

Senior Design Project – SDP19

Introduction

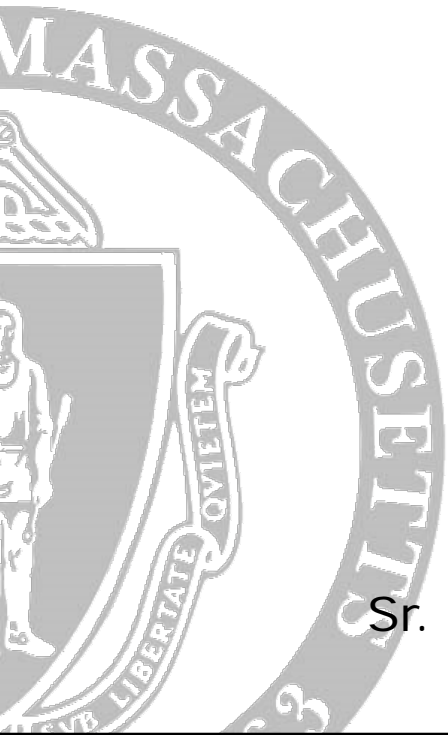
10 September 2018

C.V. Hollot

Professor and Head

Baird Soules

Sr. Lecturer and Director of Experiential Learning



SDP19 Clock Starts Ticking

SDP19 Demo Day

26th-27th April 2019

~~393 days~~

~~372 days~~

228 days

Students OWN SDP19

CSE 2019

_____, _____ Date: _____
 Last Name First Name

Curriculum Worksheet for the Computer Systems Engineering Class of 2019

FIRST YEAR		SECOND YEAR		THIRD YEAR		FOURTH YEAR	
Fall [18-19cr]	Spring [15-16cr]	Fall [18-19cr]	Spring [18-19cr]	Fall [15cr]	Spring [15cr]	Fall [13-15cr]	Spring [13-15cr]
ENGIN 112 Intro. to ECE [3 cr] [Note 1]	CMPSCI 121 Intro. Problem Solving w/Comp (Java) [4 cr]	ECE 211 Circuit Analysis I [4 cr]	ECE 212 Circuit Analysis II [4 cr]	ECE 313 Signals & Systems [4 cr]	ECE 314 Intro. Prob. & Random Procs. [4 cr]	ECE 415 Senior Design Project I [3 cr] (GenEd-IE)	ECE 416 Senior Design Project II [3 cr]
PHYSICS 151 Gen. Physics I – Mechanics [4 cr]	PHYSICS 152 Gen. Physics II – Thermo., E&M [4 cr]	ECE 221 Intro. Digital & Computer Systems [4 cr]	ECE 232 Hardware Organization & Design [4 cr]	ECE 323 Electronics I [4 cr]	ECE 324 Computer Networks & the Internet [3 cr]	CSE Elective [3 or 4 cr] [Notes 6 & 7]	CSE Elective [3 or 4 cr] [Notes 6 & 7]
MATH 131 Calculus I [4 cr]	MATH 132 Calculus II [4 cr]	ECE 242 Data Structures & Algorithms (w/Java) [4 cr]	MATH 235 Linear Algebra [3 cr]	ECE 353 Computer Systems Lab I [3 cr]	ECE 354 Computer Systems Lab II [4 cr]	CSE Elective [3 or 4 cr] [Notes 6 & 7]	CSE Elective [3 or 4 cr] [Notes 6 & 7]
Social World Elective [4 cr] [Note 2]	Biological Sciences Elective [3 or 4 cr] [Note 4]	MATH 331 Differential Equations [3 cr]	CMPSCI 250 Intro. to Computaton [4 cr]	ECE 373 Software Intensive Engineering [4 cr]	ECE 303 Junior Seminar [1 cr]	Social World Elective [4 cr] [Note 2]	Social World Elective [4 cr] [Note 2]
ENGLWRIT 112 College Writing [3 cr]		Social World Elective [4 cr] [Note 2]	Science Elective [3 or 4 cr] [Notes 5 & 6]		ENGIN 351 Writing in Engineering [3 cr]		
ENGIN 191 Freshman Seminar [1 cr] [Note 3]						5-yr B.S. / M.S. Graduate Course [3 or 4 cr] (Cannot be used for B.S. degree) [Note 8]	5-yr B.S. / M.S. Graduate Course [3 or 4 cr] (Cannot be used for B.S. degree) [Note 8]

The curriculum notes can be found on the reverse side of this worksheet.

UNIVERSITY OF MASSACHUSETTS AMHERST • DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

<http://ece.umass.edu/>

Updated June 2015

Students Empowered

- Select your own team
- Select your own project
- Select your own advisor
- **Empowerment**
- **Responsibility**

CSE 2019

Date: _____

Last Name

First Name

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Full (18-19cr)	Spring (15-16cr)	Full (18-19cr)	Spring (18-19cr)	Full (15cr)	Spring (15cr)	Full (13-15cr)	Spring (13-15cr)
ENGIN 112 Intro. to ECE (3 cr) [Note 1]	CMSCSCI 121 Intro. Problem Solving w/Comp (4 cr)	ECE 211 Circuit Analysis I (4 cr)	ECE 212 Circuit Analysis II (4 cr)	ECE 313 Signals & Systems (4 cr)	ECE 314 Prob. & Procs. (4 cr)	ECE 415 Senior Design Project I (3 cr) (GenEd-4E)	ECE 416 Senior Design Project II (3 cr)
PHYSICS 151 Gen. Physics I - Mechanics (4 cr)	PHYSICS 152 Gen. Physics II - Thermo., E&M (4 cr)	ECE 221 Intro. Digital & Computer Systems (4 cr)	ECE 232 Hardware Organization & Design (4 cr)	ECE 323 Electronics I (4 cr)	ECE 324 Comp. Networks & the Internet (3 cr)	CSB (3 or 4 cr) [Notes 6 & 7]	CSB (3 or 4 cr) [Notes 6 & 7]
MATH 131 Calculus I (4 cr)	MATH 132 Calculus II (4 cr)	ECE 242 Data Structures & Algorithms (w/Java) (4 cr)	MATH 235 Linear Algebra (3 cr)	ECE 353 Computer Systems Lab I (3 cr)	ECE 354 Computer Systems Lab II (4 cr)	CSB Elective (3 or 4 cr) [Notes 6 & 7]	CSB Elective (3 or 4 cr) [Notes 6 & 7]
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Updated June 2015

Course attributes

- Idea → prototype (year-long hackathon)
- Ideas self-generated
- Teams self-form
- Self-learning opportunities
- **Teaming experience**
- Impact on society
- Pre-professional experience in engineering design
- **Minimal classroom interactions**
 - **Weekly team/advisor meetings**
 - **Reviews before faculty evaluators**

Takes a Department to do SDP



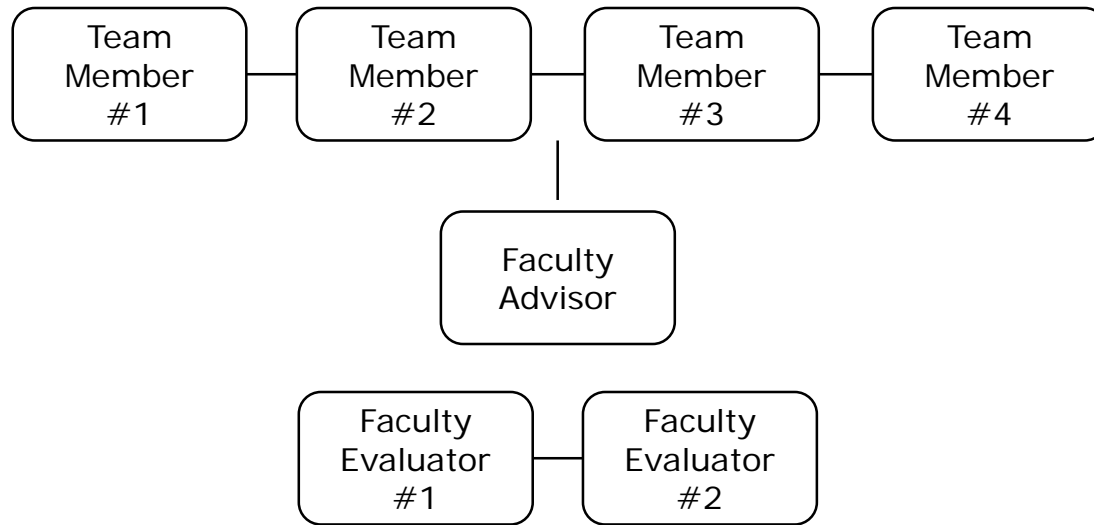
COO



CTO



CLT



Fran Caron



Marcus Hall, Room 9A

Baird Soules

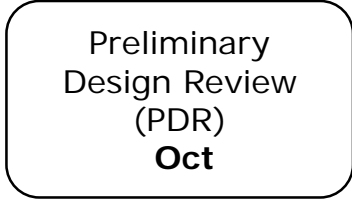


M5, Room 5J



SDP19 Reviews (the drumbeat)

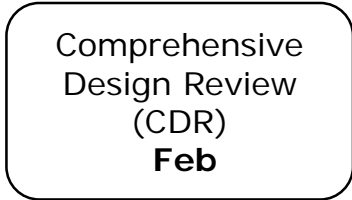
Making the Pitch



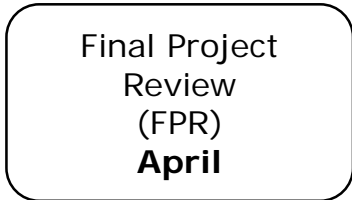
Demonstrating the Essence



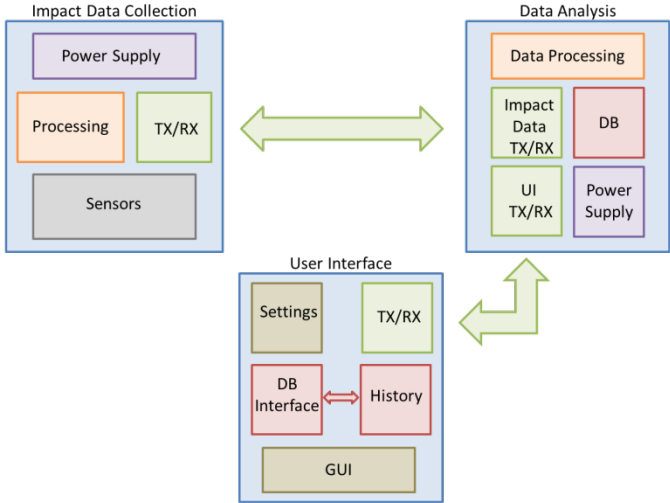
Working Prototype



THE Prototype



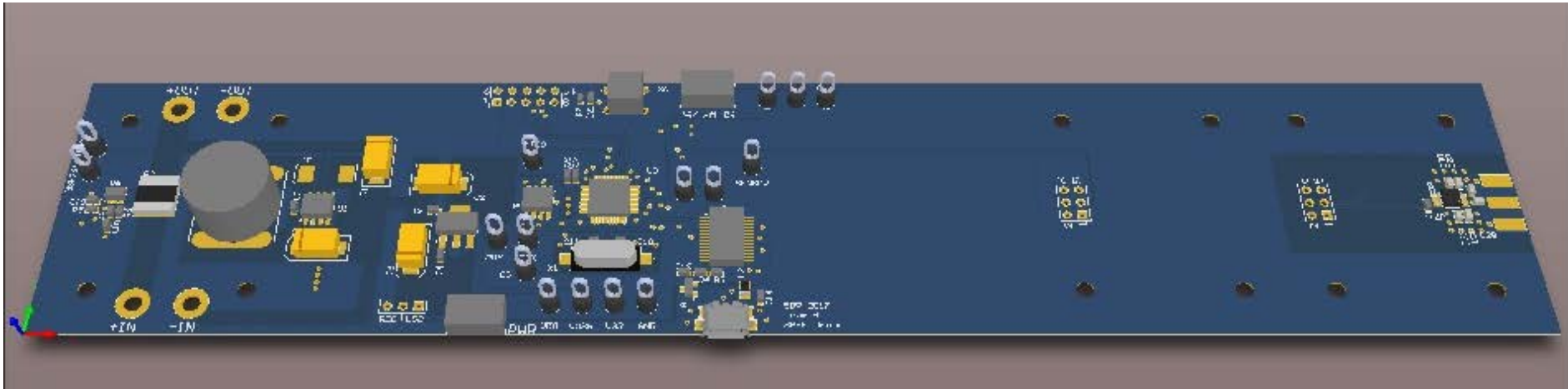
Block Diagram



SDP19 Course Deliverables

- Project Website
- Review Presentations
(PDR/MDR/CDR/FPR slide decks)
- Written report
- Demo Poster
- System Prototype

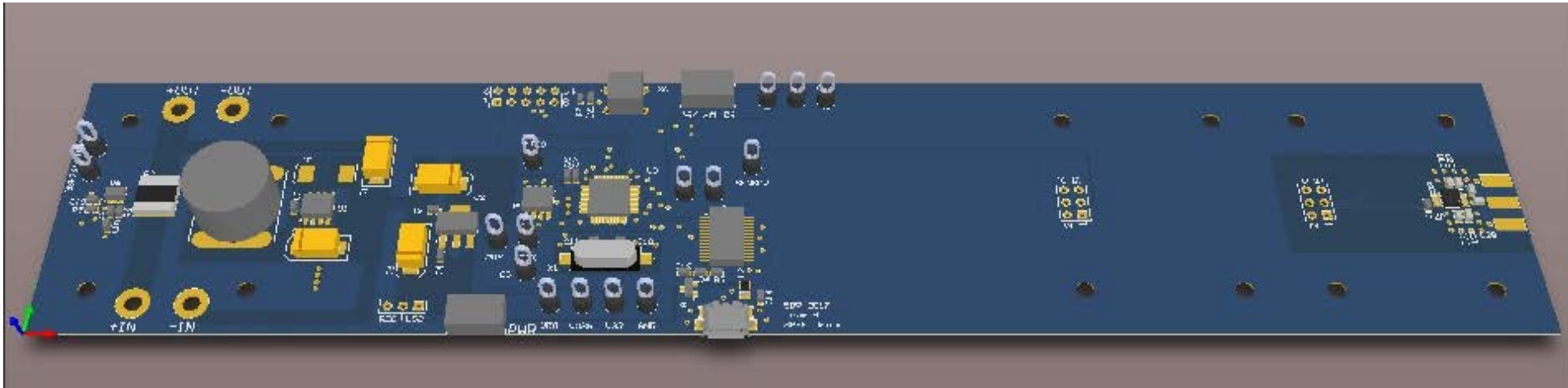
Must include custom PCB



Examples

- 8-bit microcontroller
- sensor board (signal conditioning, intelligence)
- actuator board (power stage)
- power supply

Must include custom PCB (cont'd)



- Arduinos allowed in MDR, but **not allowed in final prototype** – must integrate Arduino's raw processor (Atmega 328) on PCB – program in C
- Ras-Pi **does not satisfy** custom PCB requirement

SDP19 Process

- Teams of 4 students
 - Choose one team manager
- Advisor
 - Each team chooses its own ECE faculty advisor (**due 21st Sept**)
- Meetings
 - Weekly team meetings
 - Weekly advisor meetings
 - Course meetings
- Project budget: \$500
 - Some parts available in SDP lab or M5
 - We encourage students to secure outside support; e.g., free samples, sponsorships, competitions,

Review and Grading Process


- Reviews (PDR, MDR, CDR, FPR)
 - Two ECE faculty evaluators (different from advisor)
 - 20/30 min presentation by team + 20 min Q&A

- The final grade for ECE 415 (and ECE 416):
 - Advisor grade (50%): Given at the discretion of the advisor
 - Review Board grade (30%): Average of review panel grades
 - Course Coordinator grade (20%): Based on project documents and performance
 - Each team member graded individually.

SDP19 website <http://www.ecs.umass.edu/ece/sdp/sdp19/>

Senior Design Project - SDP19

Home	Teams	Syllabus	Schedule	Lectures	Examples
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Welcome to Senior Design Project 2019 (SDP19)

Course Overview: The Senior Design Project provides a capstone experience for undergraduate students in the Department of Electrical and Computer Engineering. Students work in teams of 3-4 students in this year long course sequence to design and prototype a system of their choice. Past projects have included a variety of topics ranging from home automation systems to ultra wide band wireless links, assistive robots, and wireless drumsticks. Each team is advised by a faculty member in the department and projects undergo several formal reviews. The learning goals for the senior design project include technical design, team work, presentation skills, an understanding of realistic constraints, economics, and ethics.

News: Team Forming is complete

<http://www.ecs.umass.edu/ece/sdp/sdp19/>

To Do List

- Sign up for a lab bench (Marcus Hall, Rm 9A)
- Converge to a project idea
- Connect with a Faculty Adviser
- Register for M5 membership (required)



Schedule

This schedule shows the main events for SDP19. Please note that the schedule is subject to change.

September 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4 First day of classes	5	6	7	8
9	10 Lecture 1: Introduction	11	12	13	14	15
16	17 Lecture 2: Problem Specification and Team Management	18	19	20	21 Advisors due	22
23	24 Lecture 3: PDR	25	26 Benchside Meetings	27	28	29

October 2018						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
30	1 Benchside Meetings	2	3	4	5	6
7	8 Holiday	9 PDR	10 PDR	11 PDR	12 PDR	13
14	15 PDR	16 PDR	17 PDR	18 PDR	19 PDR	20
21	22	23	24	25	26	27

Diagnostic Drones (Ashland MA)

“develop and build a collision detection and avoidance system for a drone to operate”

Deadline for expressing interest: email to cvh **no later than noon, Tuesday, 11th September, 2018**

SDP18 Awards

SDP18 Third Place

SmartDesk



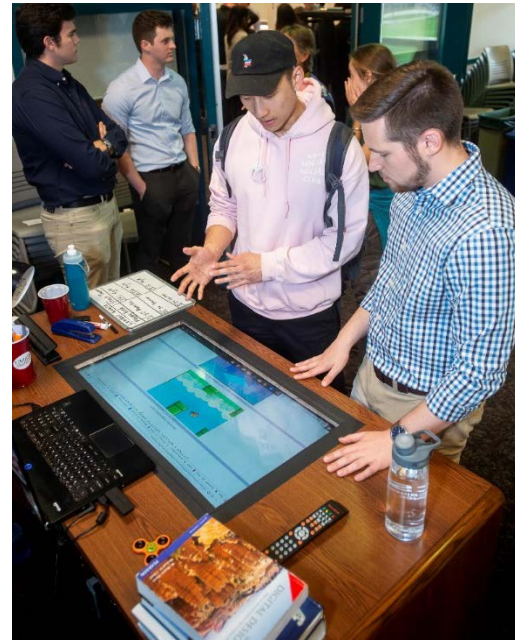
**John Melloni, Daniel Mathieu,
Tristan Koopman & Aidan Fitzpatrick**

Advisor: Paul Siqueira



SDP18 Third Place

SmartDesk



SDP18 Second Place

HELPING HAND



**Corey Ruderman, Dan Travis
Jacob Wyner & Joshua Girard**

Advisor: Marco Duarte



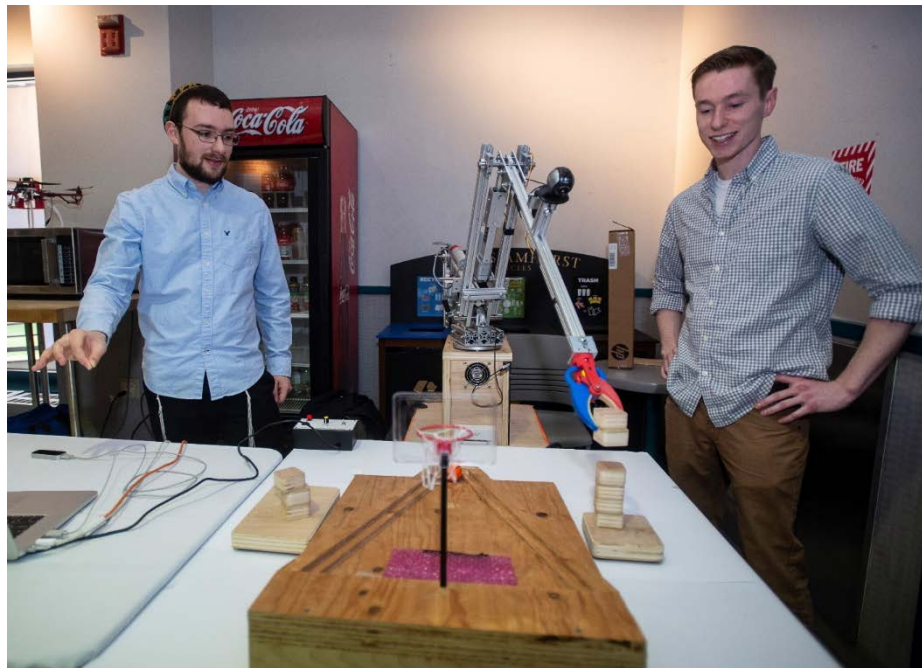
SDP18 Second Place

Helping Hand



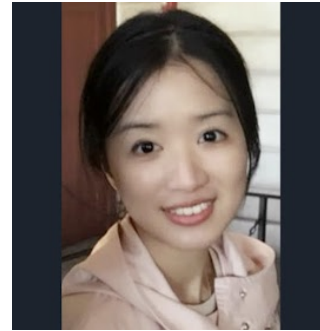
SDP18 Second Place

Helping Hand



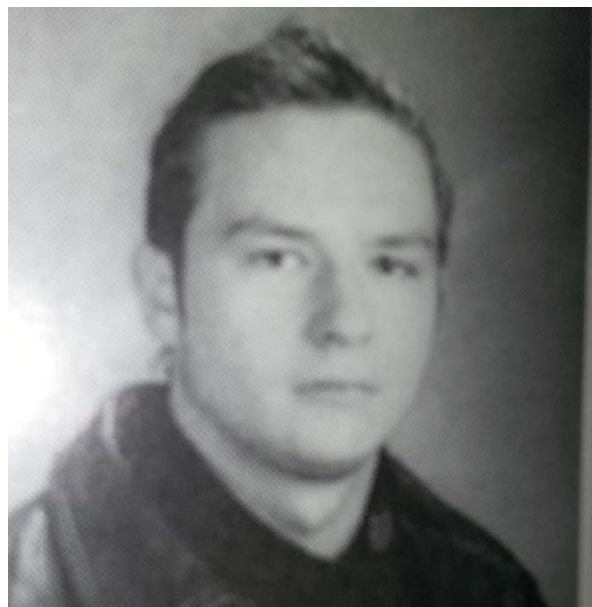
SDP18 First Place

DUAL PLAY



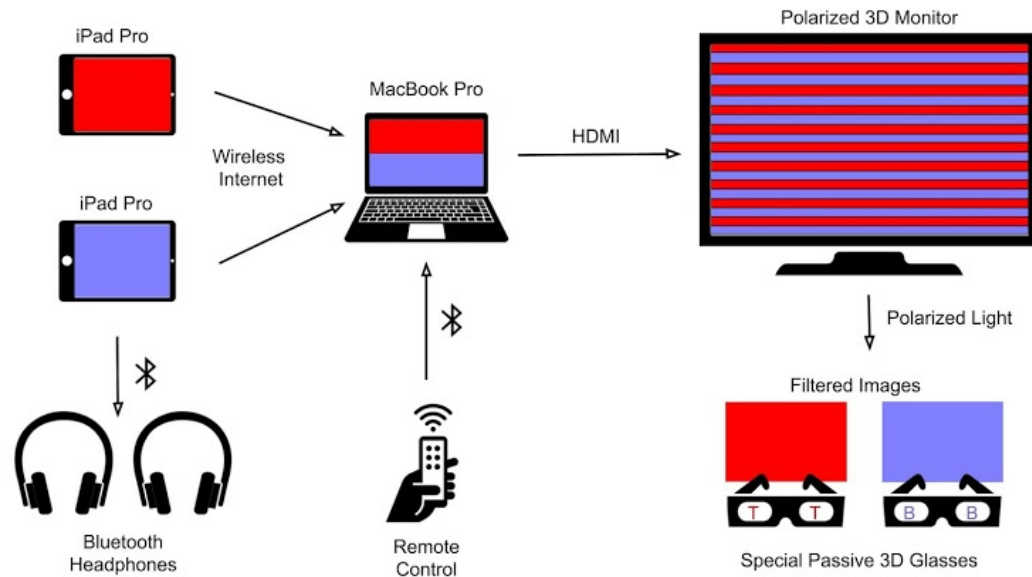
SuoAn Gao, Lina Wu, Yujia Huo & Siyu Wu

Advisor: Zlatan Aksamija



SDP18 First Place

Dual Play



SDP18 First Place

Dual Play



Coordinators' Choice Award

ACCESS

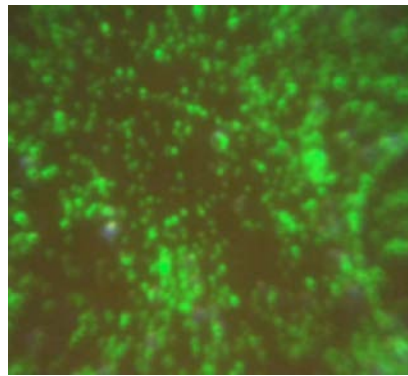


**Ivan Williams, Hassaan Khan,
David Downs & Victor Arango**

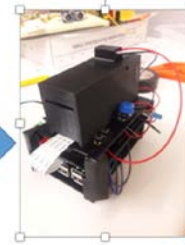
Advisor: Guangyu Xu

Coordinators' Choice Award

ACCESS



- Spin-coat polystyrene microspheres
- ID un-cloneable - complexity pattern.



- IDs loaded into reader
- Image sent to server for processing
- Result relayed back to user

SDP18 People's Choice - Third Place

ALFRED



Pat Barron, John Fouad, Ben Ivaldi & Chris Wong

Advisor: Andras Moritz

SDP18 People's Choice - Third Place

ALFRED



SDP18 People's Choice - Third Place

ALFRED



SDP18



Honorable Mention

SAFE Drone

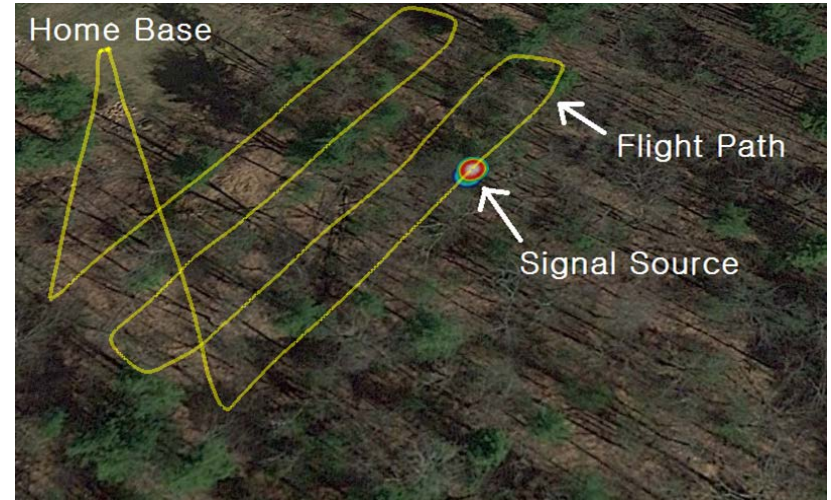


Bradley Marszalkowski, Jamie Kline & Serena Thomas

Advisor: Bill Leonard

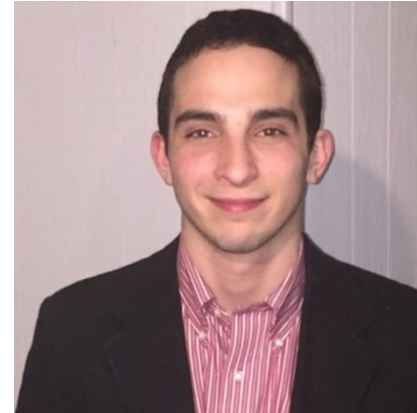
Honorable Mention

SAFE Drone



Honorable Mention

AutoUmp

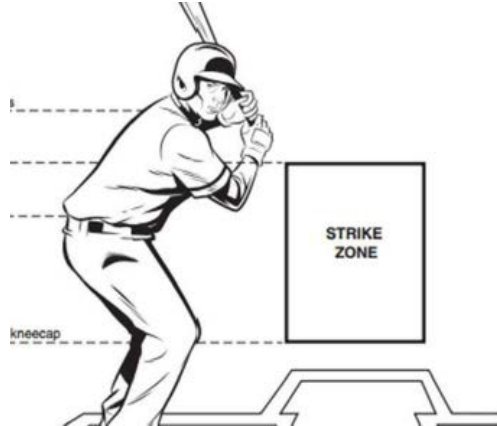


**Tim Adams, Justin Marple,
Jason Camiel & Matt Barnes**

Advisor: Tilman Wolf

Honorable Mention

AutoUmp



SDP17 Third Place

Pegasus-21



Trevor Berry, Istvan Kreiz & Keith Miller

Advisor: Zlatan Aksamija

SDP17 Third Place

Pegasus-21



SDP17 Second Place

Smart Hydroponic Greenhouse



**Michael D'Anna, Samantha De Groot,
Maxwell Joyce & Shaun Palmer**

Advisor: Bob Jackson

SDP17 Second Place

Smart Hydroponic Greenhouse



Sensor Array

- Moisture
- pH
- Humidity
- Temperature
- Water Level

Hydroponics

- Pump/Water Cycle Control
- Nutrient Dispersal System

Lighting

- Voltage Regulators and Power Management
- Light Cycle and Intensity Control

- Plant Database
- Notification Interface

Android Application

SDP17 First Place

Step

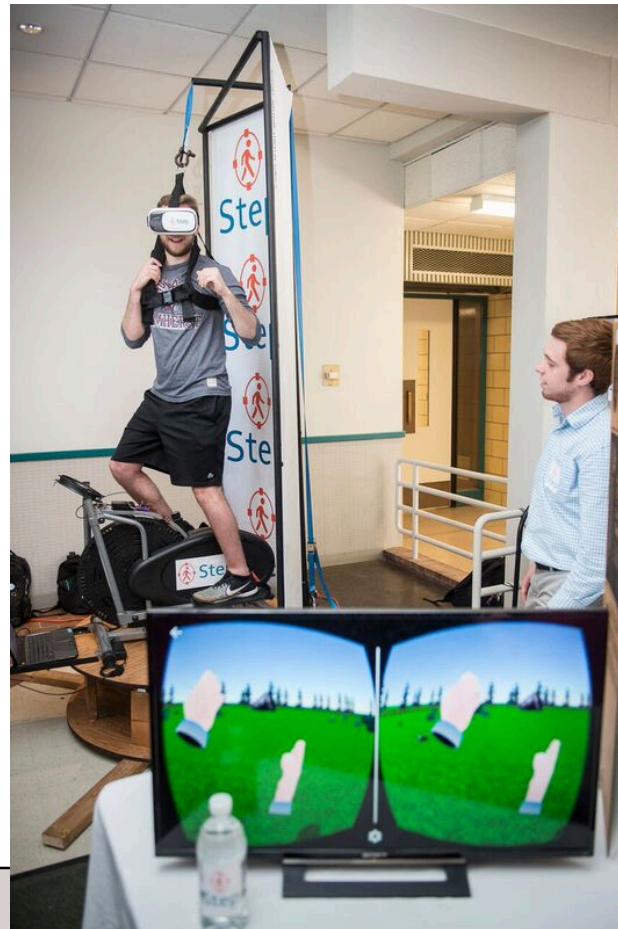


Joseph Roberts, Ryan Daly, Jared Ricci & Steven So

Advisor: Dennis Goeckel

SDP17 First Place

Step



Assignment

- Converge on project (ok to consult with adviser)
- Reserve lab bench, Monday, 11th Sept'17
- Confirm faculty adviser by Tuesday, 19th September'17

Career planning

- Engineering Career Development and Experiential Learning Center (Cheryl Brooks), Marston 112
 - Walk-in resume/cover letter help
 - Mock interviews (by appointment)

3	4	5	6	7	8	9
				10:00 - 3:00 Welcome Back for All Engineering Students		
10	11	12	13	14	15	16
11:00 - 2:00 Handshake Launch	9:00 - 12:00 Handshake Launch	9:00 - 1:00 Skanska Recruiting/Resu me Drop Table	11:00 - 2:00 Handshake Launch	2:00 - 5:00 Handshake Launch	2:00 - 5:00 Handshake Launch	
		2:00 - 5:00 Handshake Launch	5:30 - 6:30 Resume and Career Prep Workshop	5:30 - 6:30 Naval Nuclear Propulsion Lab Info Session		
17	18	19	20	21	22	23
5-STEM Workshop	5:30 - 6:30 ExxonMobil Info Session	3:30 - 5:00 Professional Communication Group	10:00 - 2:00 Entrepreneur-in- Residence Eric Crawley 9/21	5:30 - 6:30 Cavium Information Session		
	5:30 - 6:30 Resume and Career Prep Workshop					
24	25	26	27	28	29	30
5:00 - 8:00 Corporate Networking Night	10:00 - 3:00 Engineering & Computer Sciences Career Fair	11:00 - 4:00 Isenberg Career Fair	11:00 - 4:00 Isenberg Career Fair	10:00 - 2:00 Entrepreneur-in- Residence Eric Crawley 9/28		
		3:30 - 5:00 Professional Communication Group				
1	2	3	4	5	6	7
	5:30 - 6:30 Lockheed Martin Info Session	3:30 - 5:00 Professional Communication Group	10:00 - 2:00 American Plant Maintenance Recruiting/Resu	10:00 - 2:00 Entrepreneur-in- Residence Eric Crawley 10/05	10:00 - 3:00 Civil & Environmental Career Fair	
					10:00 - 3:00 Civil &	



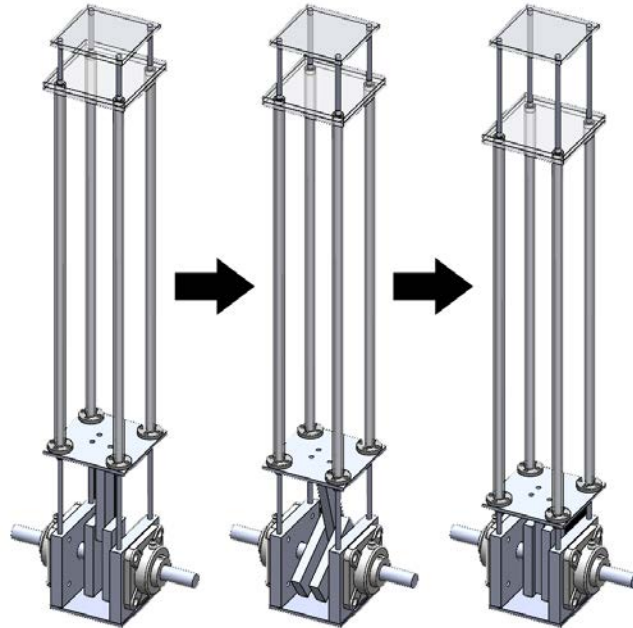
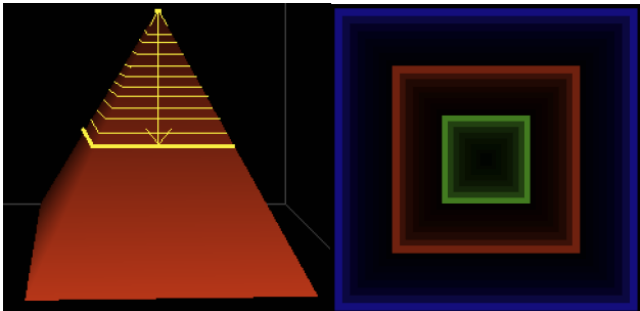
Projects

- What do you want to learn?
- Choose an area – become an expert
- Explore past SDP projects
 - UMass
 - Other ECE departments
- SDP projects are:
 - differentiators at job interviews
 - not PhD dissertations

Real-Time Concussion Analyzer (SDP13)

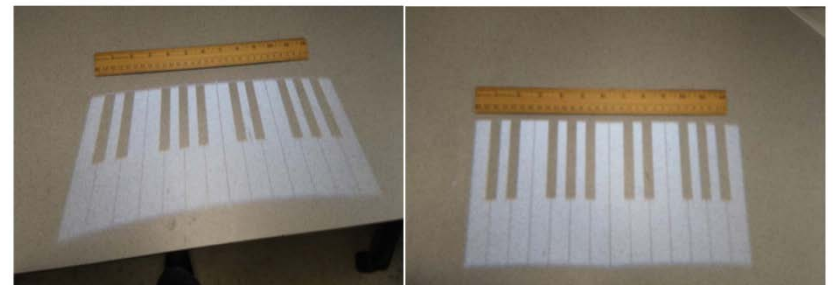
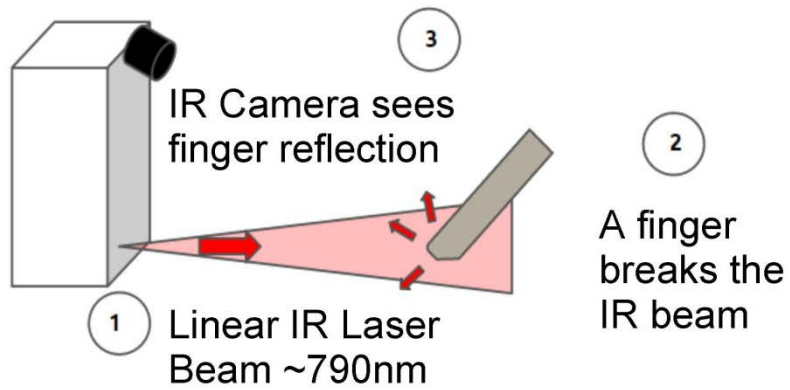


Hologram Machine (SDP14)



Viano (SDP15)

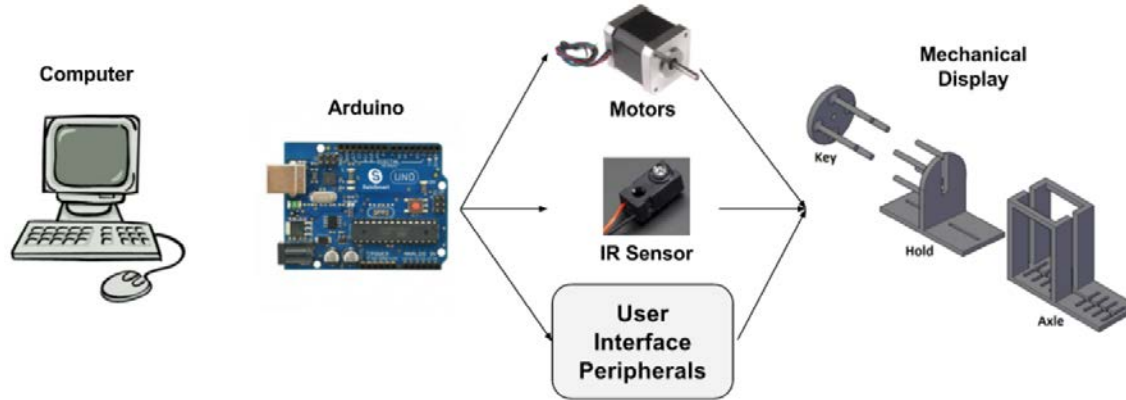
Finger Tracking



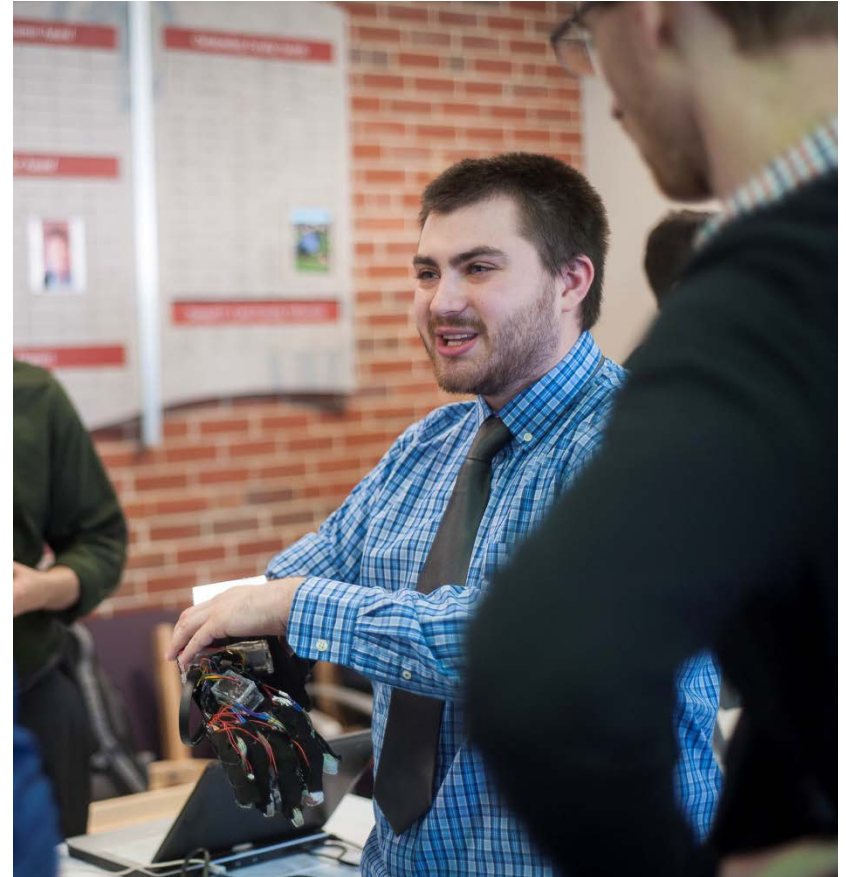
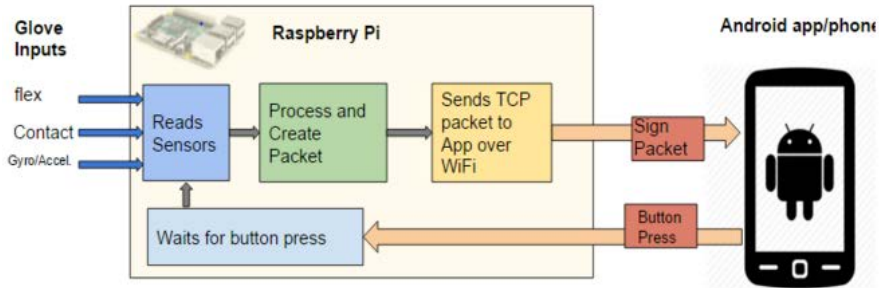
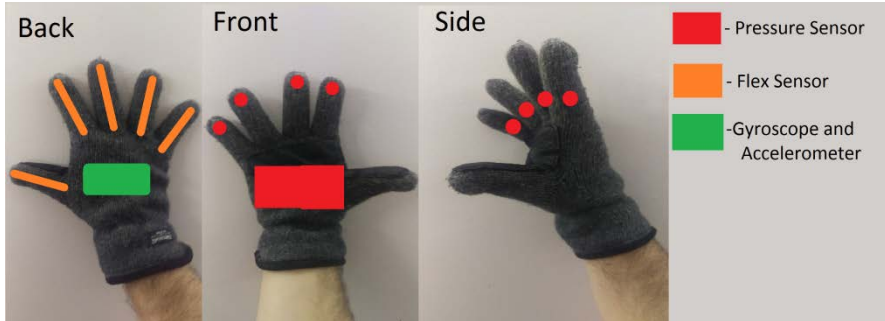
Before

After

braillebook (SDP16)



SigninGlove (SDP16)



ASPECTS (SDP16)

ECE Students Win First Place in FAA Design Competition By Creating Virtual Geofences to Protect Airports from Drones

The student team of UMass electrical engineering majors Alex Breger, Chris Boselli, Jason Danis, and Sandra McQueen received first place for the winning design in the "Runway Safety/Runway Incursions/Runway



