Automated High Beam System

LUMOS TECHNOLOGIES

December 17, 2012

Presentation Outline

Meet The Team

Introduction

Engineering Aspects

- System Overview
- Hardware System
- Software System

Business Aspects

- Market Analysis

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- Project Timeline
- Feedback
- Future Improvements
- Acknowledgements

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Q&A

Demonstration

Meet The Team

Meet The Team

CEO Linda Zhao

- Hardware system design research
- Meeting management

CFO Sujin Lee

- Hardware system design research
- Hardware design and development

VP Software Alex Huang

- Altera development board
- Video quality control
- Vehicle detection research

Meet The Team

VP Operation **Claire Liu**

- Hardware system design research
- Altera development board
- Overall progress management
- Financing

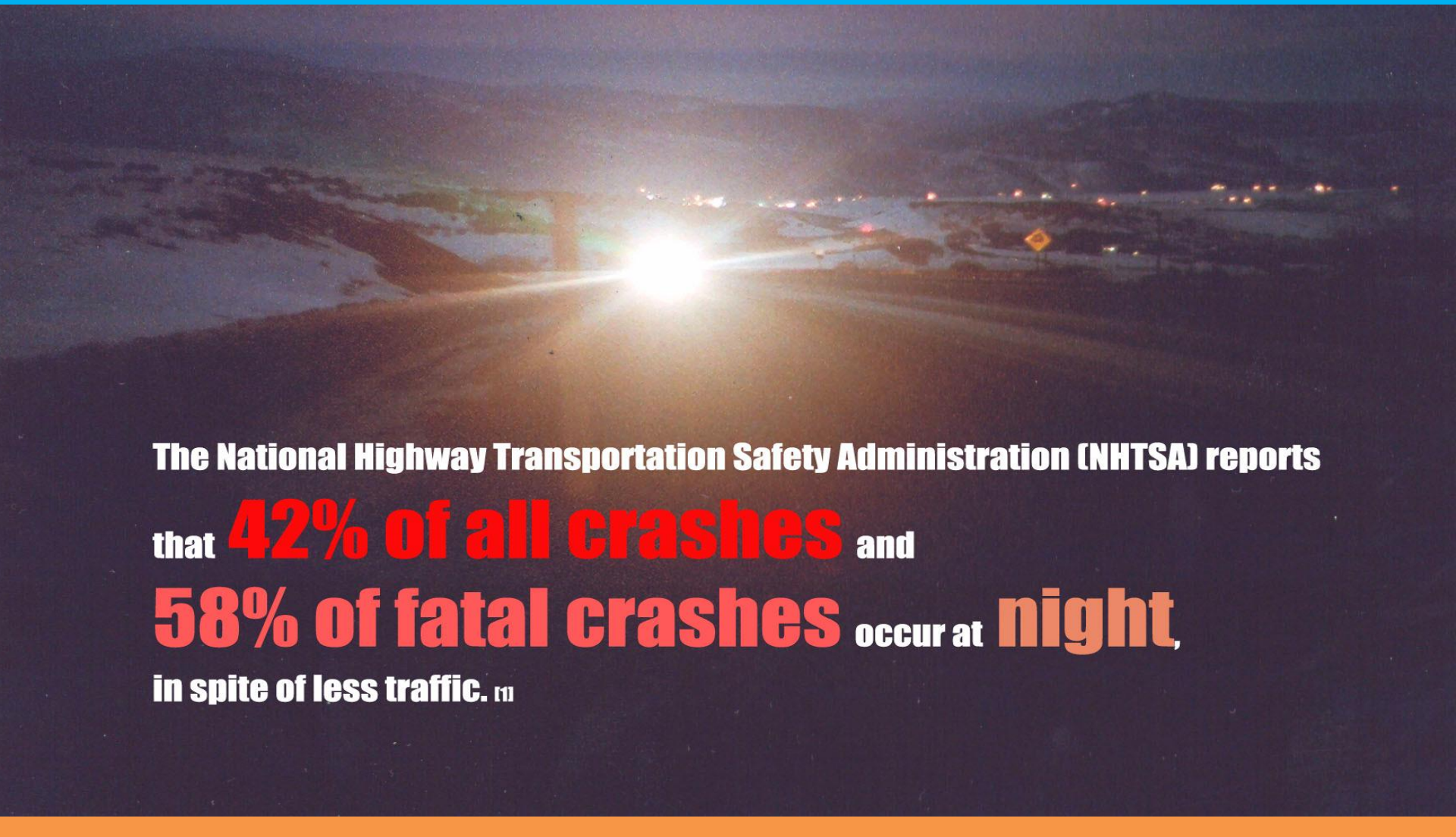
VP R&D **Victor Mateescu**

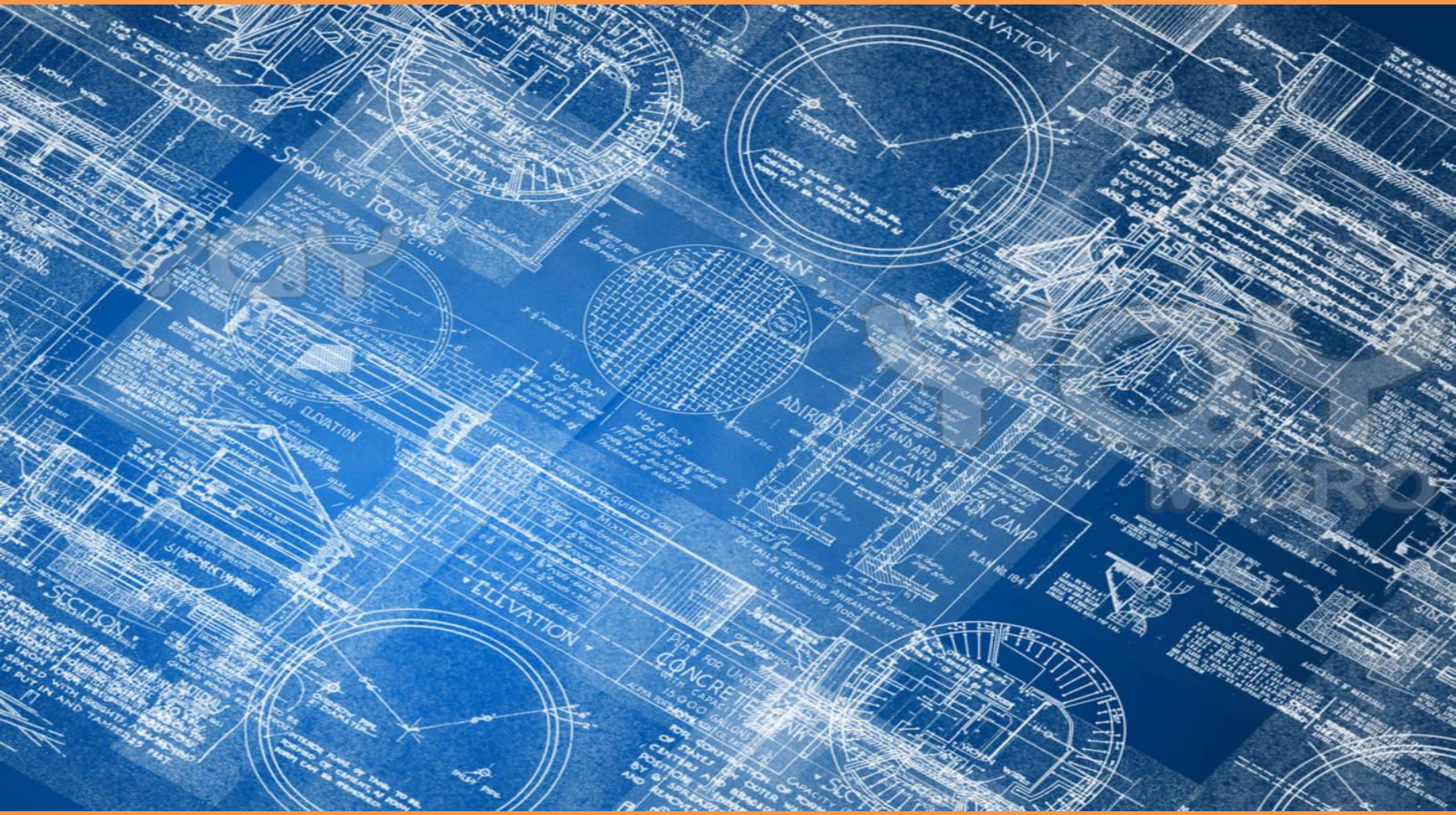
- Vehicle detection research
- Software design and implementation

Introduction

The Problem

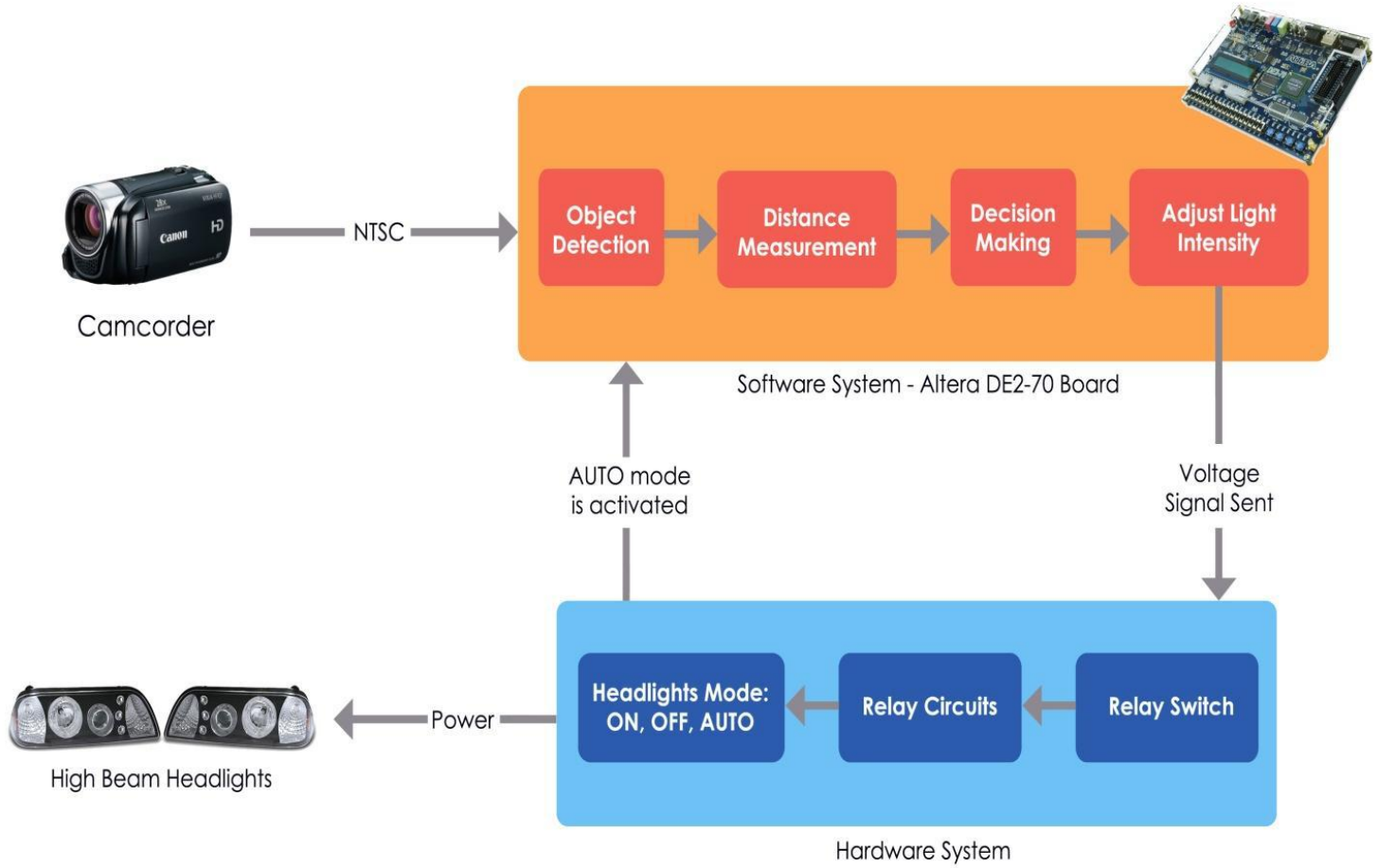
Motivation


The National Highway Transportation Safety Administration (NHTSA) reports
that 42% of all crashes and
58% of fatal crashes occur at night,
in spite of less traffic. [1]



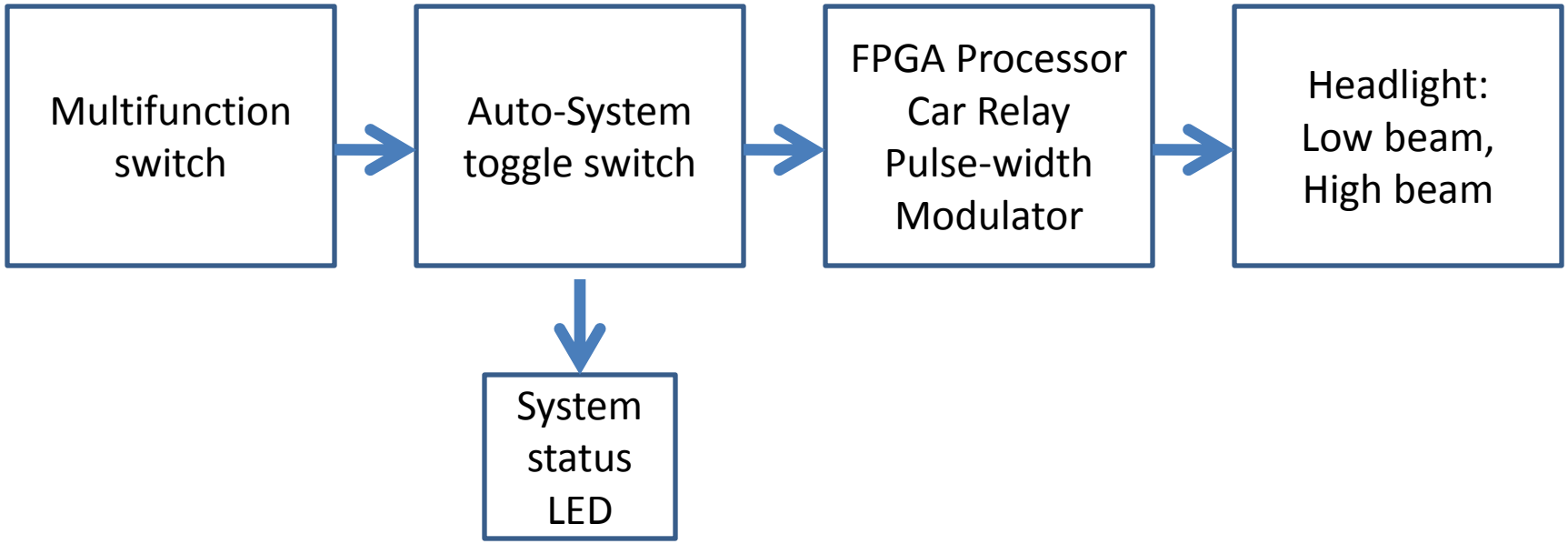
Engineering Aspects

System Overview

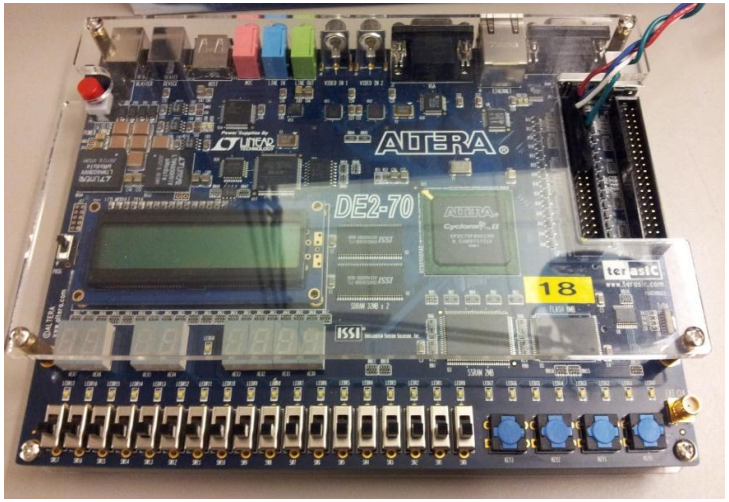


Hardware System

User Control



Hardware System



Hardware System

Canon Camcorder

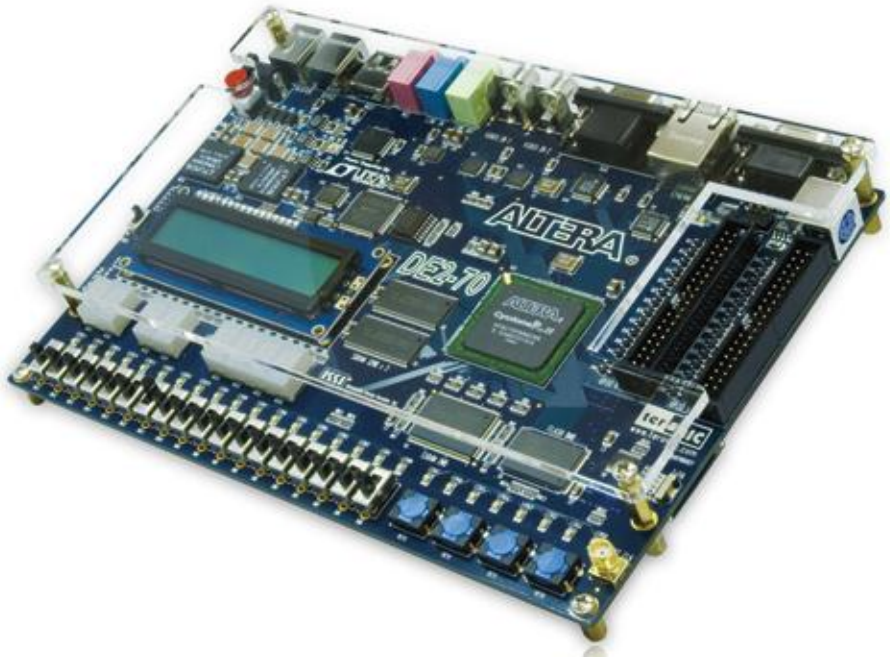
- System video
- Composite output
- Exposure control

Canon VIXIA HF M300

Hardware System

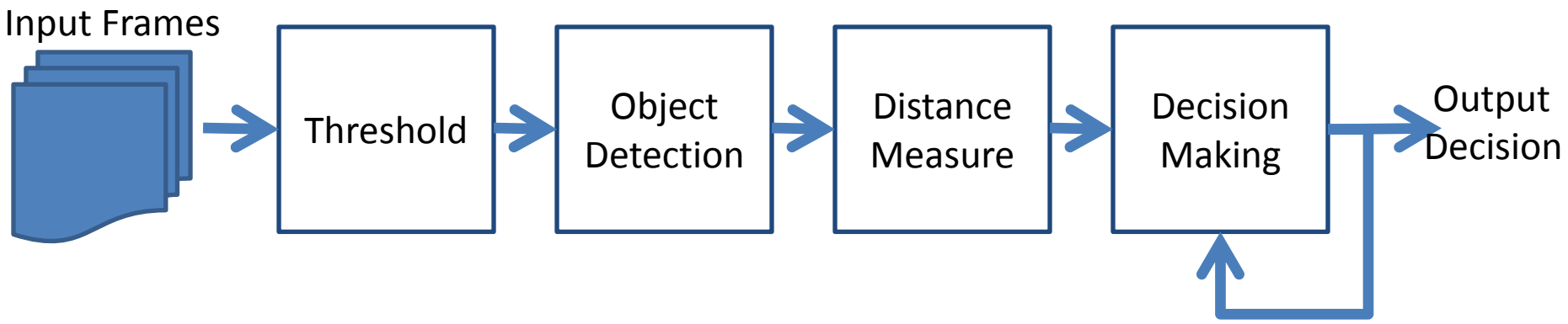
Altera Development and Education Board

- System IO
- User Friendly IDE
- Useful for prototyping
- No operating system necessary



Altera DE2-70

Software System



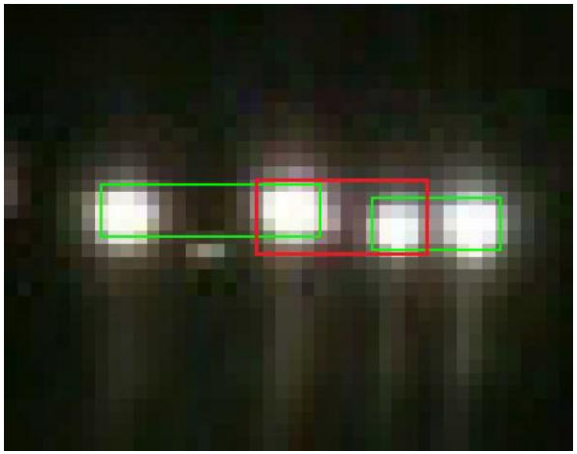
Software System

- Thresholding: Extract bright spots

- Determine the optimal threshold, T
- Binary map is “1” for pixels in frame greater than T, and “0” for pixels less than T

Software System

- Object Detection: Group together blobs if
  - They are close to each other
  - They overlap vertically



- Filter out groups with improper aspect ratio or excessive overlap
- Distance measure: Determine distance of vehicles from the user based on their width

Software System

- Three possible decisions: High beams 100%, 50%, OFF
- If high beams 100%:
  - Z < 150m? High beams 50%
  - Otherwise, remain at 100%
- If high beams 50%:
  - Z > 180m? High beams 100%
  - Z < 100m? High beams OFF
- If high beams OFF:
  - Z > 130m? High beams 50%
  - Otherwise, remain OFF
- Use a moving average of distance measurements

Business Aspects

Market Analysis

Target Market

- Anyone who owns a vehicle
- Night drivers
- Truck drivers
- Auto shop owners

Market Analysis

Competitors

General Motor Autronic Eye

- First automatic headlight dimmer [2]
- No longer in the market [2]

Mercedes-Benz Adaptive Highbeam Assist

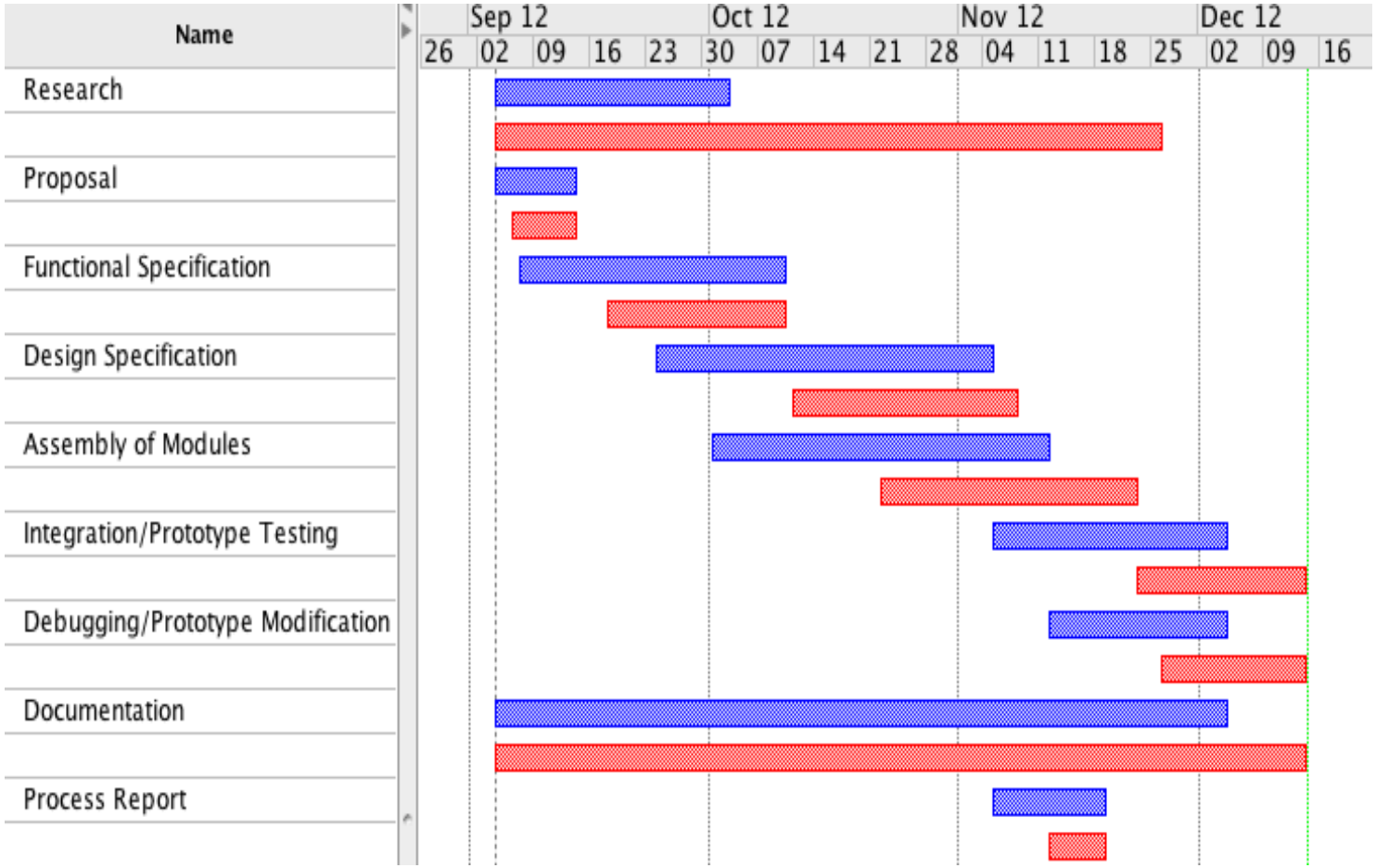
- Package costs $1000.00 [3]
- Activated at the speeds above 55 km/hr [4]

BMW High-Beam Assistant

- Package costs $1000.00 [5]

Reflection

Project Timeline



Budget & Financing

Expected Development Cost

Components	Price
Development Board	$ 200
Car Camcorder	$ 150
2 Headlight Bulbs	$ 60
Battery	$ 150
Vehicle Accessories	$ 100
Other Components (wires etc.)	$ 100
20% Contingency Fund	$ 152
TOTAL	**$ 912**

Budget & Financing

Actual Development Cost

Components	Price
Development Board	Free
Video camera	$ 315
2 Headlight Bulbs	$ 23
Battery	$ 17
Vehicle Accessories	$ 238
Other Components (wires etc.)	n/a
20% Contingency Fund	n/a
TOTAL	**$ 593**

Feedback

- Great for all kinds of vehicles
- Convenient product
- Reduce traffic accidents rate
- Very marketable
- User friendly

Future Improvements

- Better software development board
- Handle different possible situations
- Utilize vehicle data,
  e.g., current speed
- Smaller video camera

Acknowledgements

Thanks to

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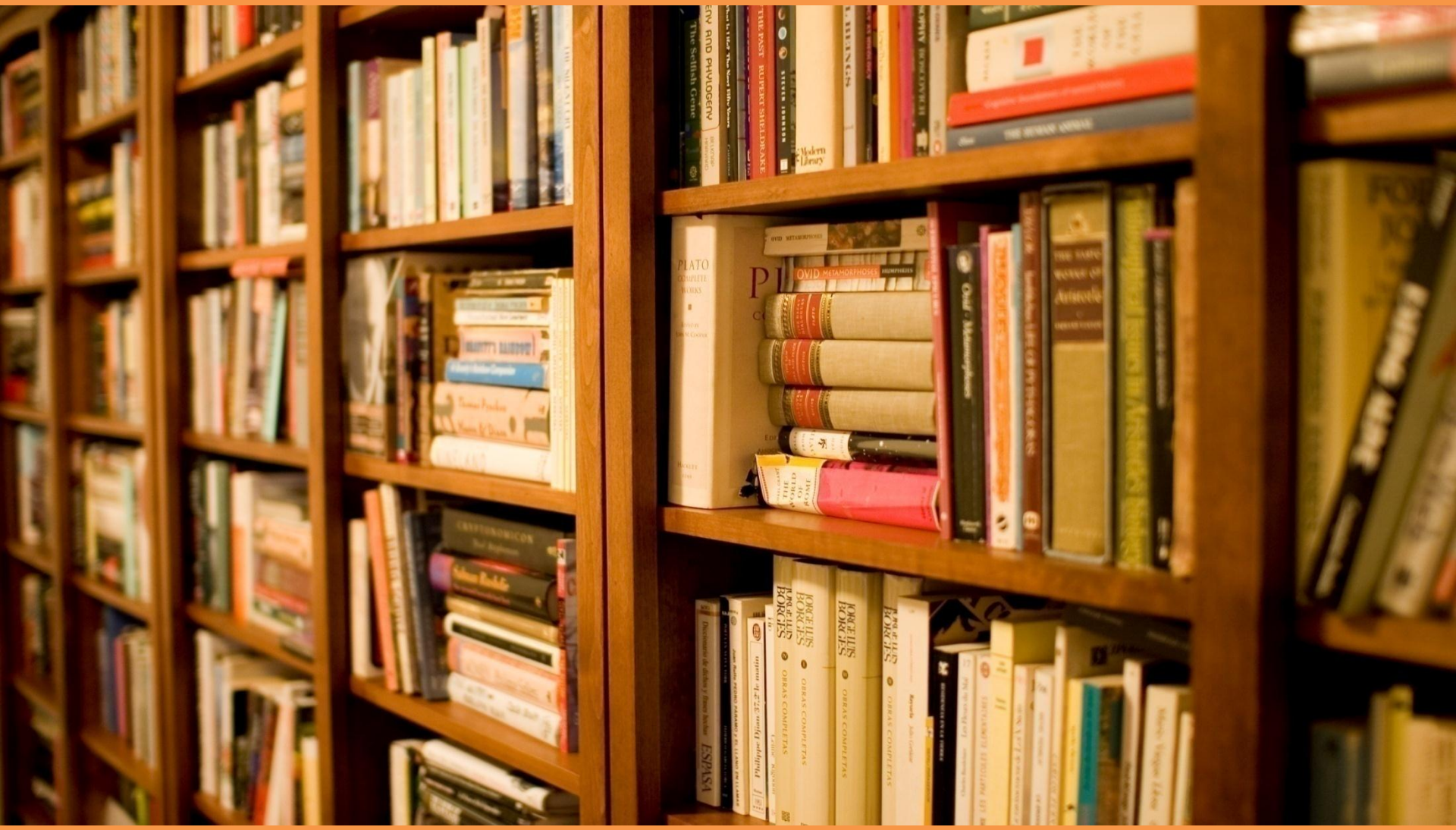
Steve Whitmore

TAs for this course

Special thanks to

Our friends and family


PLATO
OVID METAMORPHOSES
JORGE LUIS BORGES
OBRAS COMPLETAS

Reference

Reference

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Questions

Demonstration


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Thank You