IS ELON MUSK RIGHT?

Are LiDARs a Crutch?

IEEE SA WEBINAR SERIES

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• Tesla’s First Autonomous Day | April 22nd 2019

• “LiDAR is a fool’s errand... Anyone relying on LiDAR is doomed. They are expensive sensors that are unnecessary. It’s like having a whole bunch of expensive appendices. Like, one appendix is bad, well now you have a whole bunch of them, it’s ridiculous, you’ll see.”

~ Elon Musk
WHY SO SERIOUS?

And more...
SENSORY SYSTEM

Camera | LiDAR | Radar

Day time | Night time | Unfavorable weather
LIDAR POWERED

Light Detection And Ranging

LIDAR - HOW IT WORKS

LIDAR POWERED - HIGHLIGHTS

1. Expensive
2. Low Adoption
3. Insufficient data
JOURNEY - LIDAR

**Cost**

- 64 Laser LiDAR -> $75,000
- 16 Laser LiDAR -> $7,999
- Work in progress...
  1. MEMS
  2. Phased Array
  3. Flash LiDAR

**Accuracy**

- Highest (as we speak)

https://arstechnica.com/cars/2018/01/driving-around-without-a-driver-lidar-technology-explained/
CAMERA POWERED

CAMERA – HOW IT WORKS

[Image showing a camera view with two viewpoints and an object with a distant background.]

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

https://simple.wikipedia.org/wiki/Parallax
CAMERA POWERED

Cost Effectiveness

High Adoptability

Sufficient data
JOURNEY - CAMERA

**Cost**

- Single Stereo Camera -> $ 200
- Single Mono Range -> $150

**Accuracy**

- Work in progress...
  - 66 %
  - 30 %

https://arstechnica.com/cars/2018/01/driving-around-without-a-driver-lidar-technology-explained/
LIDAR VS. CAMERA

Accuracy

Cost Effectiveness

LiDAR

Camera
LIDAR VS. CAMERA - PERFORMANCE

**LiDAR Performance**
- High Weather Resistance
- Solid State LiDAR
- Spinning LiDAR

**Camera Performance**
- Abundance of data from fleet
- Only under convenient weather
- Data from test drives
CRUTCH OR COMPLEMENT?

Technology

- Durability
- Reliability
- Cost Effective
- Accuracy
- Dependency

Crutch / Complimentary
CONCLUSION

LiDAR ➔

- Low Durability
- High Reliability
- High Cost
- High Accuracy
- High Dependency

Crutch for now!

Time

- High Durability
- High Reliability
- Low Cost
- High Accuracy
- Low Dependency

Complimentary forever!
NEXT STEPS

• Autonomous vehicles require a rapid, accurate and complete perception system
• iDAR (Intelligent Detection and Ranging) offers a robotic perception system that is more reliable than human vision.
• Existing 2D image processors and 2D to 3D image conversion concepts have serious flaws that can only be addressed with massive computing power and more importantly — algorithms that have not been invented which makes this approach too costly, inefficient and cumbersome to achieve Level 5 autonomous driving at commercial scale.
• Integrating cameras, agile LiDAR, and AI equals a perception system that is better than the sum of its parts. It surpasses both the human eye and camera alone, which is required since we don’t have the sophistication of the human brain yet replicated.

https://www.aeye.ai/idar/
QUESTIONS...?

THANK YOU

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