



Zeynep Tufekci
Minhyung Kang
Cristiano Solarino
Huseyin Ciloglu
Luke Conlin

Supervised by: Carlos Gershenson

To Beep or Not to Beep

Effects of Driver Types on Highway Traffic Jams

On your way to work...



What's the result?



What's the Conclusion?

“Everyone driving slower than you is an idiot.

Everyone driving faster than you is an asshole.”

--George Carlin

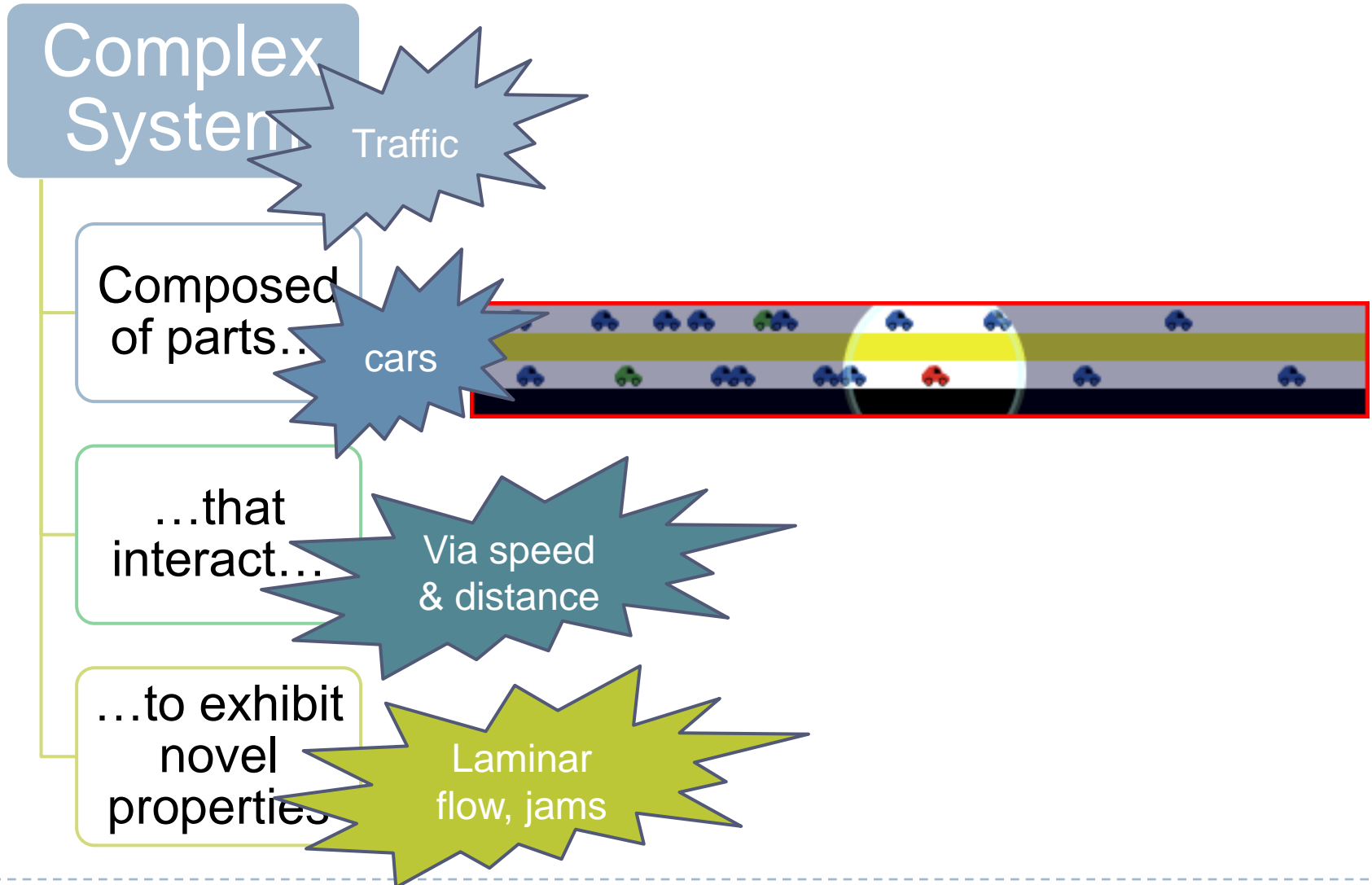


Is there anything that can be done about this?



YES!!

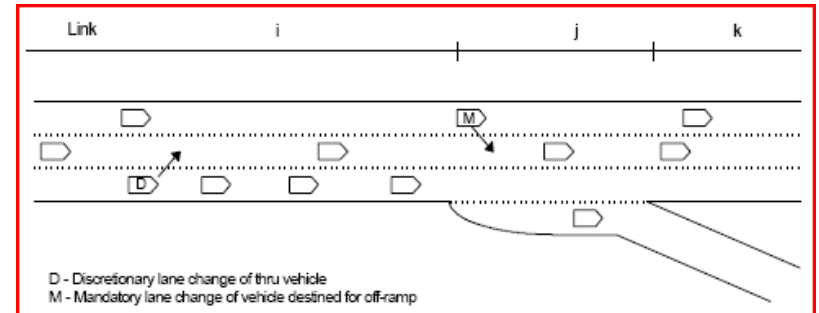
We can model traffic as a complex system



Traffic can be modeled at different scales

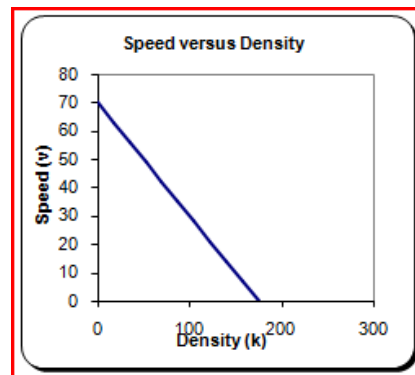
▶ Van Aerde (1996) INTEGRATION Model

- ▶ Traffic flow
- ▶ Car-following
- ▶ Lane-changing
- ▶ Toll plazas, HOV lanes, etc.

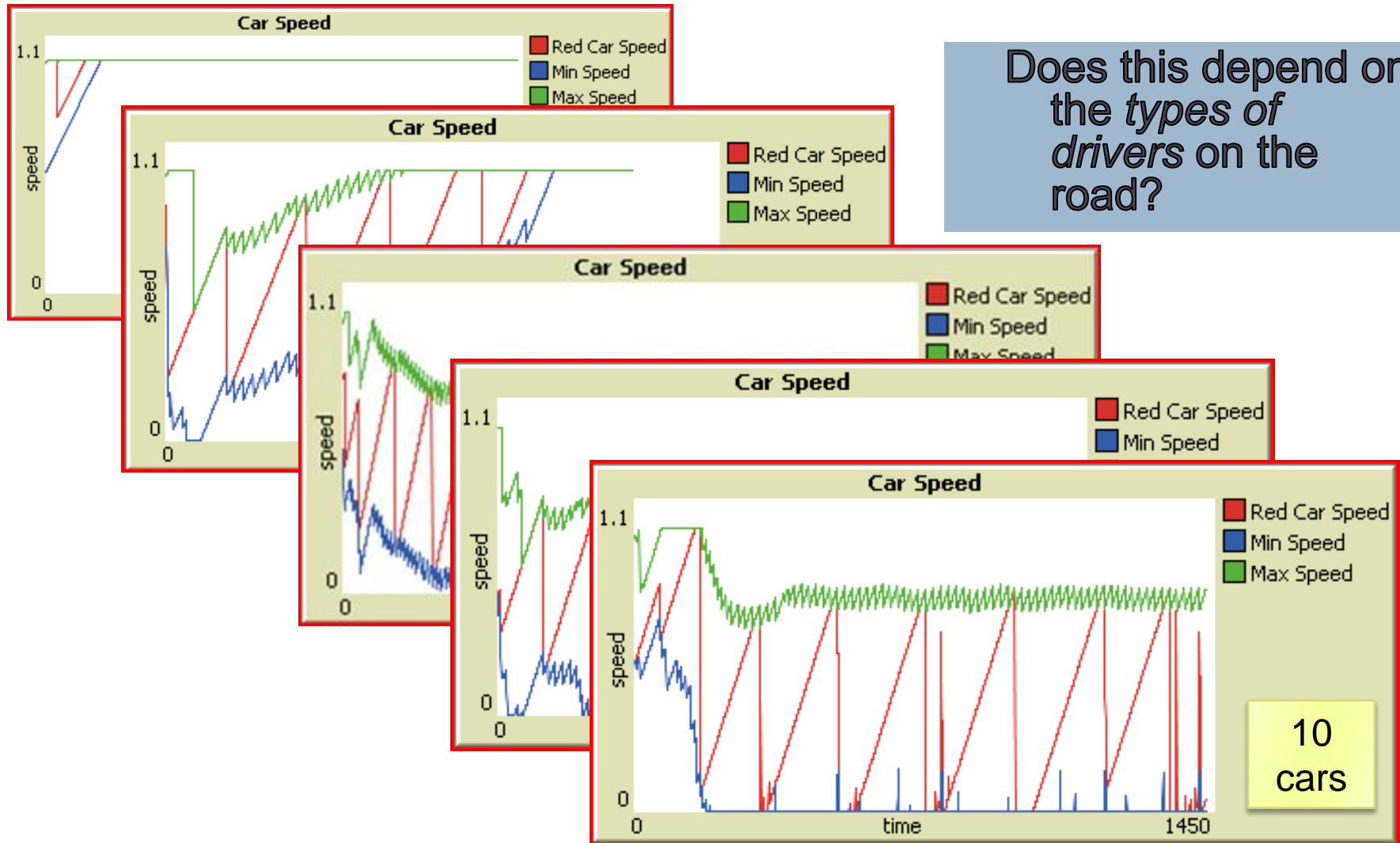


▶ Greenshield Model

- ▶ Average speed is inversely proportional to density



Traffic waves are inevitable above a critical car density in simulations Kerner & Rehborn (1997)

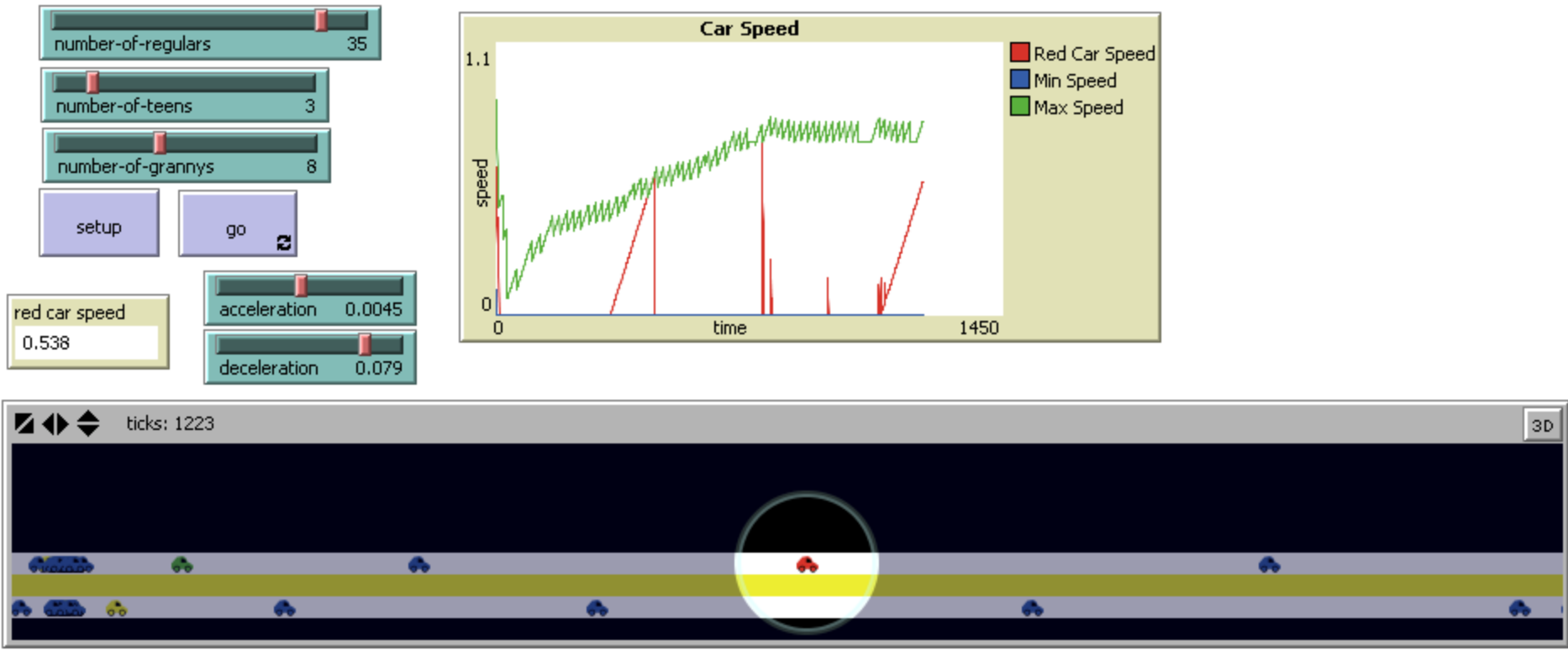


There is a lack of research on the effects of people driving *differently*

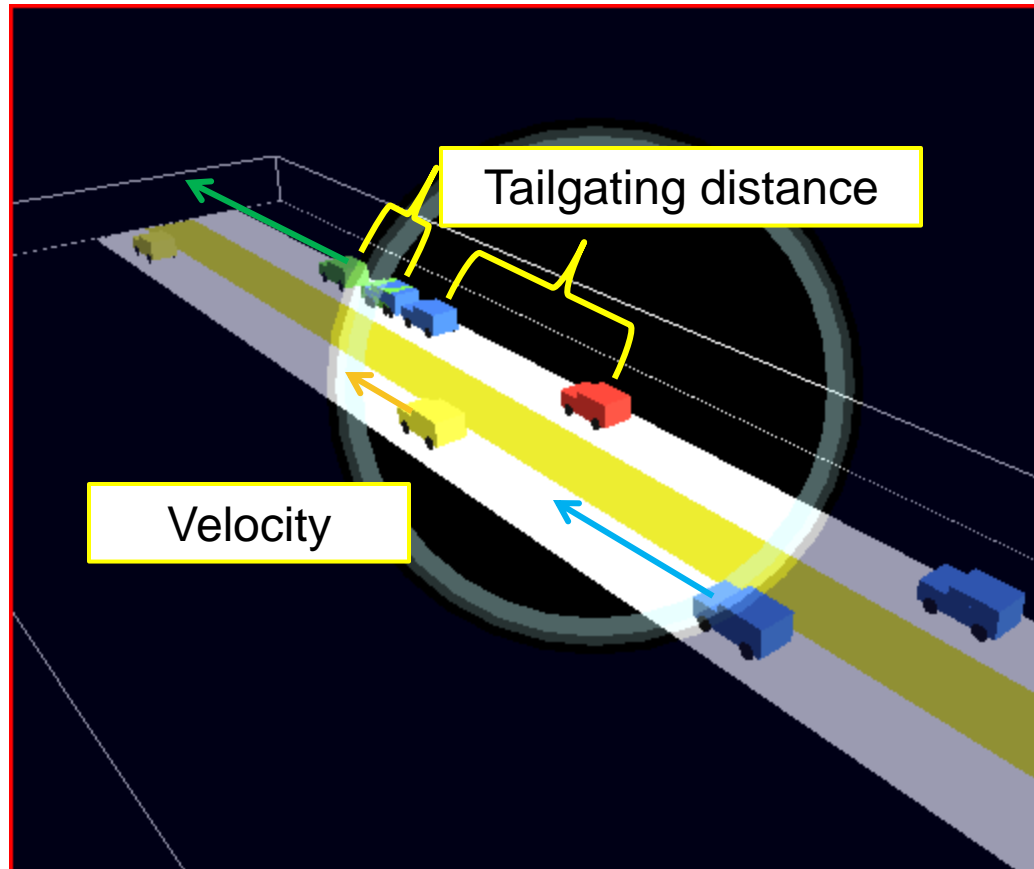
Helbing & Tich (1998) included a “fluctuation force” term for individuals in their traffic model, but set it = 0

Ball (2003) noted that “increasing the level of psychological complexity in a model can alter the global behaviour in significant ways”

Netlogo simulation allows simple model



Several parameters to describe drivers

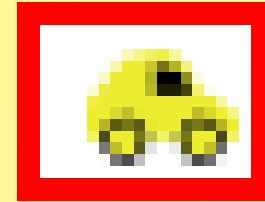


Driver Types



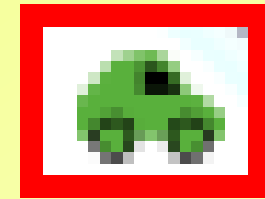
“Granny”

- Tailgate distance = 10
- Max speed = .7



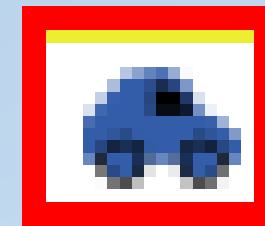
“Teen”

- Tailgate distance = 1
- Max speed = 1.1



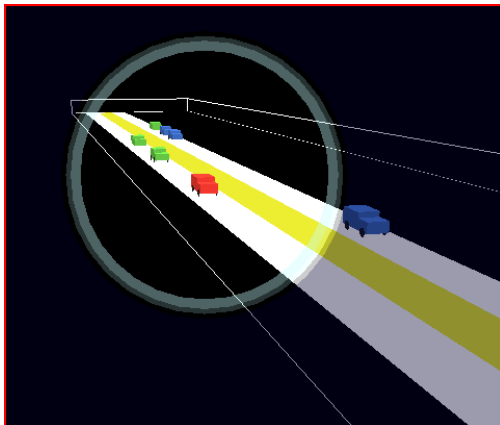
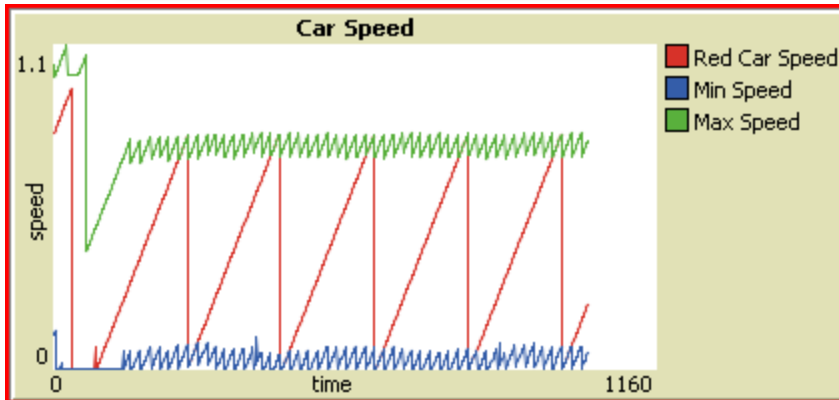
“Regular”

- Tailgate distance = 3
- Max speed = 1

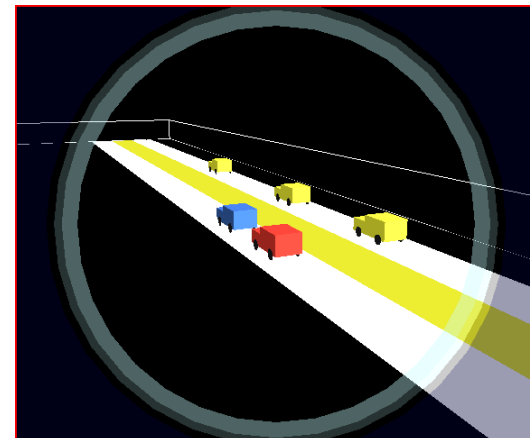
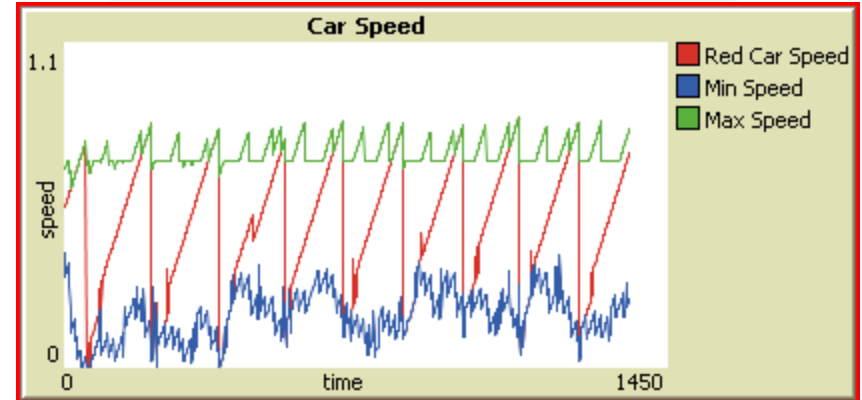


Does less = more?

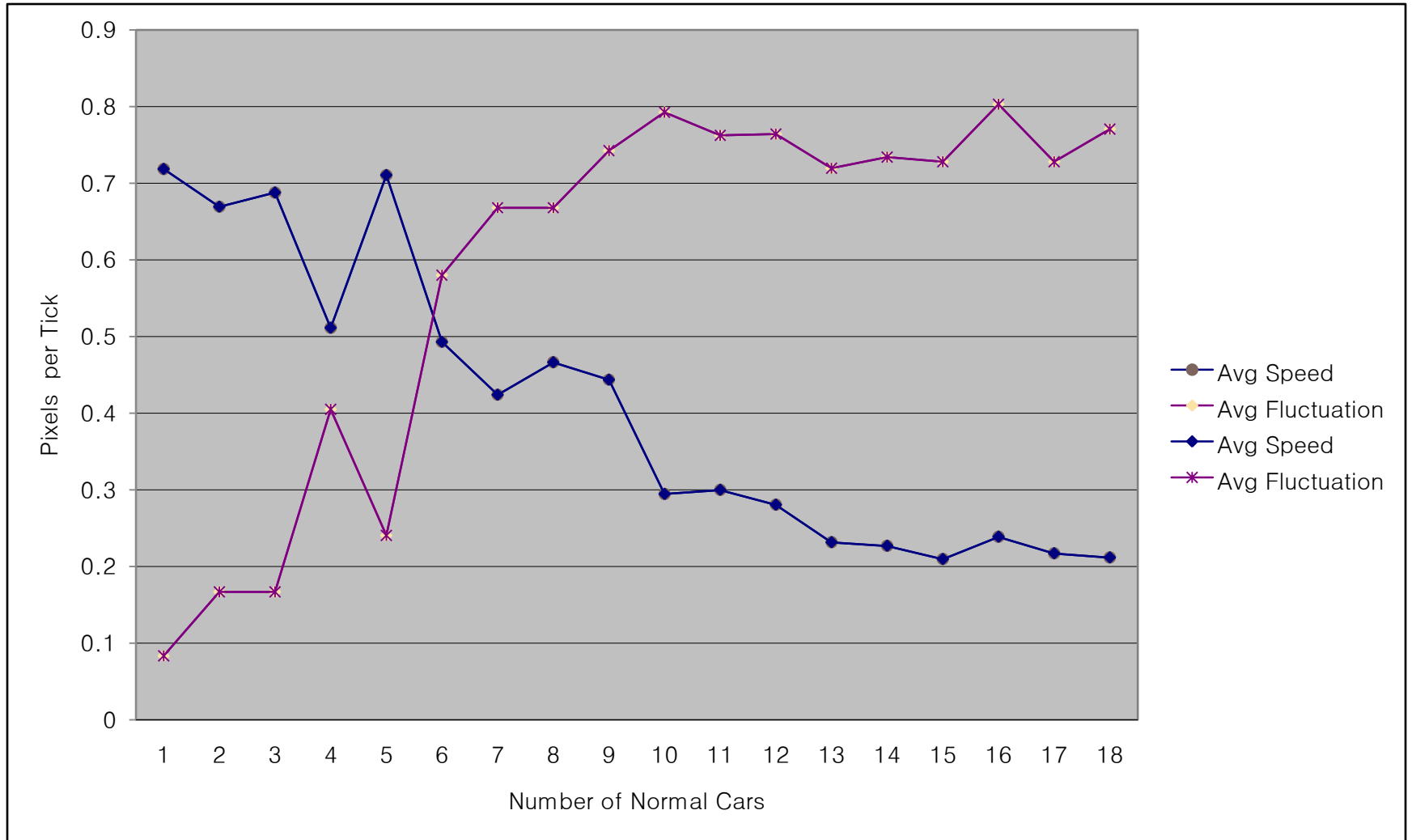
5 Regular
5 Teens



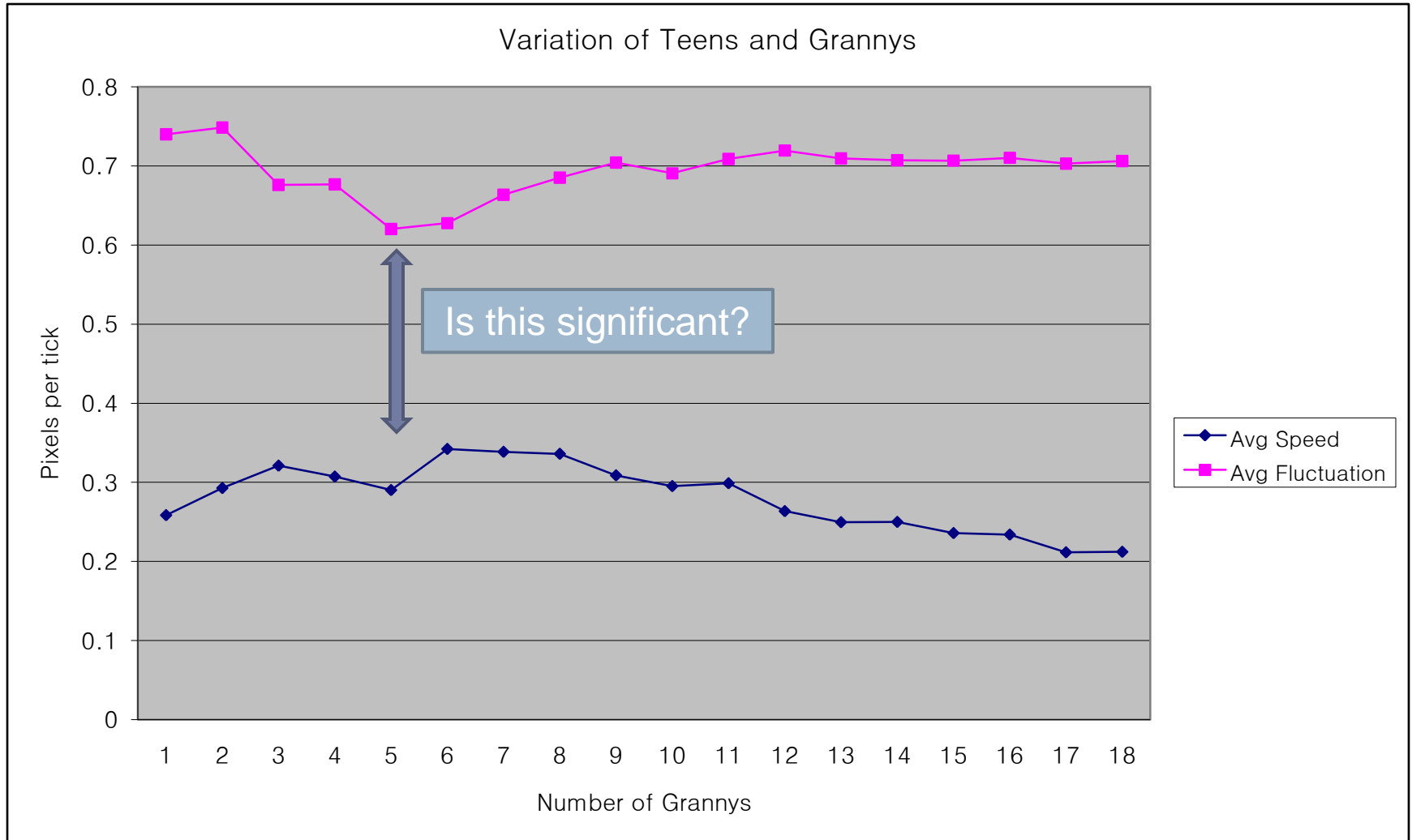
5 Regular
5 Grannys



more = less



Effect of driver type on average velocity



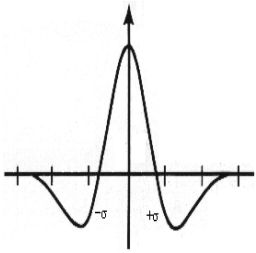
A problem of scale

Is it valid/useful to use *averages* to characterize complex systems?

Are we missing important local context effects?

Exploring traffic with wavelet analysis

Perhaps we can “zoom in” using wavelet analysis



Conclusions

- ▶ Variation in driver types can be important
- ▶ More research needs to be done
- ▶ Wavelet analysis may be useful for this

Thank you!

Yaneer Bar-Yam

Carlos Gershenson

...and YOU!