Motivation for This Course

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Login ID from my student days

You may use ucla email as an alumni

My Background

- Academic
  - UCLA (78, 78, 84)
  - Teaching experiences (1974-now)
- Industry (1976-now)
  - System Development Corp – Software Engineer
  - TTI – Citicorp – Network Designer
  - The Aerospace Corp
  - Hughes/Raytheon

  } Systems Engineer
  - Career path
    - MTS → (10) → Sr Principal Engineering Fellow → Consultant
  - Domains – software engineer, systems engineer, system architect, trusted systems engineer, network protocol design, military systems, network security product launch

Lecture Assignment

- Please go to the Bruinlearn Assignment Page
- Fill out the Student Self Introduction

Lectures Goals

- Stimulate your imagination
- Ability to express your thoughts
- Ability to ask the "right" questions
- Use examples during the lecture
  - Show how to apply

Example of Expressing and Imagination

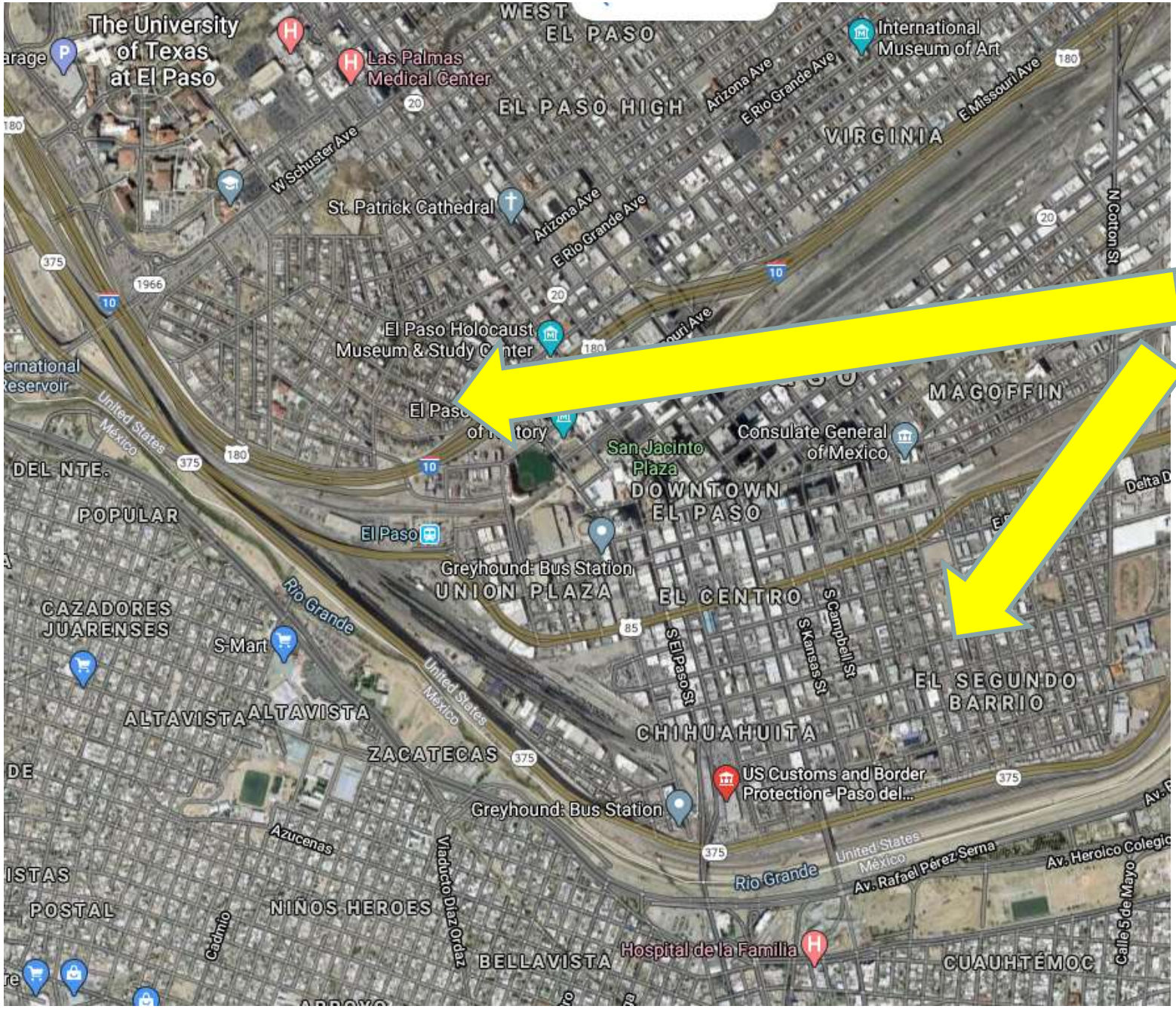
- El Paso, TX Border Patrol Control Center
- Agent express frustration that once a person crosses border fence, can disappear into many of the urban houses next to the border

What is the Need?

Systems engineering deals with building a system that satisfies customer's needs

Map of the Region

UCLA
SYSTEM ENGINEERING



Where

Notice the dense housing areas next to the border

Find out more details with customer engagements

Speak up When You Have a Chance

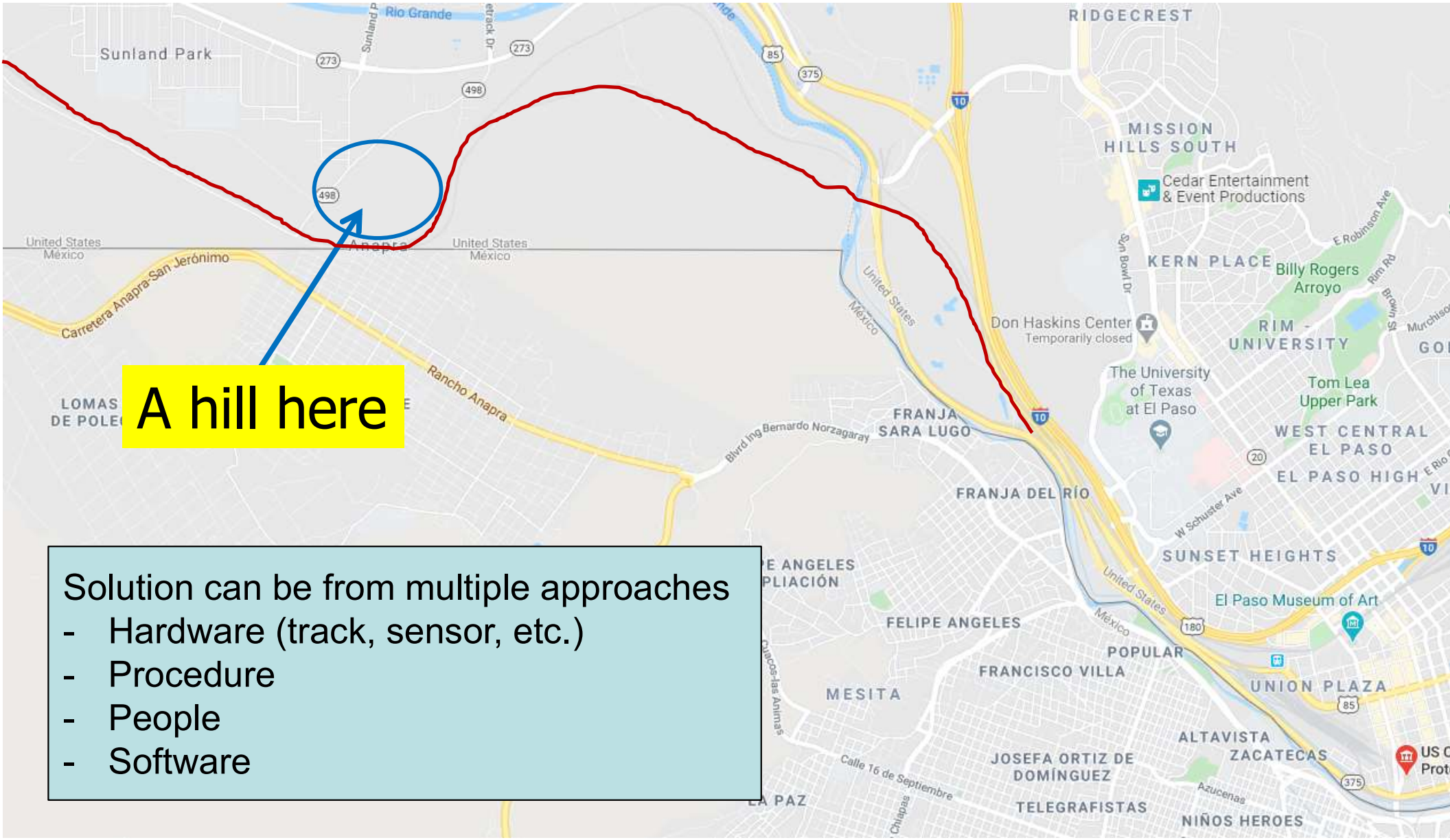
- Visiting with executives of my company
  - No one spoke up on what to do – silence
- I mentioned that we can shoot micro dots toward the people – shock!
  - Can identify using proximity technology
  - No harm – kinetic energy small (light mass)
  - Embed into the clothing and pick up on shoes
  - Comprehend the potential solution
  - This is a system with many components
  - Many issues need to be understood:
    - What is the micro dot? How to shoot it? Where to place the shooting devices? What is the range of sensors? How long the sensor can be used? etc.

How

Explore possibilities - Operational scenarios

Another Need:
Railroad Next to the Border

UCLA
SYSTEM ENGINEERING



Solution can be from multiple approaches
- Hardware (track, sensor, etc.)
- Procedure
- People
- Software

Need to Learn

- Critical thinkers
- Problem solvers
- Skilled professionals
- People who can work in a team
- Learn from experience
- Persons of good judgement

Employers want them

Source: NEA Higher Education Advocate, September 2014

Seven Ways of Learning 1

1. Building Skills

- Behavioral learning
- Tasks, procedures practice exercises
- Tasks are broken into concrete steps and practiced

Case Study and Group Project

2. Acquiring Knowledge

- Cognitive learning
- Make meaning out of information
- Pay attention – process – recall information

Lectures and Homework

Seven Ways of Learning 2

3. Developing critical, creative and dialogical thinking

Questions and answers in lectures

- Learning through inquiry
- Critique, evaluate arguments and evidence
- Creative thinking
- Asking probing questions
- Practice thinking through meaningful discussions

Seven Ways of Learning 3

4. Cultivating problem-solving and decision-making abilities
   - Learning with mental models
   - Defining problems, solving problems, and making decisions
   - Evaluating different options

Group Project

5. Exploring attitudes, feelings, and perspectives
   - Learning through groups and teams
   - Changing opinions, attitudes
   - Creating multiple perspectives

Seven Ways of Learning 4

6. Practicing professional judgement
   - Learning through role playing, simulations, scenarios, games

Group project

7. Reflecting on experience
   - Experimental learning
   - Real-life work through experience

Apply to your field