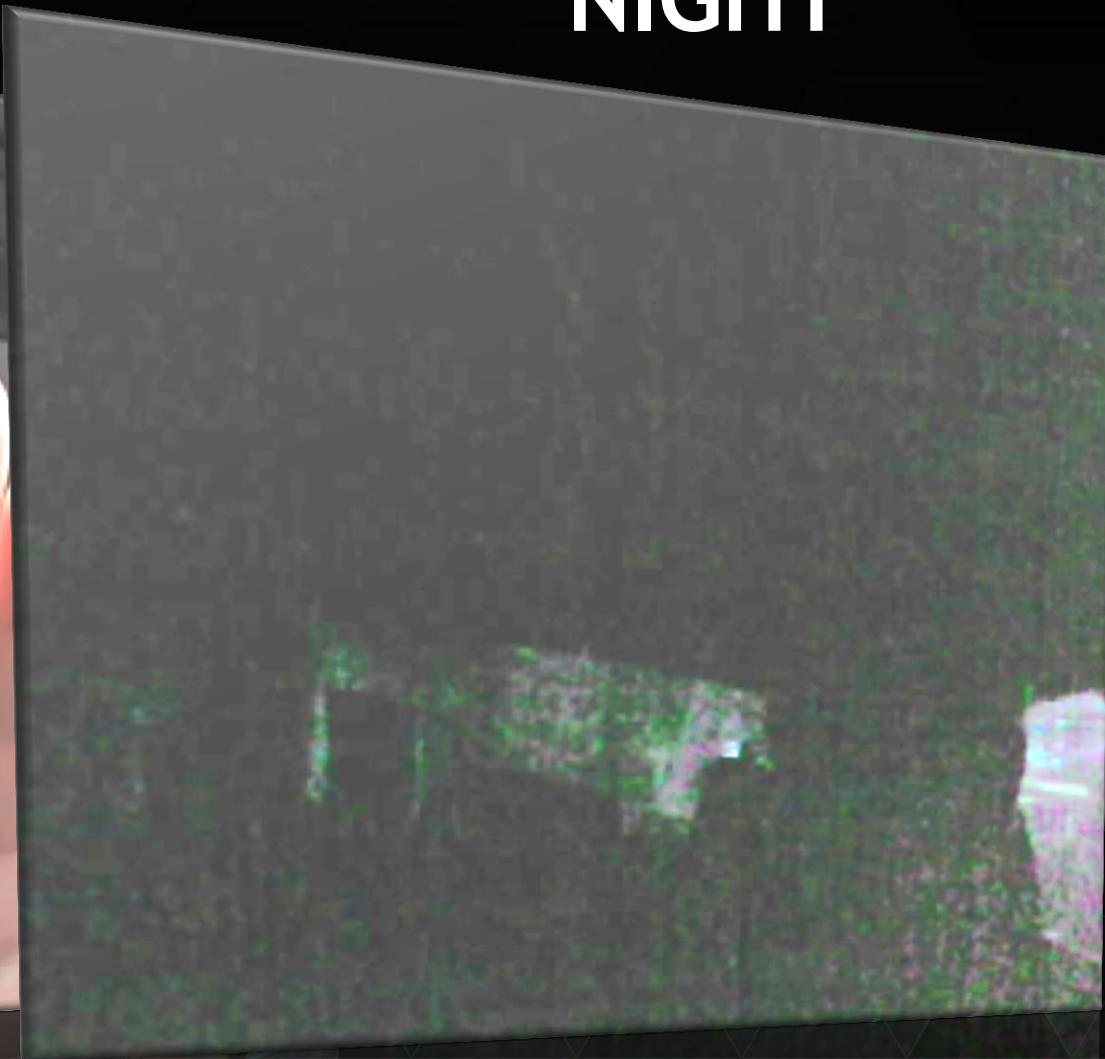
DAY



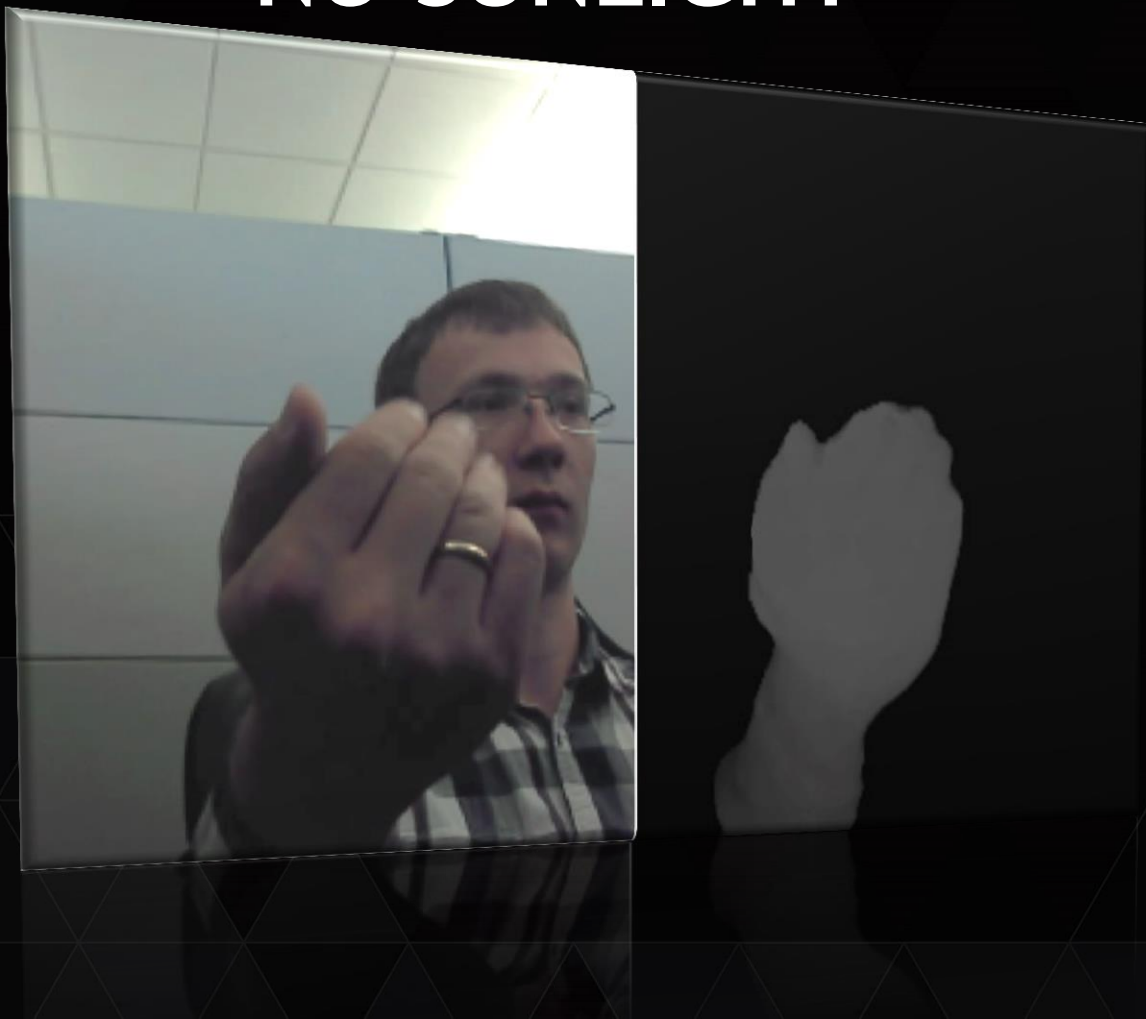
DAY



NIGHT



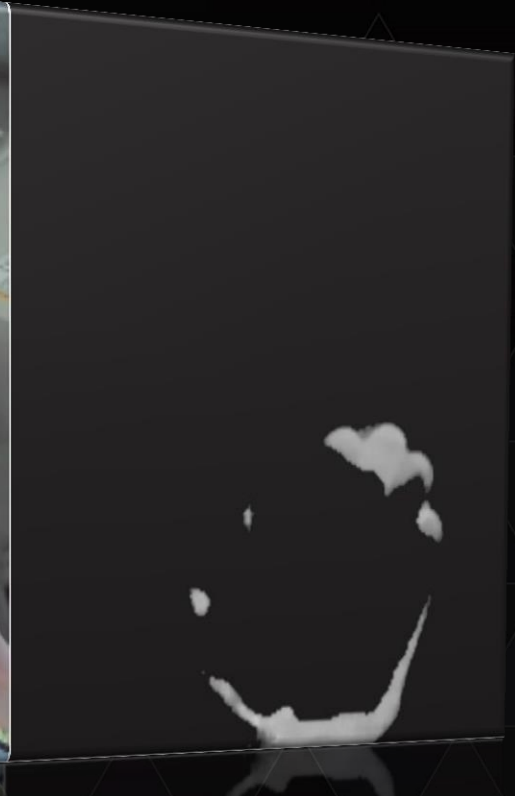
NO SUNLIGHT



NO SUNLIGHT



SUNLIGHT



MULTI-SENSOR SOLUTION



COLOR + DEPTH



RADAR

sensors

MULTI-SENSOR SOLUTION



COLOR + DEPTH



RADAR

sensors



gesture UI

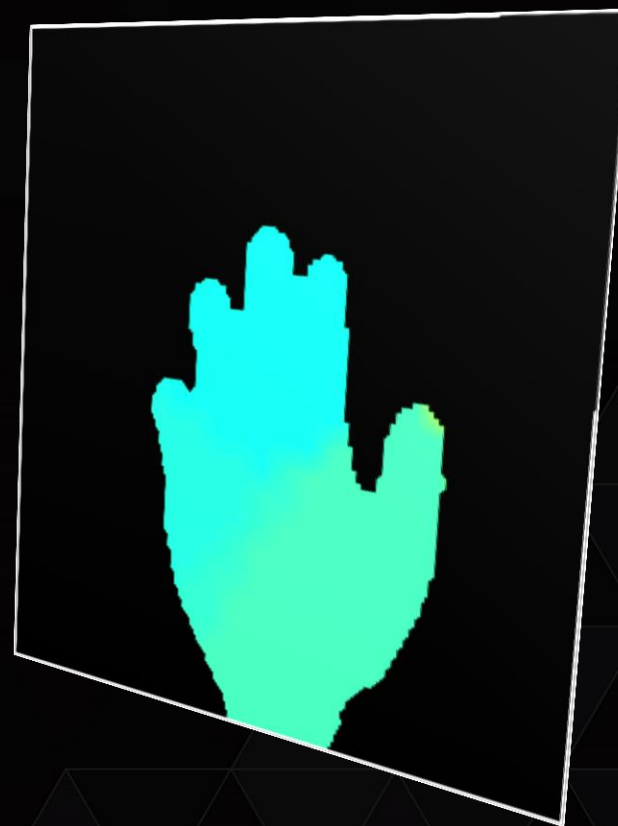
3.2% INCREASED ACCURACY



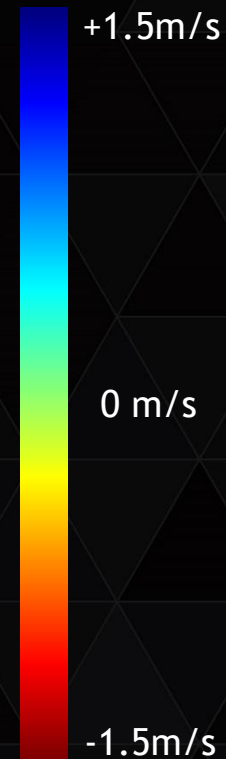
3D shape



color



velocity

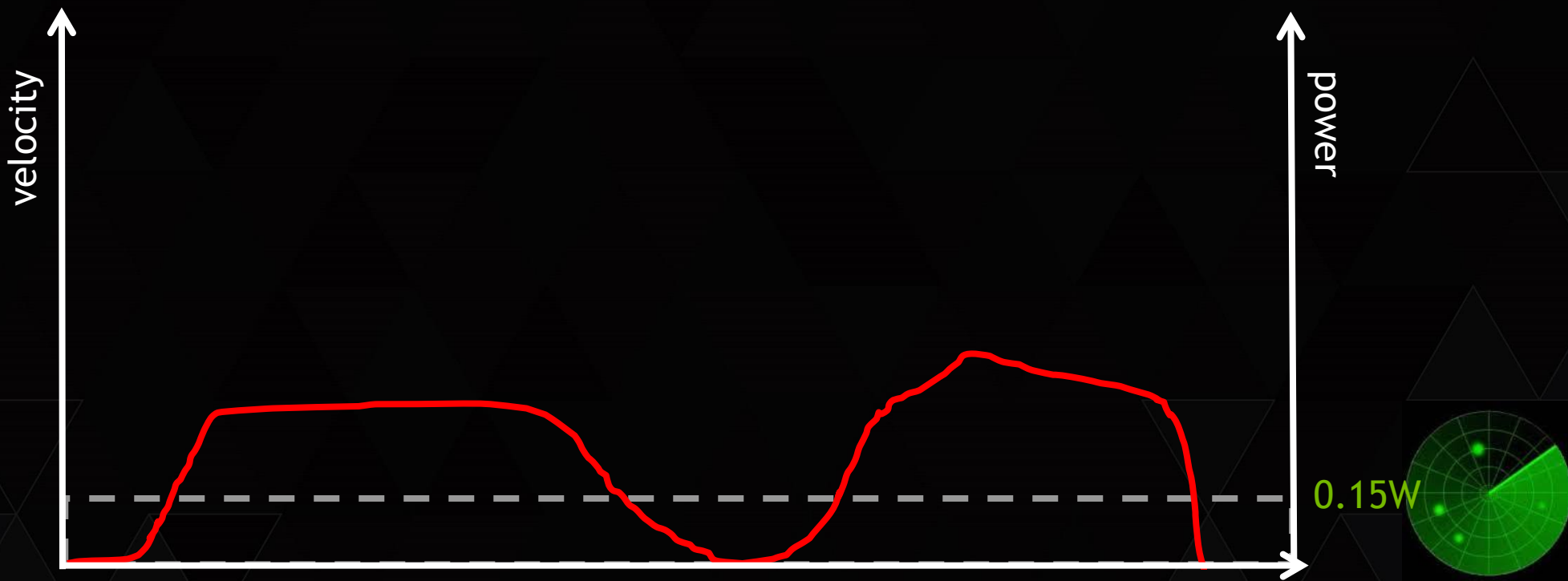


+1.5m/s

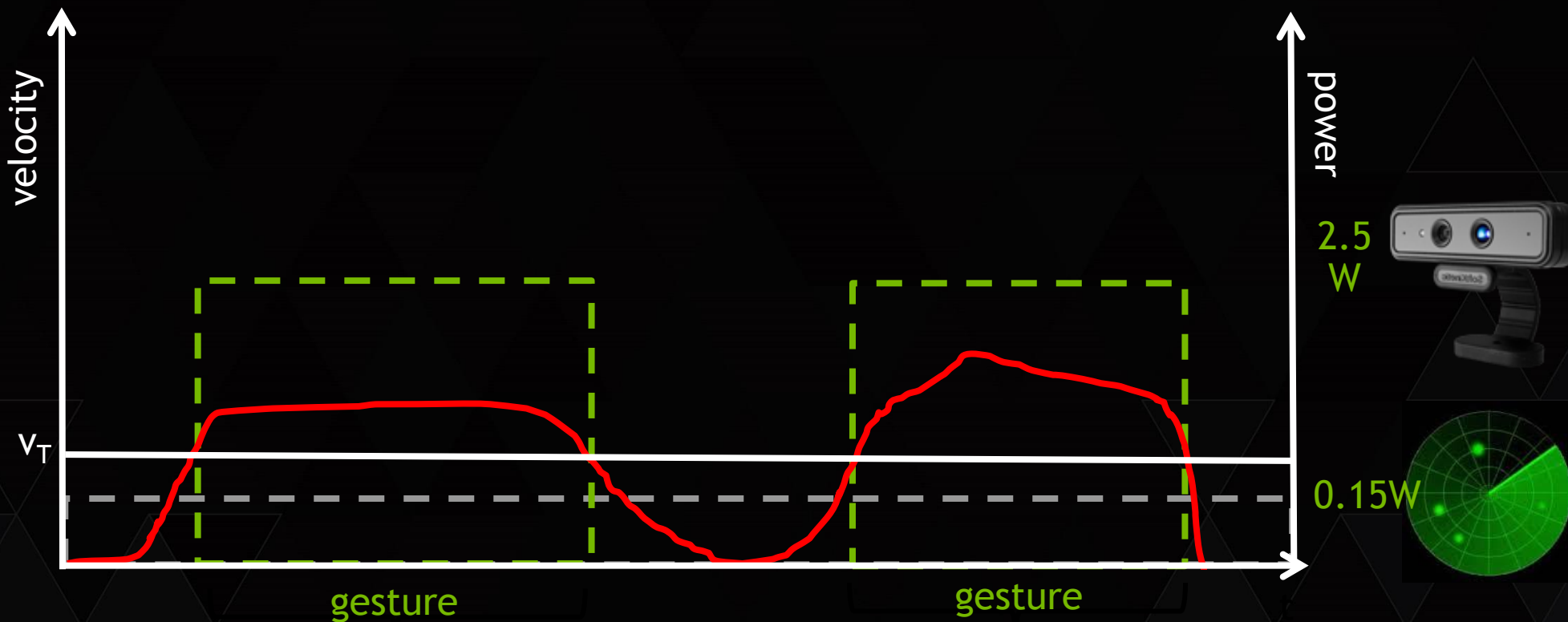
0 m/s

-1.5m/s

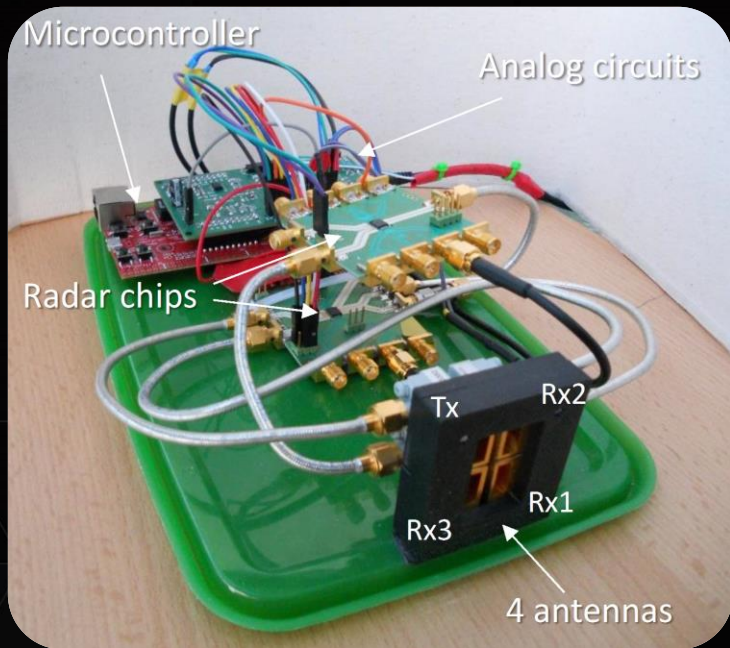
16X POWER EFFICIENCY



16X POWER EFFICIENCY

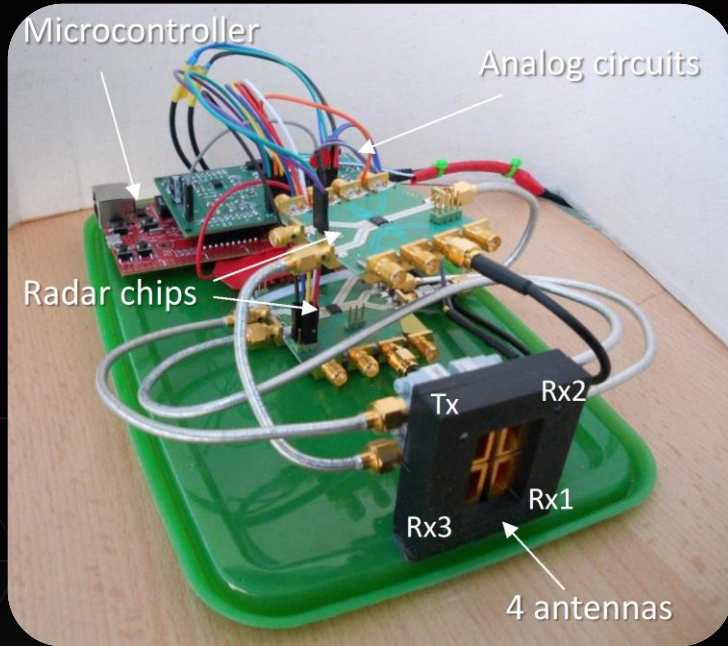


SHORT RANGE FMCW RADAR

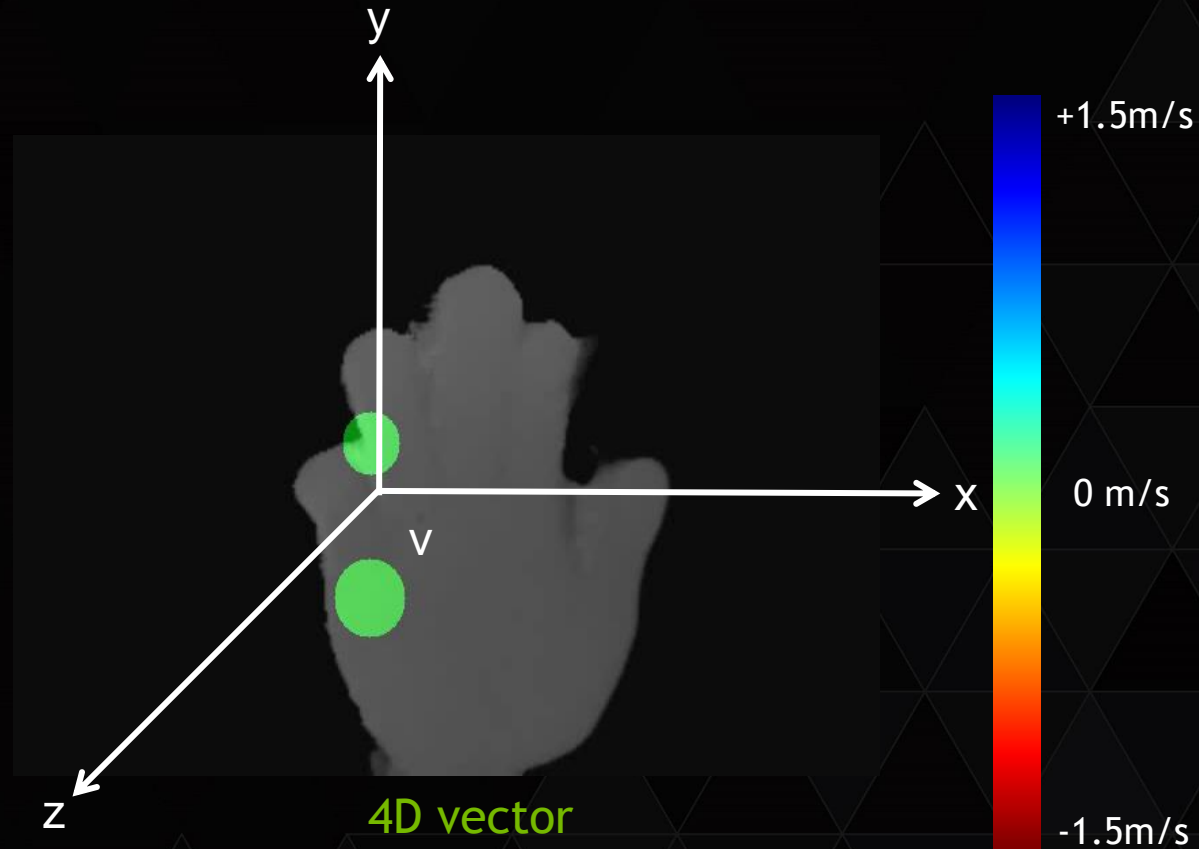


radar prototype

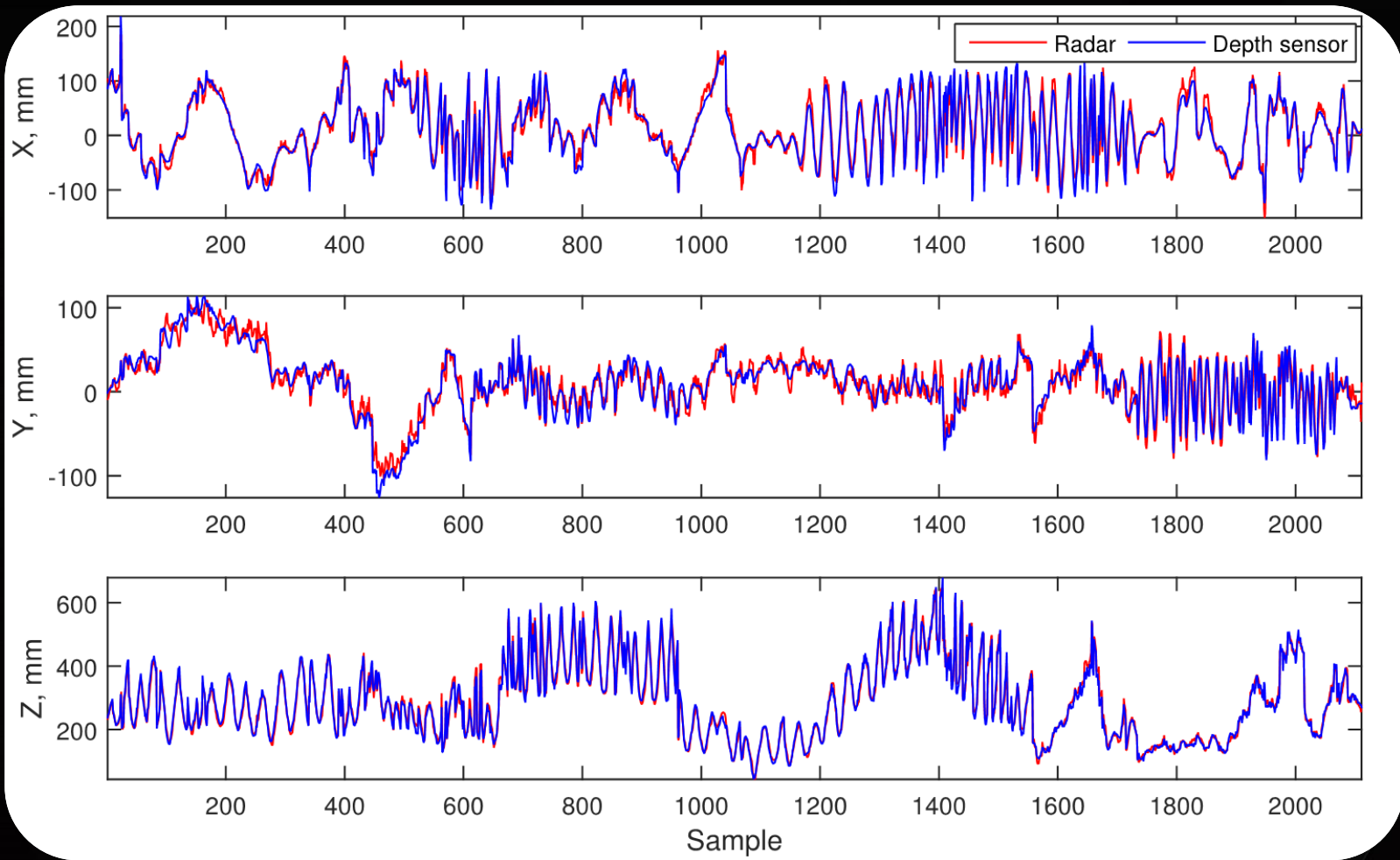
SHORT RANGE FMCW RADAR



radar prototype

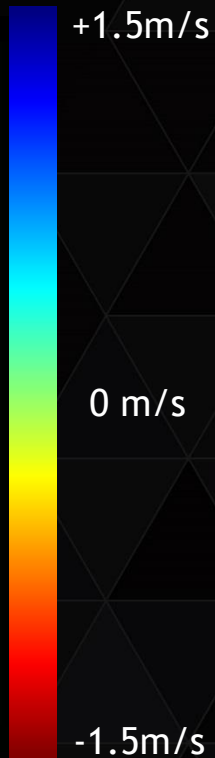
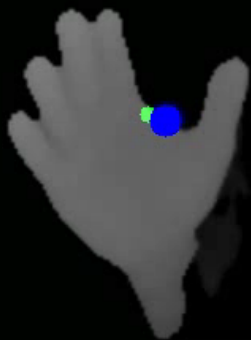


POSITION RESULTS

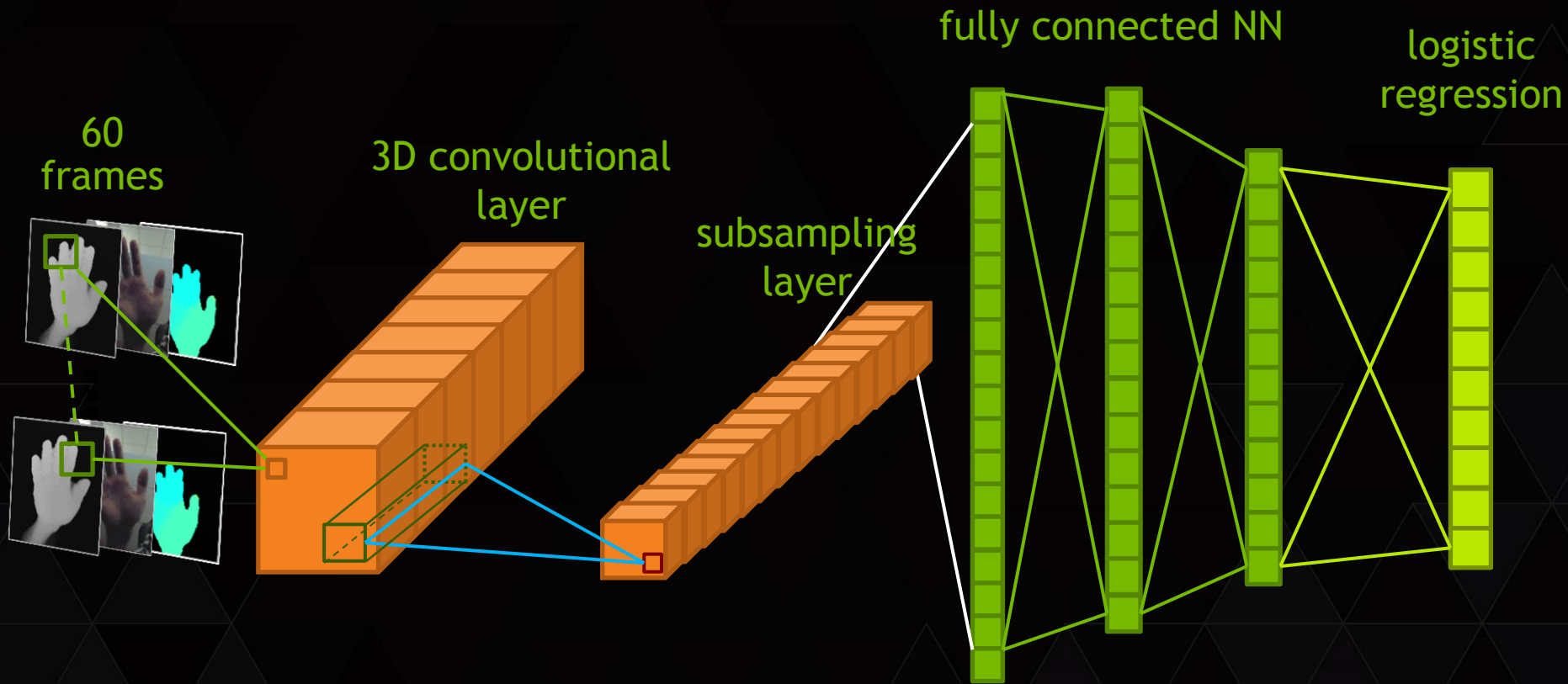


VELOCITY RESULTS

Detected



GESTURE NETWORK



10 GESTURES

PALM



left



right

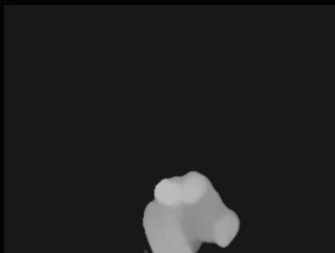


up



down

SWIPE



SHAKE

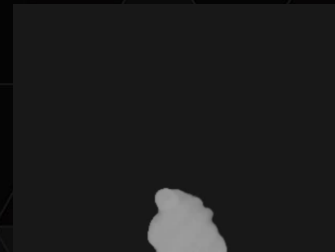


ROTATION



clockwise

CALL



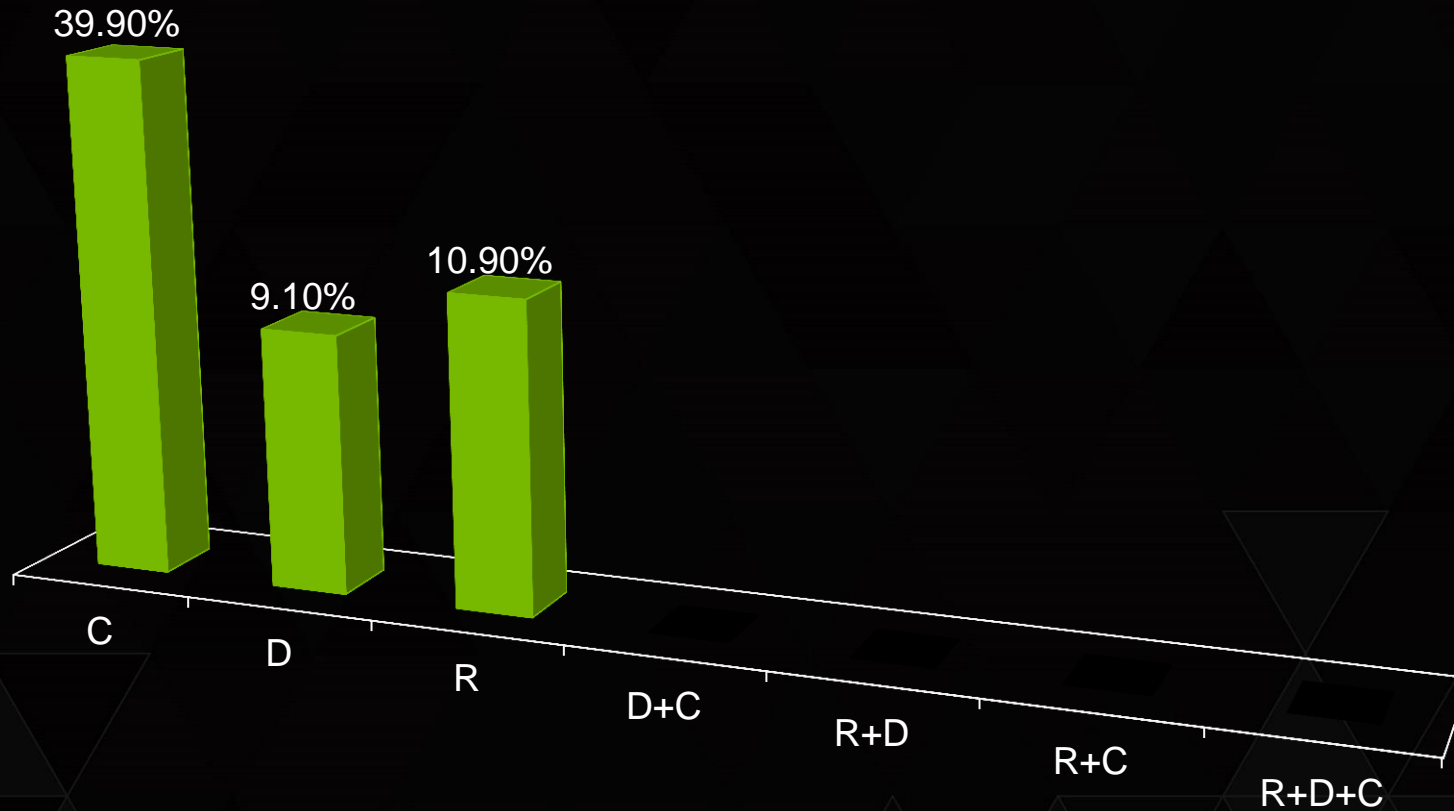
INDOOR CAR SIMULATOR



OUTDOOR CAR

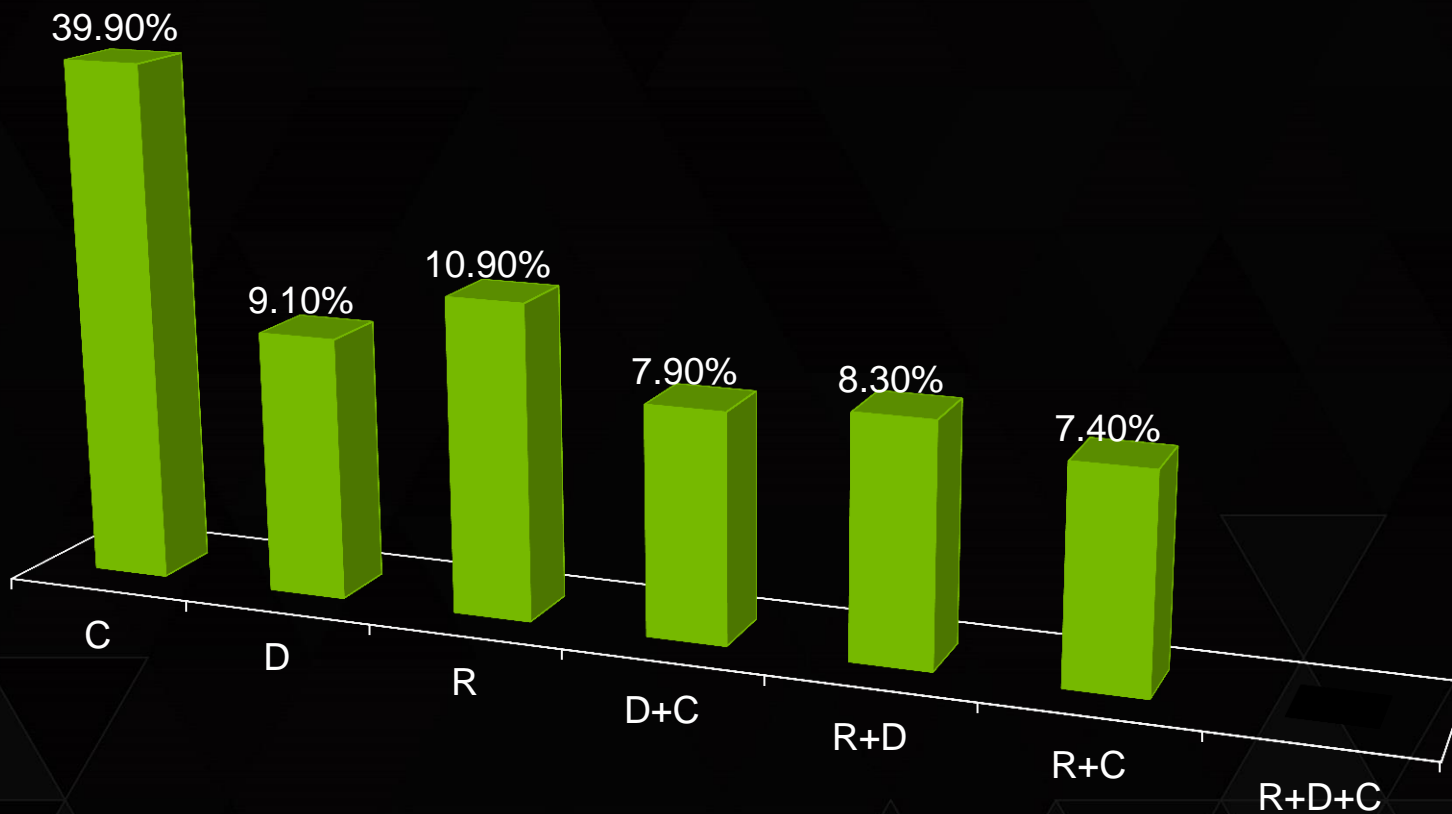


ERROR RATE



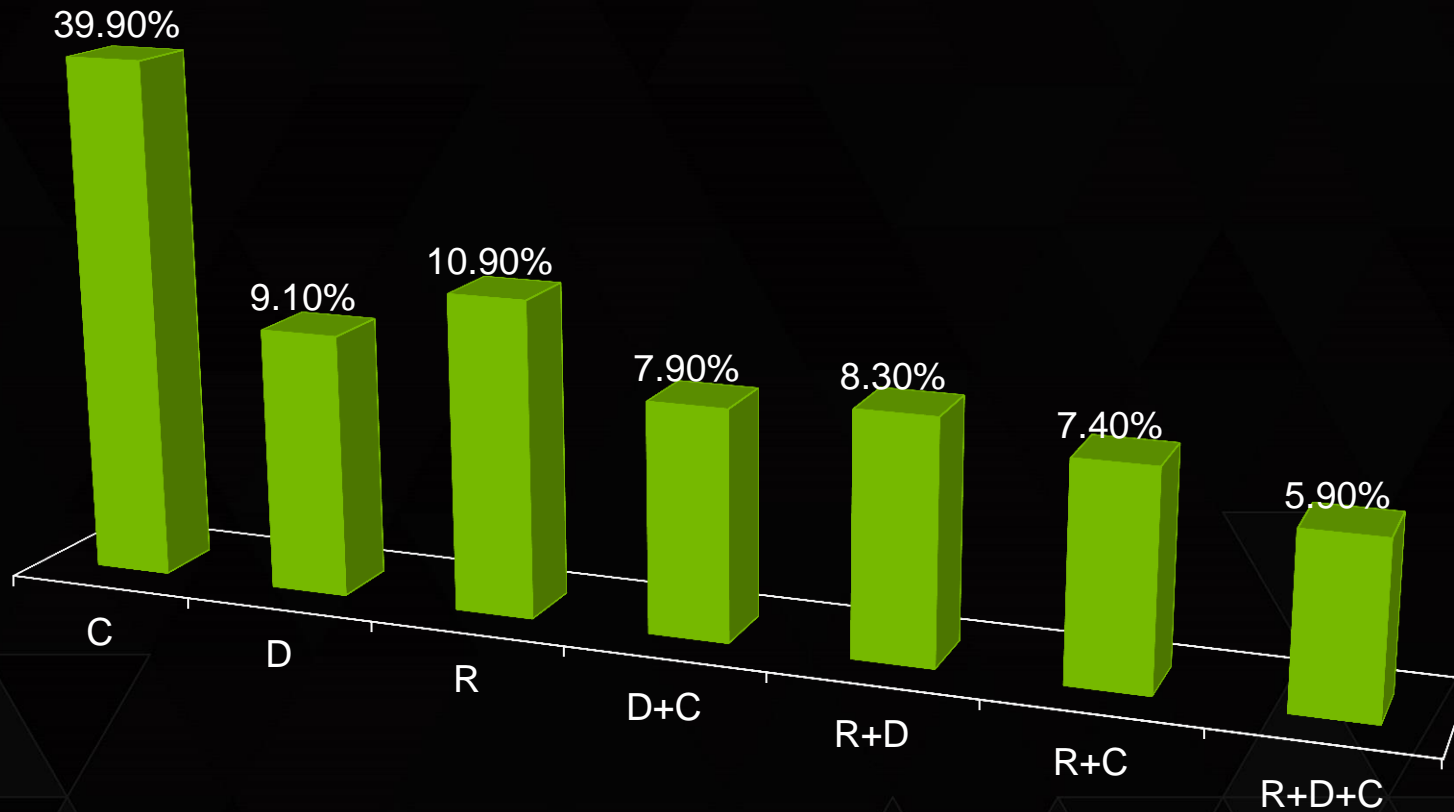
D – depth C – color R - radar

ERROR RATE



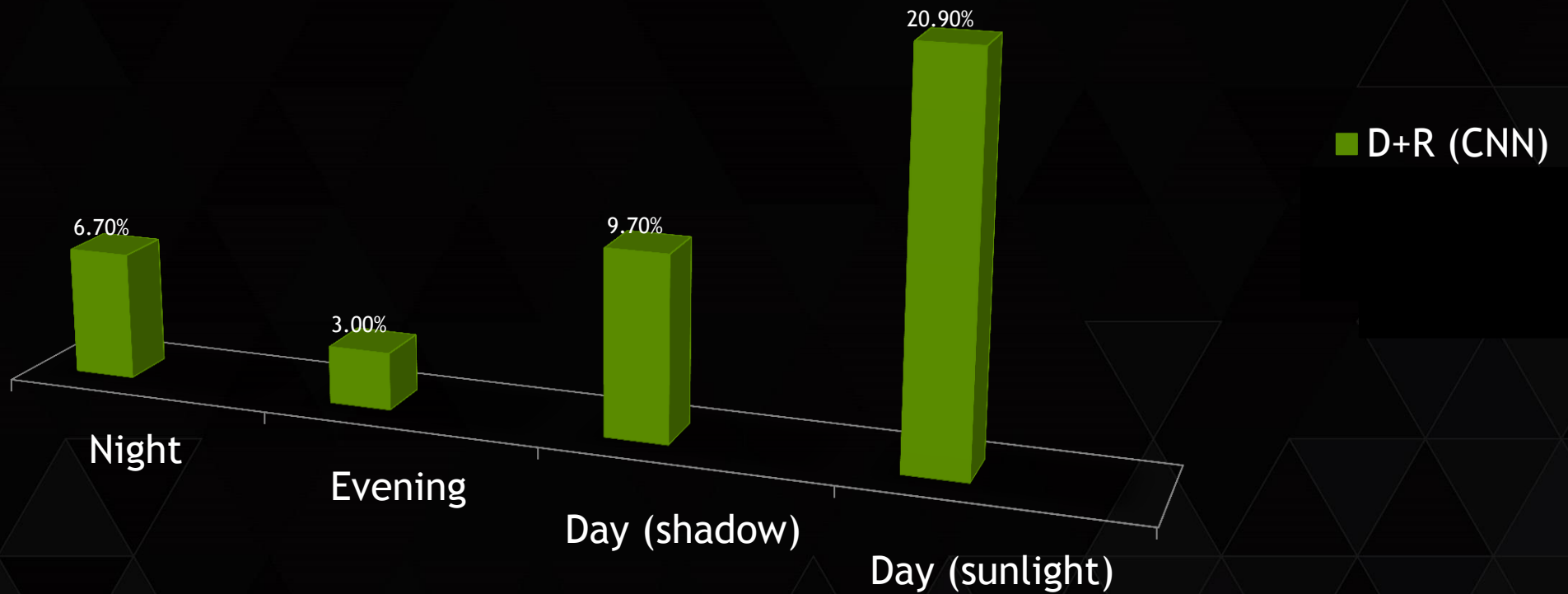
D – depth C – color R - radar

ERROR RATE



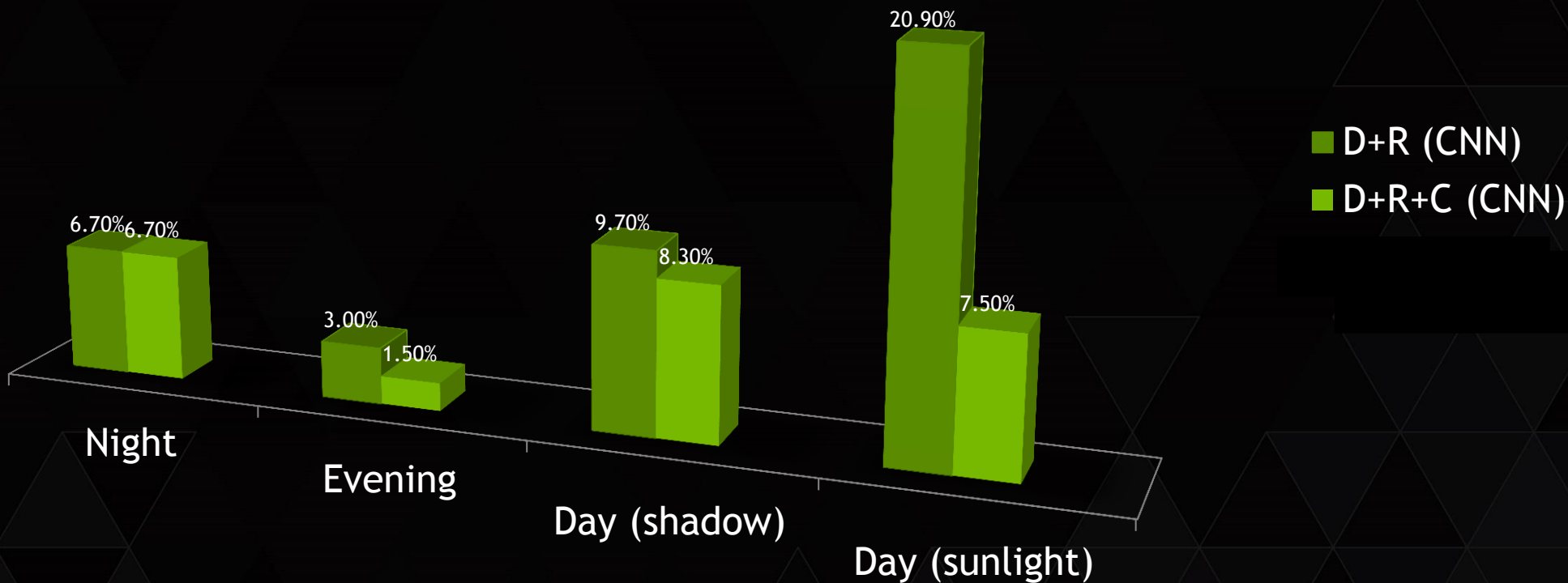
D – depth C – color R - radar

ERROR RATE



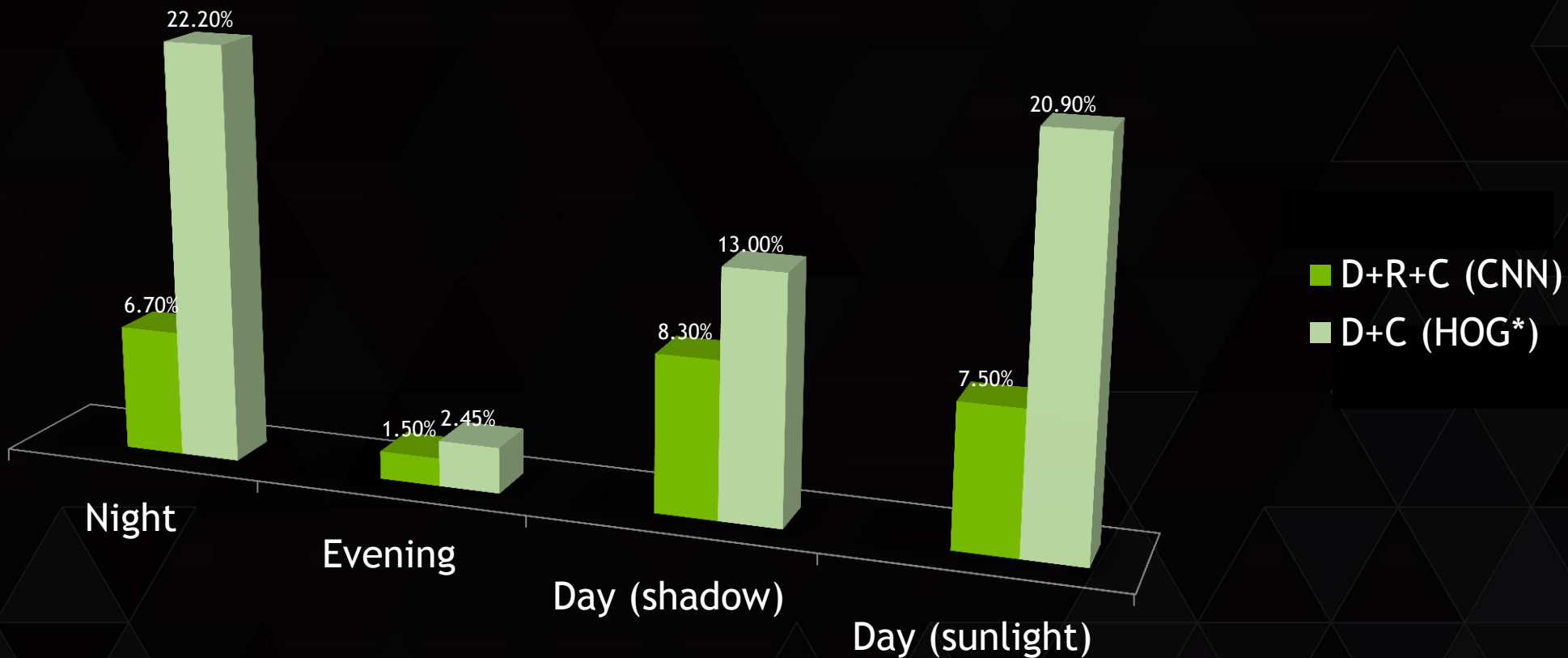
D – depth C – color R - radar

ERROR RATE



D – depth C – color R - radar

ERROR RATE



D – depth C – color R - radar

*Ohn-Bar and Trivedi, *IEEE Trans. on Intelligent Transportation Systems*, 2014.

DEMO



Detected

52ms on Quadro 6000

CONCLUSION



COLOR + DEPTH



RADAR¹



GESTURE UI²

¹Multi-sensor System for Driver's Hand-Gesture Recognition, IEEE Automatic Face and Gesture Recognition, May 2015.

²Short-Range FMCW Monopulse Radar for Hand-Gesture Sensing, IEEE International Radar Conference, May 2015.

GPU TECHNOLOGY
CONFERENCE

THANK YOU

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JOIN THE CONVERSATION

#GTC15   

QUESTIONS?