

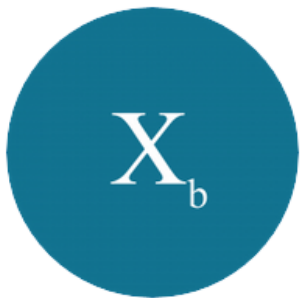
DESIGNING AUTOMATED VEHICLES AROUND HUMAN VALUES

J. CHRISTIAN GERDES
STANFORD UNIVERSITY

Ethical programming, not programming ethics



Professor Shannon Vallor
Santa Clara University

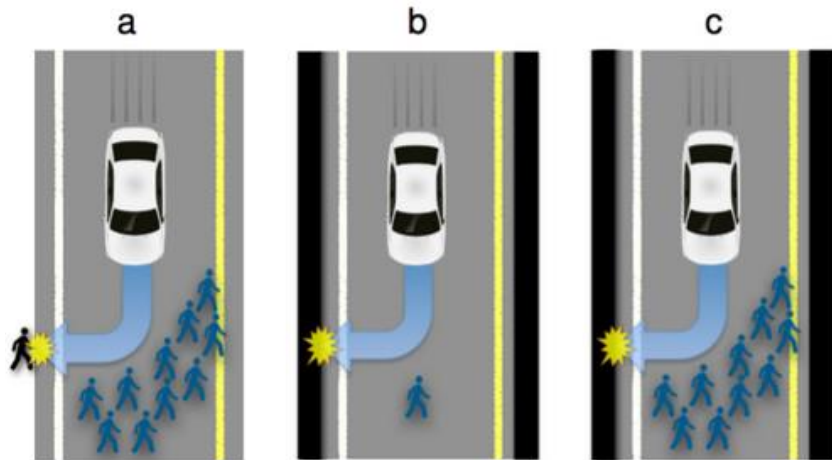


A View from **Emerging Technology** from the arXiv

Why Self-Driving Cars Must Be Programmed to Kill

Self-driving cars are already cruising the streets. But before they can become widespread, carmakers must solve an impossible ethical dilemma of algorithmic morality.

October 22, 2015





MORAL TRIBES

EMOTION, REASON, AND
THE GAP BETWEEN US AND THEM

JOSHUA GREENE

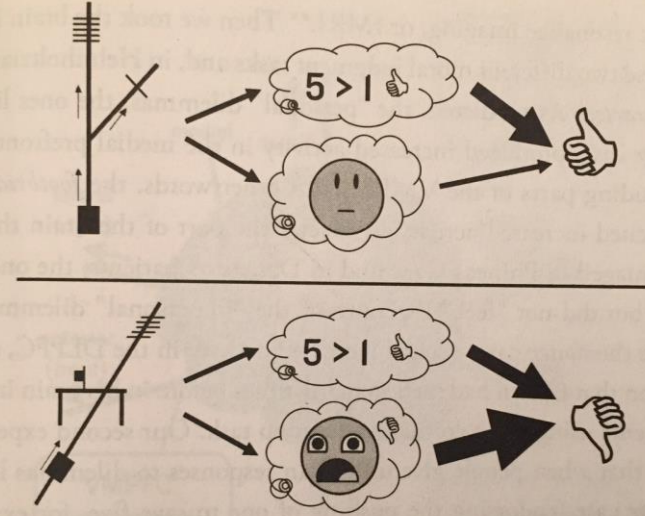
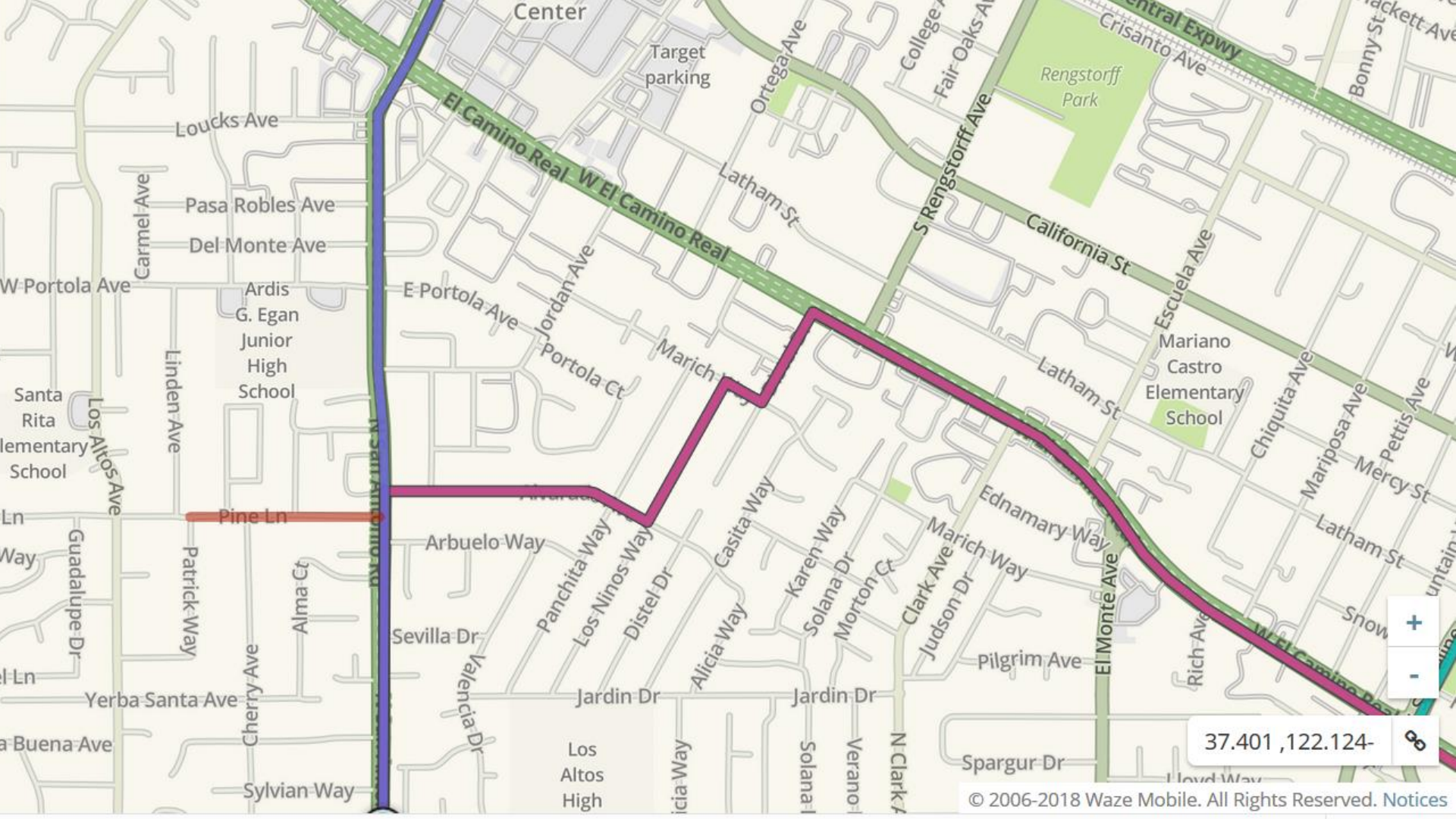


Figure 4.3. Dual-process morality. Turning the trolley away from five and onto one (above) makes utilitarian sense and doesn't trigger much of an opposing emotional response, causing most people to approve. Pushing the man off the footbridge (below) likewise makes utilitarian sense, but it also triggers a significant negative emotional response, causing most people to disapprove.



Loucks Ave

Pasa Robles Ave

Del Monte Ave

Ardis G. Egan Junior High School

Pine Ln

Cherry Ave

Sylvian Way

Center

Target parking

El Camino Real

Arbuelo Way

Jardin Dr

Los Altos High

Latham St

Marich Way

Casita Way

Karen Way

Jardin Dr

Solana

Verano

N Clark

Ortega Ave

College Ave

Fair Oaks Ave

S Rengstorff Ave

California St

Latham St

Ednamary Way

Clark Ave

Judson Dr

Pilgrim Ave

Spargur Dr

Rengstorff Park

Mariano Castro Elementary School

Central Expwy

Crisanto Ave

Escuela Ave

Chiquita Ave

Mariposa Ave

Latham St

Snow

Rich Ave

Lloyd Way

Bonny St

Rackett Ave

Mercy St

Pettis Ave

Mountain

37.401, 122.124

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Los Angeles Times

How Waze and Google Maps turned an Encino neighborhood into a speedway



By STEVE LOPEZ | MAY 30, 2018 | 3:00 AM



The New York Times

Navigation Apps Are Turning Quiet Neighborhoods Into Traffic Nightmares

By Lisa W. Foderaro

Dec. 24, 2017

The Seattle Times

Traffic Lab

Pedestrian and bicyclist deaths double statewide in recent years

Originally published June 13, 2018 at 6:00 am | Updated June 13, 2018 at 4:10 pm

By [Michelle Baruchman](#) 

Seattle Times staff reporter

NATIONAL

Distraction, On Street And Sidewalk, Helps Cause Record Pedestrian Deaths

March 30, 2017 · 10:02 PM ET

Heard on [All Things Considered](#)

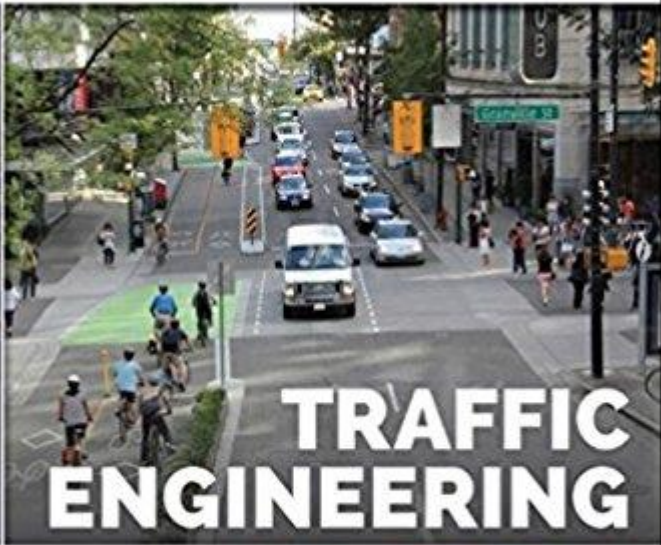


DAVID SCHAPER





INSTITUTE OF TRANSPORTATION ENGINEERS

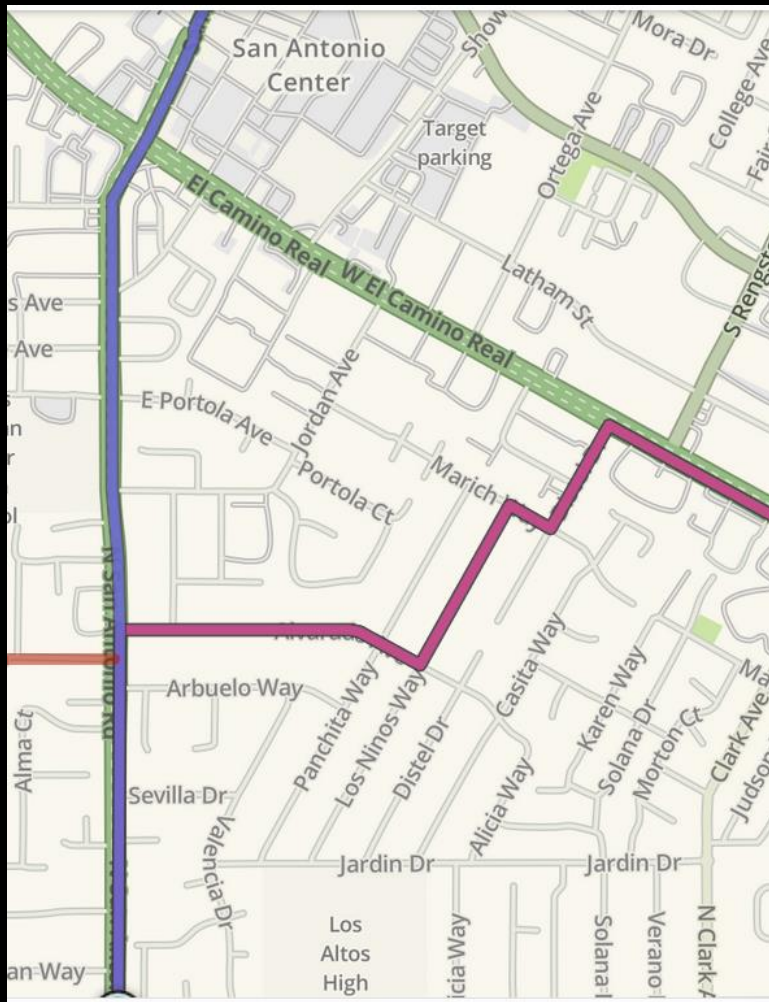


TRAFFIC ENGINEERING

HANDBOOK

SEVENTH EDITION 7

WILEY







PLEASANT WAY
W PORTOLA



Value Sensitive Design

Conceptualization

Technical
Implementation

Empirical Analysis





Conceptualization

What values are important?

- Gather a range of stakeholders to get a range of perspectives
- Stakeholder engagement helps to...
 - Surface the underlying values
 - Identify value conflicts and types of resolutions
 - Frame the underlying problem
- Build a workshop around a relevant scenario



Technical
Implementation

How do we design the system?

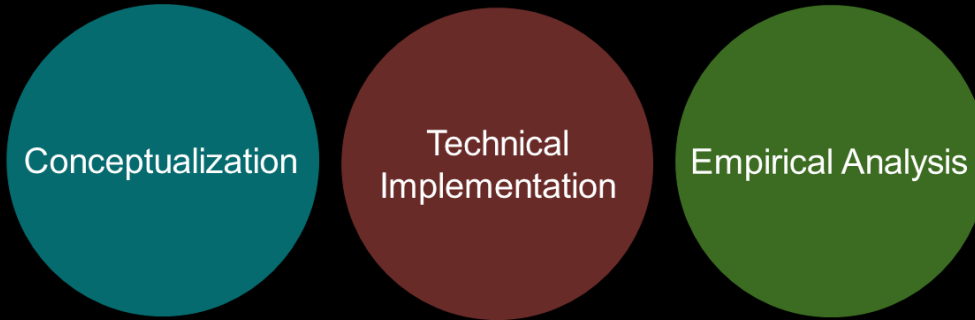
- Technical implementation should:
 - Provide a means for realizing values, often as rules or costs
 - Map design parameters to associated values
 - Enable treatment of value conflicts
- Not a formulaic process
 - Need engineers comfortable thinking in terms of values
 - Need to move from specific examples to general principles



Empirical Analysis

Did we capture the values?

- Revisit values and conflicts identified in concept phase
- Evaluate the design
 - Simulation
 - User testing and experience
- Estimate the societal impacts
 - Challenging due to lack of models
- Legal analysis



- Seemingly small engineering decisions may have the greatest societal impact
- Value Sensitive Design provides a method for identifying human values and tracing them through the design process
- Interdisciplinary modeling required to more fully map these micro-level decisions into macro-scale societal effects