Design … after UW

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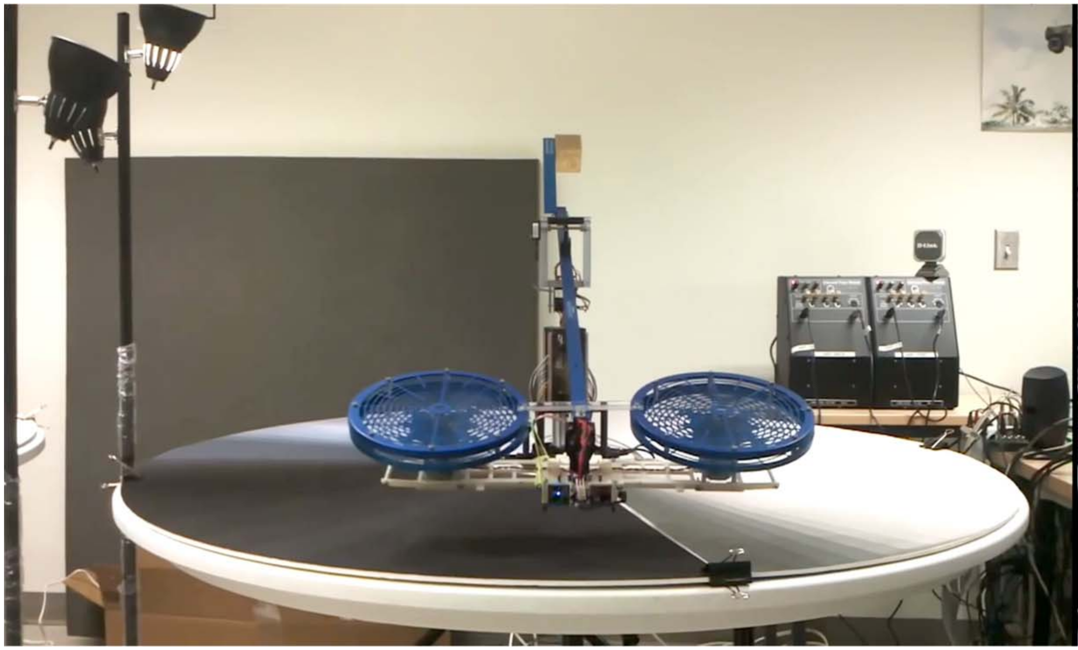
QUANSER = Question + Answer



TBT: 15 years ago …

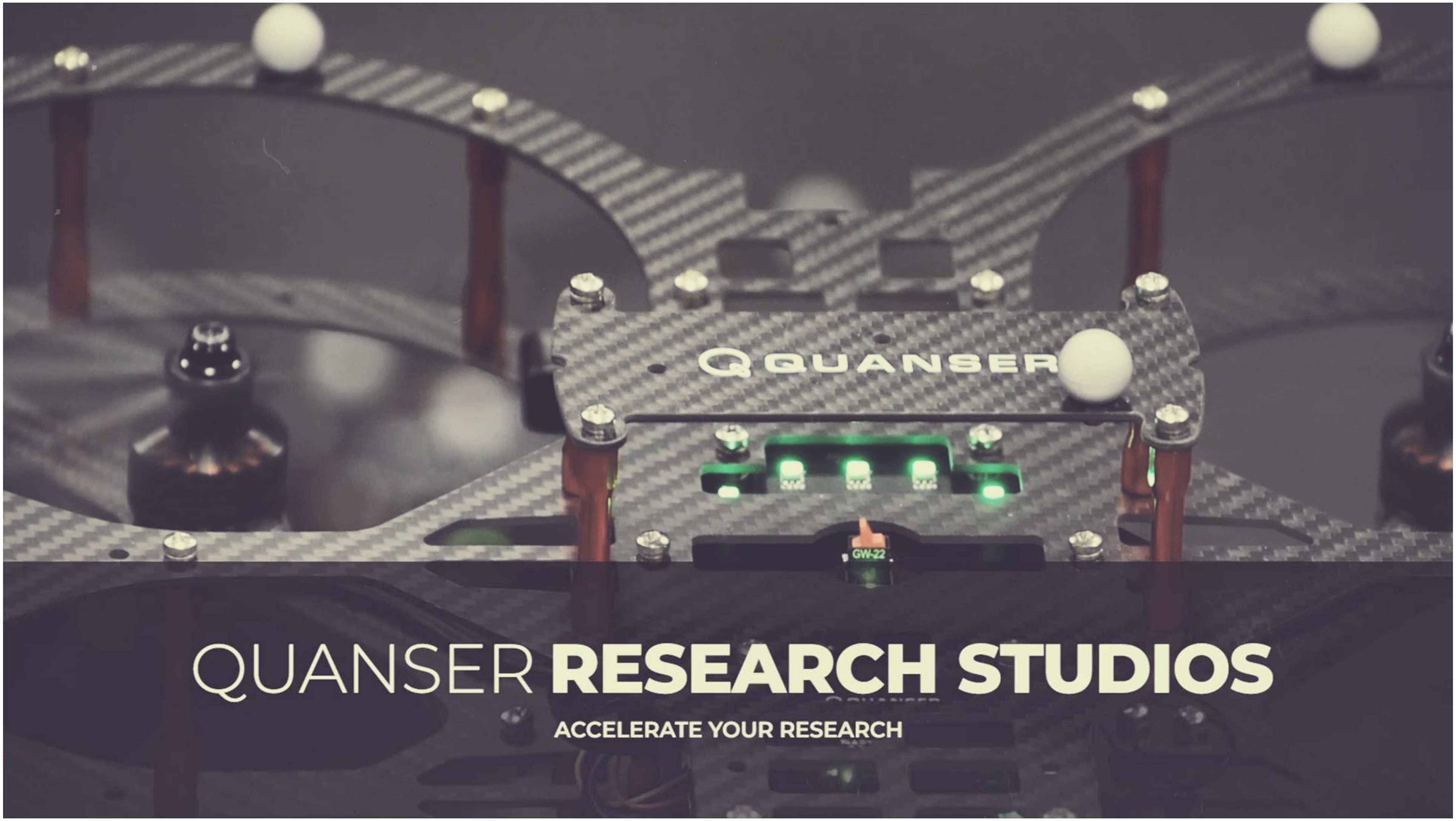
2003 Mercedes E320

Price: $53K
0-100 Km/h: 6.9s
11.9 L/100Km = 500 Km range

2018 Tesla 3

Price: $35K
0-100 Km/h: 2.4s
100% EV = 500 Km range

Advanced safety features
Intelligent driver assist
Zero emissions

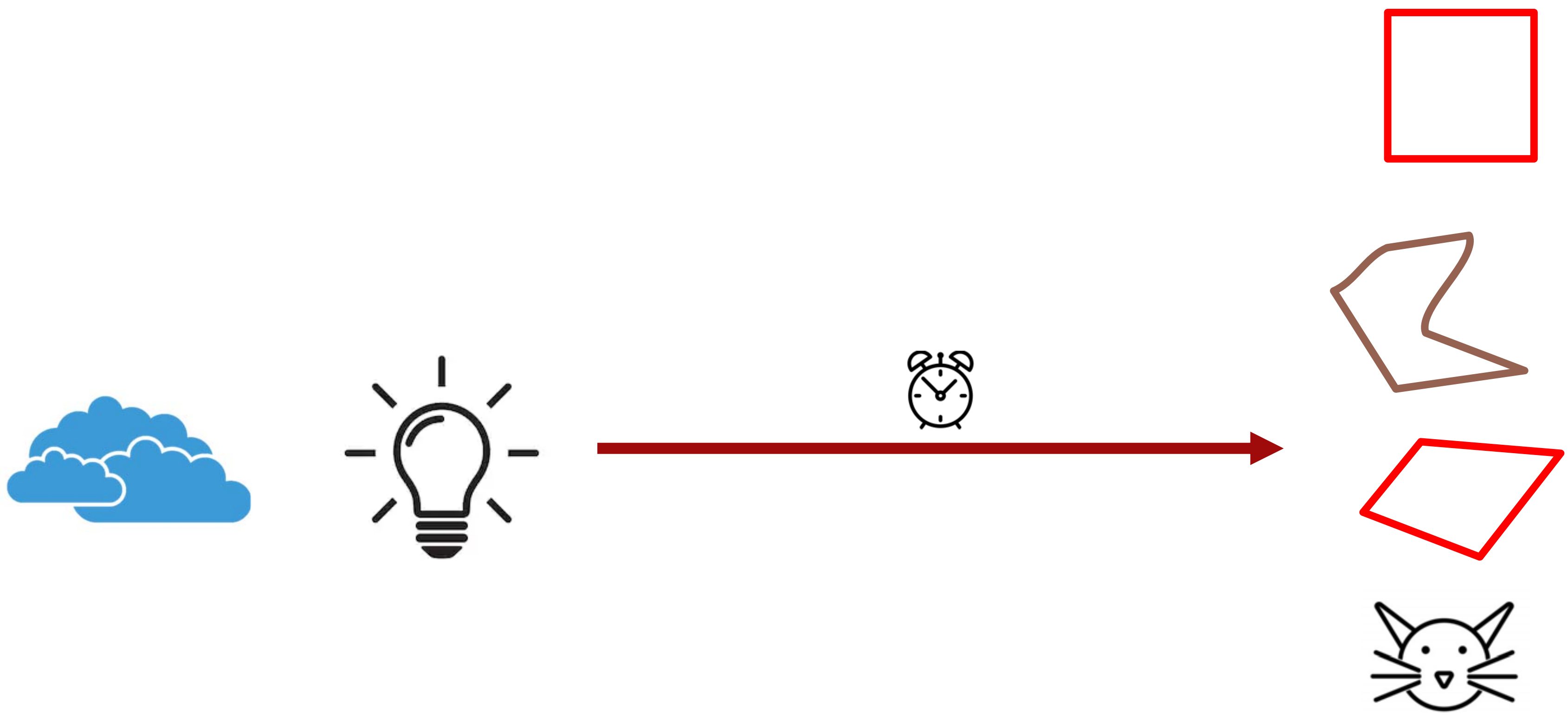

QUANSER
GW-22
QUANSER RESEARCH STUDIOS
ACCELERATE YOUR RESEARCH

New QCar Self-driving Car (2019)

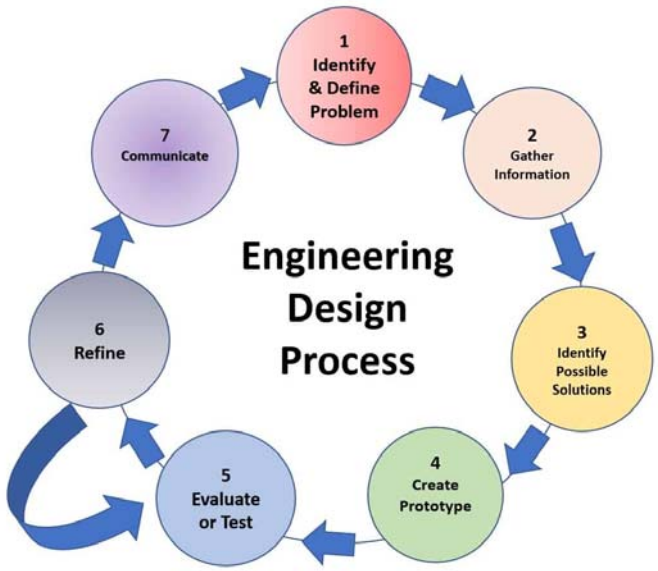
Fastest way to establish research and teaching application capacity

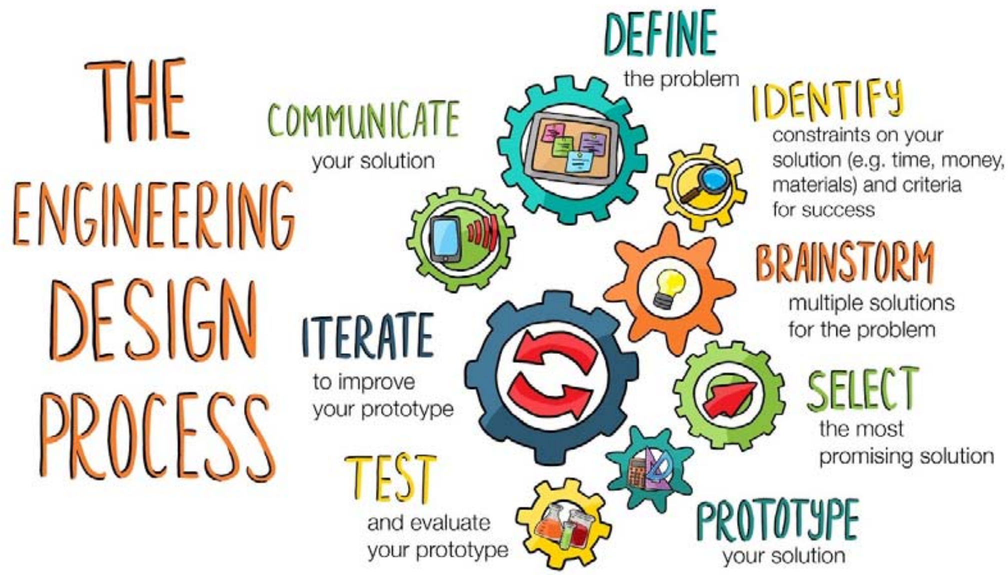
- Test and validate AI/ML on a scale model car
- Modular test environment enhanced with AR
- Sensor rich: LIDAR, IMU, depth camera, 360° 2D camera coverage, microphone, encoders, sonar
- SPI, I2C, serial, and CANBus
- GPU accelerated image processing

Design this ...



Engineering design processes





Engineering design = Problem Solving?

Universal problem statement in industry …

How do we make a lot more money without putting in too much effort?

Design something!

Vs.

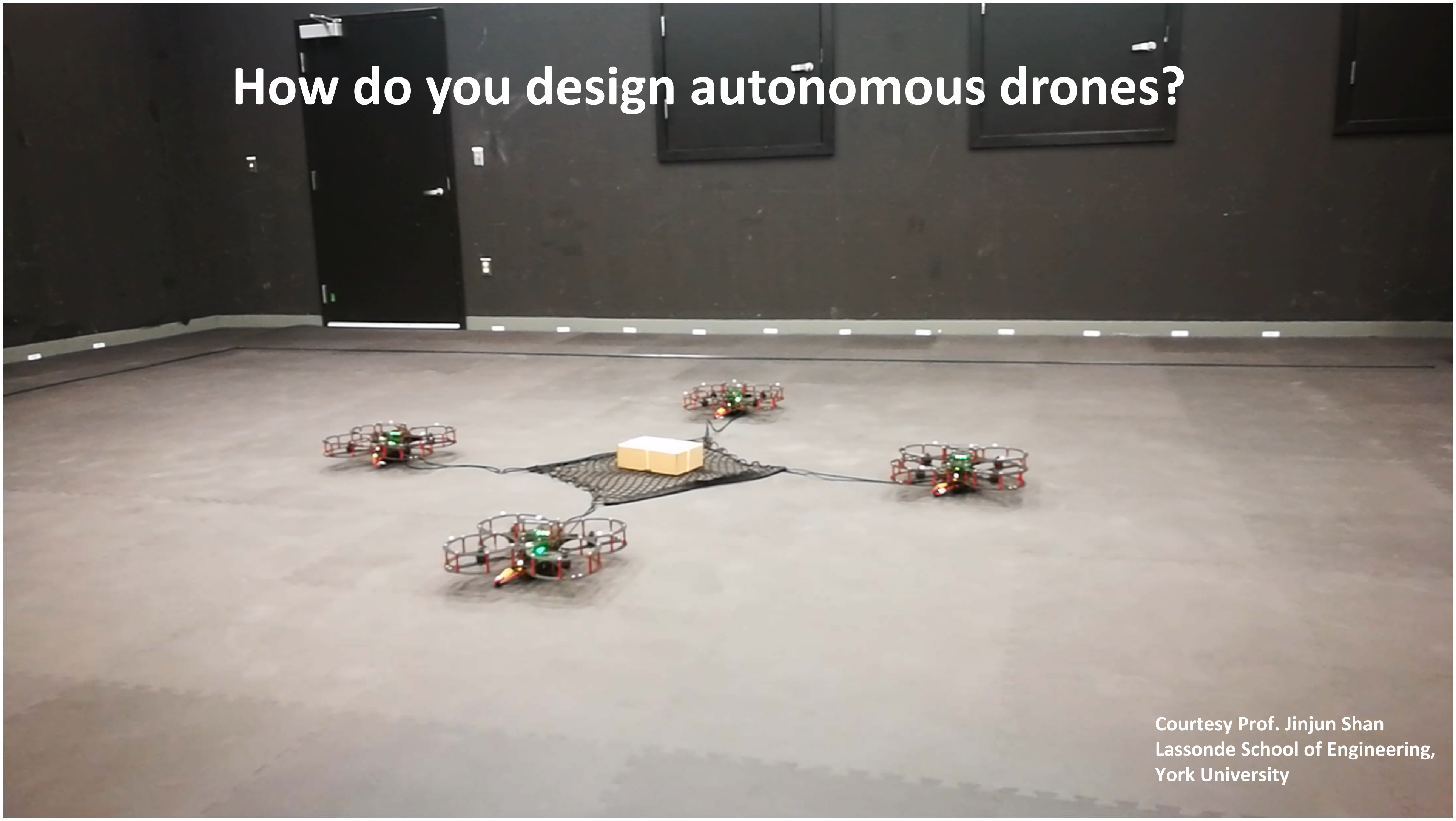
Experience a design process …

Three things I learned about design since graduation

1. Successful design in industry is never open-ended
   - It is severely constrained even in new initiatives
2. Design for Manufacture is critical for market success
   - If you can't make it, you can't sell it
3. It's all about the system …
   - Design in the modern era is complex system integration
   - Complicated but efficient sequence of choices
   - Catalog engineering

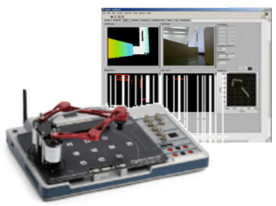
Quanser product dev stage-gate process

1. Concept
2. Feasibility
3. Design (Q definition: a plausible configuration)
4. Refinement
5. Regulatory
6. Productionization
7. Product deployment
8. Closing


How do you design autonomous drones?
Courtesy Prof. Jinjun Shan
Lassonde School of Engineering,
York University

Quanser's progression for modern design education

Motivation	Technical skills	System integration & application	Testing & validation	Design for manufacture	Design for commerce



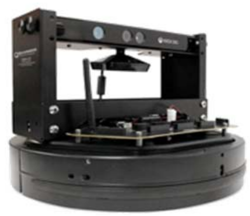
Design is bonded to application and not a generalized "problem"

Sample advanced systems skills development

1 ***Mechatronic manipulation of physical systems***

2 ***Systems engineering on an idealized robotic system***

3 ***Complete, intelligent systems of authentic complexity***



Intelligent drones

Autonomous cars

Agile software framework

QUARC

qdex

Targets

python

UNREAL ENGINE

Application software

Smart industrial processes

Contemporary Priorities for Engineering Education

- Authentic engineering applications
- Efficient system-level skills development
- Complete, high-fidelity physical system and robotic platforms
- Platform agility and neutrality

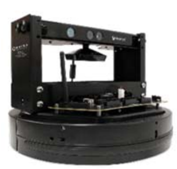
Skills and Outcomes

Fundamental modern mechatronic systems

- System models
- Basic dynamics
- Sensors
- Actuators
- Basic control
- Power and motors
- Microprocessors
- Programming
- Communications
- Rapid prototyping and 3D printing
- More

Fundamental modern robotic systems

- Vision
- Signal and image processing
- Image-based motion planning
- Robot sensor reading
- Teleoperation
- Differential drives
- 2D mapping
- Localization
- Path planning
- More



Autonomous car systems

- Vision
- Image processing
- Object recognition
- Object tracking
- Filtering
- Motion modelling
- State estimation
- Path planning
- SLAM
- Machine Learning
- Neural networks
- More

Autonomous drone systems

- Vision
- Sensors for flight
- Flight control
- Attitude localization
- Position localization
- Sensor fusion
- Autonomous flight
- Flight path planning
- Swarm applications
- Visual leader/follower
- Mixed robot multi-agent applications
- More

Modern industrial systems

- Robotic manipulators
- Sensing and instrumentation for industrial applications
- Physical systems and processes
- Control for industrial applications
- Machine vision
- Machine learning
- Networks and communications
- Industry 4.0
- More

Final thoughts on life after university …

$$

Travel

Senior management

IP Design	Product Design	Product Support	Project Mgt	Product Mgt	Sales Support	Tech Mktg	Tech Sales

Monday, October 21 … Please Vote