January 9, 2014

ENGR110/210
Perspectives in Assistive Technology

David L. Jaffe, MS

Margaret Mongare

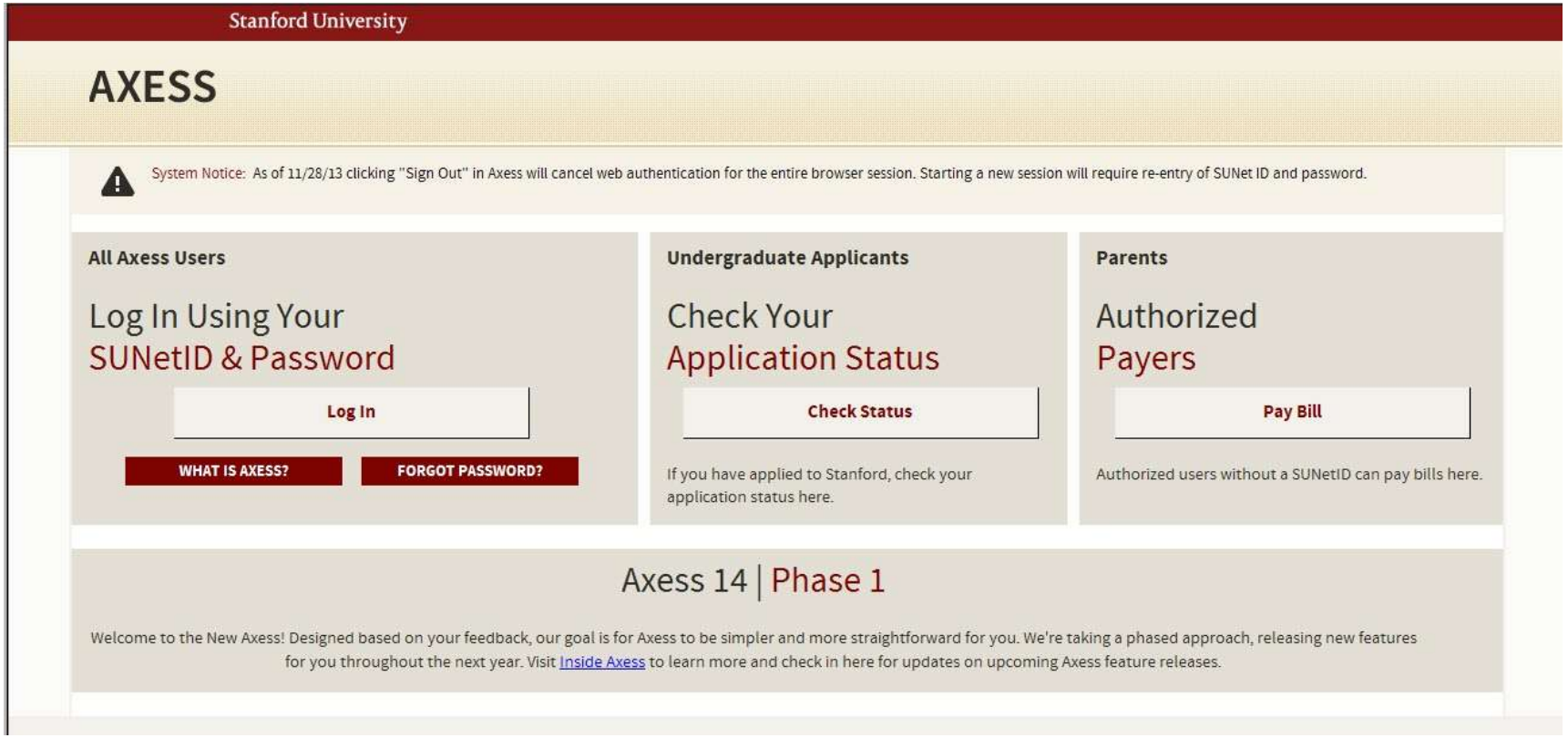
Professor Drew Nelson

Proadpran P. Punyabukkana, PhD

Questions?

Enroll on Axess

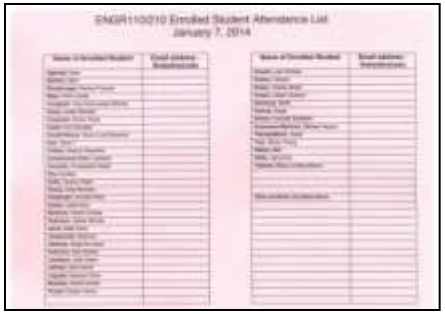
Students: If you haven't already done so, please enroll in ENGR110/210 on Axess.



Today's Handouts, Signup Sheets, and Fillout Forms

For all students:

- Attendance Sheet



Important to verify your attendance

For students taking the course for 1 unit with a letter grade:

- Assignment for One Credit Letter Grade Option

For students taking the course for 3 units: (team projects)

- Mid-term Team Assignment
- Project Preference for Students Working on Team Projects

Assignment for One Credit Letter Grade Option

ENGR110/210 – Winter 2014
Perspectives in Assistive Technology
Assignment for One Credit Letter Grade Option

This is the course assignment for students working on individual projects for one credit with a letter grade.

Overview: For your assignment you are asked to interview an individual with a disability or a senior, choose and pursue a specific project activity, present your work, submit a final comprehensive final project report that encompasses your efforts for the entire quarter, and reflect on your experiences.

Required Course and Individual Project Activities

The required course and project activities for students working on an individual project for one credit and a letter grade are:

1. Participate fully in the class including attending lectures as required, listening actively, posing questions to the guest speakers and the course instructor, engaging in class discussions, verbalizing thoughts and analyses, reading and responding to emails from the course instructor, and communicating team project progress.
2. Attend at least 10 lectures, including the first lecture, *Introduction to Assistive Technology*.
3. Meet with the course instructor to agree on an assistive technology project and to report progress during the quarter.
4. Interview an individual with a disability or senior, consisting of an overview of the individual's life, challenges being faced, successes achieved, desires for the future.
5. Review of assistive technology employed, their usefulness and limitations, problems experienced, and similar products on the market.
6. Focus on one of these activities that relates to or would potentially benefit the interviewed senior or individual with a disability:
    a. **Research an assistive technology topic** - report on new products and research under development.
    b. **Pursue a "paper design" of an assistive technology device** - develop a CAD design or a "low resolution" physical device built from foam-core or other prototyping material.
    c. **Create a work of art** - create an original poem, song, skit, painting, or video. (This option would be of particular interest to students who have skills and expertise other than engineering.)
    d. **Engage in an aftermarket aesthetic** design - select an existing assistive product that could benefit from a better appearance, contact the manufacturer, and work with a user of the device to improve its aesthetic appeal.
    e. **Engage in an aftermarket functionality / usability design** - select an existing assistive product that could benefit from a better functionality or usability, contact the manufacturer, and work with a user of the device to improve its functionality or usability.
7. Give a final presentation of about 15 minutes in length to be scheduled outside of class time during the week of **March 3rd** that includes PowerPoint slides, photographs, and short videos as described below.
8. Submit a final report that documents the entire quarter's effort and addresses the elements described below. Individual final reports are due **Monday, March 17th**.
9. Submit an Individual Reflection as described below. Individual reflections are due **Monday, March 17th**.

Mid-term Team Assignment

ENGR110/210 – Winter 2014
Perspectives in Assistive Technology
Mid-term Team Assignment

This is the mid-term assignment for students working on team projects for three credits.

Overview: For this assignment you are asked to form a team, select a project, contact the individual who suggested the project and interview an individual with a disability or a senior who would benefit from the project to better understand the problem, gather information on existing commercial products and research, determine the magnitude of the need, brainstorm and evaluate potential solutions, select the top three design concepts, present your findings, and submit a report of your team's progress.

Tasks: For this assignment you are asked to pursue and report on the following tasks.

1. Participate fully in the class including attending lectures as required, listening actively, posing questions to the guest speakers and the course instructor, engaging in class discussions, verbalizing thoughts and analyses, reading and responding to emails from the course instructor, and communicating team project progress.
2. Form a project team of no more than three members. Select a suitable and appropriate name for your team and pick a project leader.
3. Choose a team project from the list of project suggestions. Select a suitable and appropriate name for your project and for the device you will be building. (Your team's name, project selection, project name, device name, and list of members are due by **5pm Friday, January 17th.)**
4. Contact the individual(s) listed who suggested the project and get information including details about the problem / need, the disability group(s) targeted, the current solution employed (if any) and its shortcomings or limitations, the potential benefits of an improved solution, and the design features / specifications from his/her point of view.
5. Identify and interview at least one individual who is affected by this problem / need and determine specifically how it affects him / her, the benefits of an improved solution, and the design features / specifications from his / her point of view.
6. Gather information on other solution alternatives including commercially available products, research projects, and previous student projects. Here are some companies that sell assistive technology products or have an online database of devices:
    - Abledata, North Coast Medical, Smith & Nephew, Infogrip, Access Ingenuity, Sammons Preston, Alimed, Allegro Medical, EnableMart, and Therapro.
    - Links to these companies can be found at http://engr110.stanford.edu/assignment1.html
7. Determine the magnitude of the problem/need and identify all the populations who may benefit from an improved solution.
8. Brainstorm possible project solutions and select at least three promising design alternatives. (See Example Spreadsheet for Comparing Design Concepts)
9. Provide a concise and convincing statement of how your project might address the need / problem. Outline general design concepts and new technology that might be brought to bear on it.
10. Present your team's problem / project informally (10 minutes, with PowerPoint slides) in class on **Thursday, February 13th** as described below.
11. Submit a mid-term report as described below.

For next time: In the next assignment your team will asked to choose a specific design concept and fabricate / test a functional prototype. Teams will present their design in class and submit a Final Report and Individual Reflection.

Did You Miss Tuesday's Lecture?

- Pick up handouts from Tuesday:
  - Student Team Candidate Projects
  - Enrolled Student Signup Sheet
- Review first lecture audio and slides on course website http://engr110.stanford.edu/lecture01a.html
- Email me a 1 – 2 page summary of the lecture including your thoughts
- Upon receipt of your summary, I will credit you with "attending" this mandatory lecture

Miscellany

1. Lecture Material
2. 110% grading
3. d.school
4. Student engagement
5. Partly Sunny
6. Save the World

Agenda

1. Introduction of Course Teaching Assistant and Visiting Assistant Professor
2. Introduction of Course Resource People
3. Overview of PRL and Room 36 Resources
4. Considerations for Team Formation and Project Selection
5. Project Pitches
6. Open Question Time and Non-Random Access

Teaching Assistant

Margaret Mongare

Visiting Assistant Professor

Proadpran P. Punyabukkana, PhD

Course Resource People

Deborah E. Kenney, MS, OTR/L

Douglas F. Schwandt, MS

Mark Felling, EE, MBA

Gary M. Berke, MS, CP, FAAOP

Jules Sherman

STANFORD
PRODUCT
REALIZATION
LAB

Overview of PRL Resources

Craig Milroy

Overview of
Room 36 Resources





Marlo Dreissigacker Kohn

PURPOSE

Make something!

Get your concepts out into the physical world through hands-on prototyping and exploration.

Room 36 is part of the
Product Realization Lab (PRL)
and is a great on-ramp for rapid prototyping.

RESOURCES – COACHING

Teaching assistants are available during all open hours for design and building coaching.

Room 36 RESOURCES – TOOLS

- Tools:
  - laser cutters
  - 3D printers
  - electronics prototyping equipment, tools, and supplies
  - band saw
  - scroll saw
  - drill press
  - heat forming tools for plastic
  - vinyl cutter (and heat transfer press for applying vinyl to fabric)
  - sewing machines
  - X-Acto cutting surfaces and tools
  - hand tools such as wrenches, pliers, saws, and drills

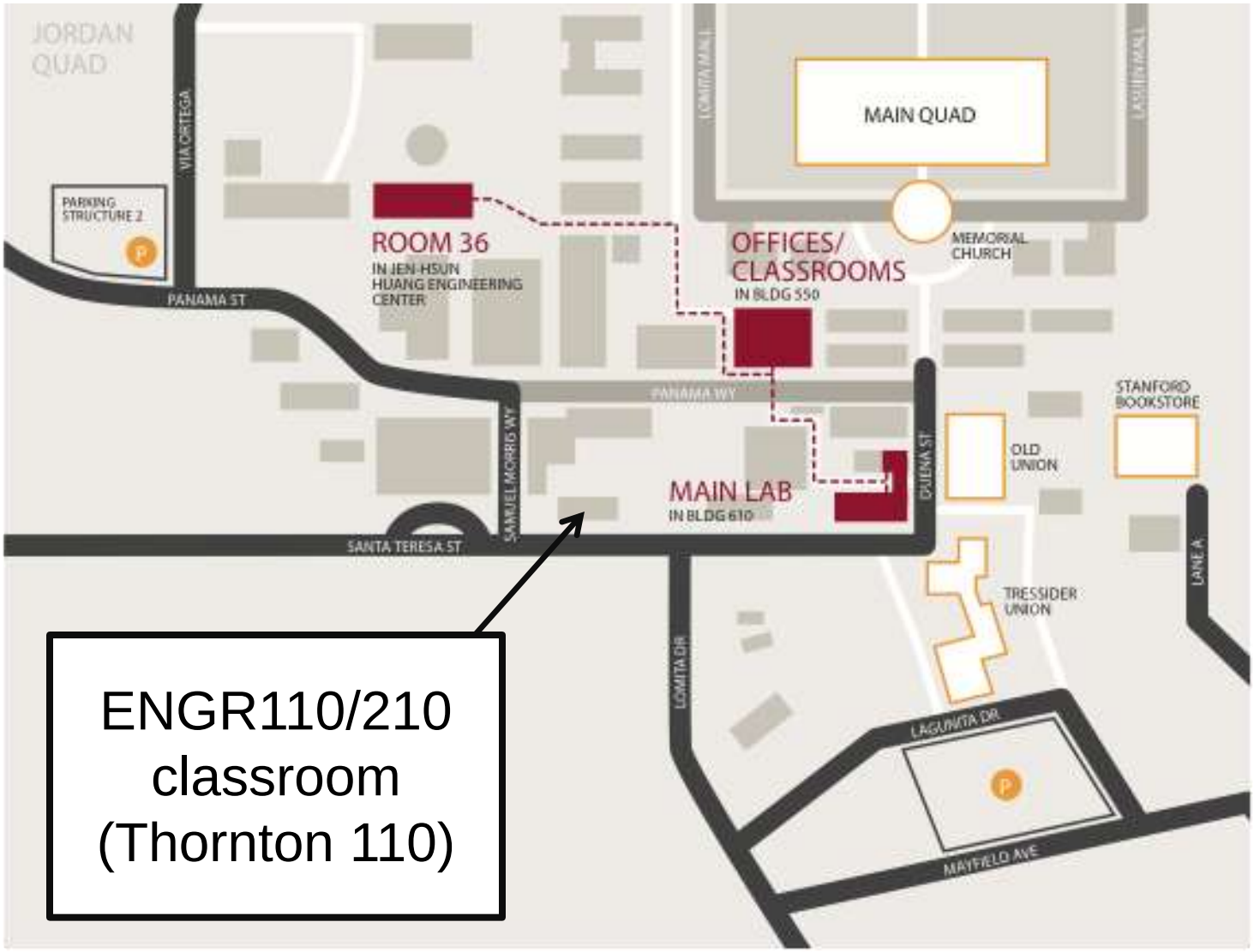
Room 36 RESOURCES – MATERIALS

- Materials:
  - foam core
  - cardboard
  - wood
  - plastics
  - fabric
  - foam

- Bins of interesting materials are available for inspiration and use, and additional materials are available for purchase.

- Claim a project bin to store your materials and projects!

LOCATIONS


JORDAN QUAD
VIA ORTEGA
PARKING STRUCTURE 2
PANAMA ST
ROOM 36
IN JEN-HSUN HUANG ENGINEERING CENTER
MAIN QUAD
OFFICES/ CLASSROOMS
IN BLDG 550
MEMORIAL CHURCH
PANAMA WY
SAMUEL MORRIS WY
DUENA ST
MAIN LAB
IN BLDG 610
STANFORD BOOKSTORE
OLD UNION
SANTA TERESA ST
TRESSIDER UNION
LANE A
LOMITA DR
LAGUNITA DR
MAYFIELD AVE
ENGR110/210 classroom (Thornton 110)

GETTING STARTED

1. **Attend a safety orientation session.**
   - Log on to WebShop (http://webshop.stanford.edu).
   - Safety orientation sessions start at scheduled times and run for 75 mins.
   - Safety sessions meet at the Main Lab in Bldg 610 (on the corner of Santa Teresa and Duena Streets).
   - Please wear closed-toe leather shoes to your scheduled session and arrive a few minutes early to get signed in.

2. **Buy a lab pass.**
   - Buy a lab pass from a TA during an open lab session. The PRL accepts cash and checks made payable to Stanford University.

     2 quarter pass: $80 - 1 quarter pass: $60

3. **Show up!** Come into the PRL to work. The PRL operates on a schedule of 3 daily 4-hour sessions (8am-noon, 1-5pm, 7-11pm). Check the schedule on WebShop to find open sessions in the lab area you'd like to work in.

4. **Talk to a TA about your project.** Come in and talk to a TA during an open session. They are a fantastic resource for you!

Project Pitches & Team Formation

Project Selection & Team Formation

For those working on **team** projects:

- Read project descriptions
- Fill out Project Preferences Form during pitches
- Talk to project presenters after the pitches
- Hand in Project Preferences Form
- Your preferences will be posted online
  - http://engr110.stanford.edu/preferences.html
- Inform me of team members (no more than teams of 3)
  - Freshmen & Sophomores must work in teams of 2 or 3
  - Name your team
  - Name your project
  - Name your device (after it develops a “character”)

Considerations for Team Formation and Project Selection (1/2)

Project preference

- All team members should have a desire to work on the same project.

Undergraduate / graduate student

- It would be best if all team members were either undergraduate or graduate students as this makes it easier to continue projects into the Spring Quarter.

Desire to continue project work into Spring Quarter

- Ideally, all team members should commit to continue their project work into the Spring Quarter, but independent study is another option.

Considerations for Team Formation and Project Selection (2/2)

Team's engineering skill set

- Match the team's expertise with the project needs.

Personality

- There should be a compatible mix of personalities in the team.

Course load

- Can you spend the time working on a team project? Courses like ME210, ME218, and ME310 are very demanding.

Why you may want to

If you have enrolled for <u>three units</u>, you may want to consider taking the course for <u>one unit</u> or <u>waiting until next year</u> if:

1. You are a freshman or sophomore, or
2. If you have limited fabrication experience, or
3. If you are already taking a project course, or
4. If you have to miss lectures or tours

Team Formation Preparedness

Since there is no guarantee that other students will have similar project interests, you should be prepared to do one of the following:

1. Convince others to work with you on one of your selected projects

2. Consider working with another student on a project he/she has chosen

3. Work on a project you selected as a team of one

Project Selection & Team Formation

For those working on **individual** projects:

- Research an assistive technology topic
- Work on a paper design of an assistive technology device
- Create a work of art
- Engage in an aftermarket aesthetic design
- Engage in an aftermarket functionality / usability design

- Meet with Dave for suggestions and approval

Project Pitches

- **Magical Bridge Playground Project** - Olenka Villarreal & Adam Rosenzweig
- **Educational Activities for Children with Disabilities** - Greg Brown
- **Project employing the Microsoft Kinect Controller** - John Tang
- **Projects suggested by Berke Prosthetics / Orthotics** - Gary Berke
- **Asthma Control Project** - Ryan Van Vert, MD FRCPC
- **Enhanced access to voting** - Dan Gillette & Ted Selker
- **Balance Buddy & Moxie Mobile** - Sara Frankel & Donald Olgado
- **Wheelchair Adaptor for the ROTA Mobility RoWheel** - Chris Bayne
- **Accessible Stroller for a Wheelchair-Using Parent** - Adriana Duffy-Hörling
- **Dog Leash Project** - Elaine Levin
- **Wheelchair Adaptation for Easy Transfers** - Molly & Jeramy Hale
- **3D Printing of Tactile Graphics / Objects for Teaching Blind Students** - Adam Bernstein

- **Projects for persons recovering from stroke** - Debbie Kenney
- **Project employing the Leap Motion Controller** - Michael Bernstein

Projects Suggested by Others

- Project employing inexpensive voice-recognition technology
- Pooper scooper for canine companions of wheelchair users
- Wheelchair backup alert
- Handbike Leg Positioning Project
- Microphone Comfort and Appearance Project
- Enhanced bed control for veterans with spinal cord injury
- Enhanced access to touch-screen devices
- Guide Robot for the Blind
- Projects suggested by Adam Kumar
- Walker for Stroke Survivors
- Customize the Wheelchair Project
- Wireless Treat Dispenser
- Shower / Bathtub / Sink / Toilet Cleaning Project
- Projects for veterans with spinal cord injury

Dave’s Projects

- Creative Expression
- Designing Your Afterlife
- Other project ideas including:
- Student-defined projects
- Software projects suggested by Project: Possibility

Project Preference for Students Working on Team Projects

Perspectives in Assistive Technology

Project Preferences for Students Working on Team Projects

Student name: _____

For each project pitched indicate your general interest in the first three columns with a ✓. At the end of the all the presentations, select your top five project preferences in the fourth column - optionally providing its ordinal (1st, 2nd, 3rd, 4th, 5th) ranking.

☹	😐	☺	Indicate Top Five	Project Name
				Magical Bridge Playground Project
				Educational Activities for Children with Disabilities
				Project employing the Microsoft Kinect Controller
				Projects suggested by Berke Prosthetics / Orthotics Amputee triathlon biking cleat system Prosthesis bike mount for improved pedal power External Achilles tendon replacement
				Asthma Control Project
				Enhanced access to voting Enhanced access to mailed paper ballots Enhanced access to online voting Enhanced access to paper ballots
				Balance Buddy & Moxie Mobile
				Wheelchair Adaptor for the ROTA Mobility RoWheel
				Accessible Stroller for a Wheelchair-Using Parent
				Dog Leash Project
				Wheelchair Adaptation for Easy Transfers
				3D Printing of Tactile Graphics / Objects for Teaching Blind Students
				Projects for persons recovering from stroke (3 projects) Standing Straight Project Cellphone and Tablet Holder Activities of Daily Living
				Project employing the Leap Motion Controller
				Projects employing inexpensive voice-recognition technology
				Pooper scooper for canine companions of wheelchair users
				Wheelchair backup alert
				Handbike Leg Positioning Project
				Microphone Comfort and Appearance Project
				Enhanced bed control for veterans with spinal cord injury
				Enhanced access to touch screen devices
				Guide Robot for the Blind
				Projects suggested by Adam Kumar Retinal Detachment Stutterers

Preferences

- Preferences will be posted on course website by student and by project:
  - http://engr110.stanford.edu/preferences.html
- Contact project suggestors to get more information
- Review other students' preferences
- Contact them and form teams
- Email Dave with selected project, team name, and team members by Friday, January 17th
- Prepare to "hit the ground running"

Project Pitches

- **Magical Bridge Playground Project** - Olenka Villarreal & Adam Rosenzweig

- Explore designs to address the following issues, creating a safe, fun, accessible, and inclusive park serving all children and their parents.

On deck: Greg Brown

MAGICAL BRIDGE PLAYGROUND

Where Everyone Can Play!

MagicalBridge.org

A Magical Opportunity

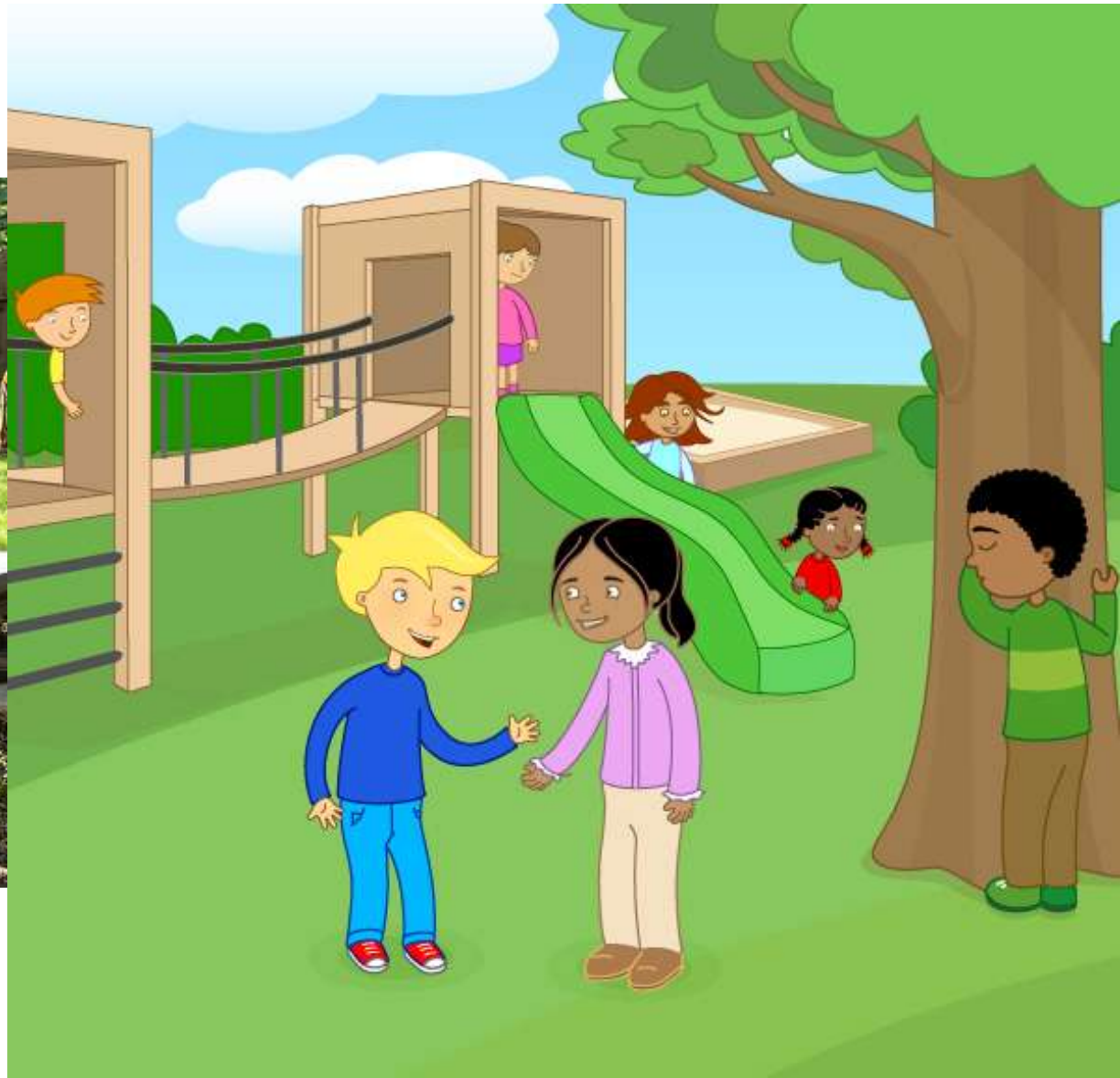
- Not a single park in Palo Alto is fully accessible
- No park in America is “universally designed”
- Create a national model
- We’re shovel-ready

Project Option #1:
Provide Tree-house Access

Project Option #2:
Alleviate Slide Traffic

Project Option #3:
Improve Swing Access

Project Option #4:
Make Play Better!



Design Criteria

- Safe for the public
- Design with everyone in mind – including children and parents with disabilities
- Durable
- Non-electrical
- Magical

Feeling the Magic

Individual contributions

Marissa Meyer

Sergei Brin

Anne Wojicki

Peery Foundation

Goldman Foundation

Enlight Foundation

✚ Sereno Real Estate Group

$3,000,000 +

Build Magic with Us!

magicalbridge.org
olenka@magicalbridge.org

Project Pitches

- **Educational Activities for Children with Disabilities** - Greg Brown, RAFT

- Investigate and develop new educational activities appropriate for children with disabilities. This may include mechanical and/or computer software solutions that will provide interactive access for these learners.

On deck: John Tang

Project Pitches

- **Project employing the Microsoft Kinect Controller** – John Tang

- Explore an application for a person with a disability using the Kinect Controller product. Examples include enhanced computer control and accessibility for those with limited manipulation abilities, physical therapy coach, control of household appliances (lights, TV, music system), operation of Bluetooth devices (iPhone), and implementation of an on-screen keyboard.

On deck: Gary Berke

Kinect for accessibility

John C. Tang
Microsoft Research

Kinect Sensor

RGB camera

infra-red camera

infra-red projector

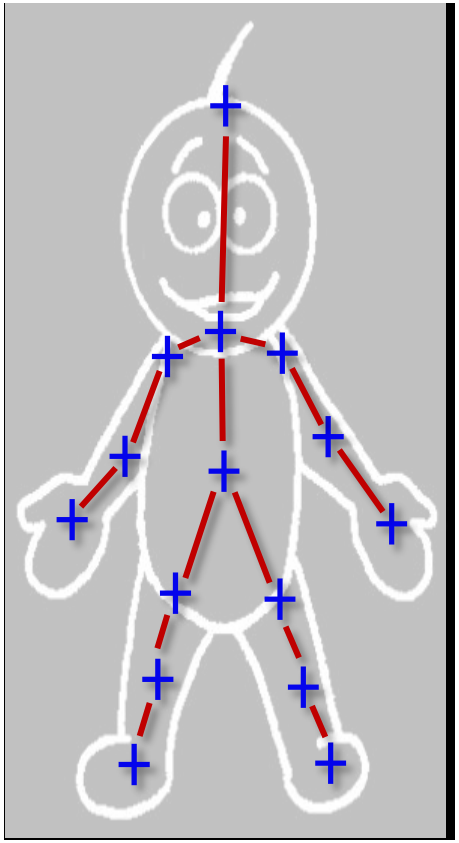
Mic array

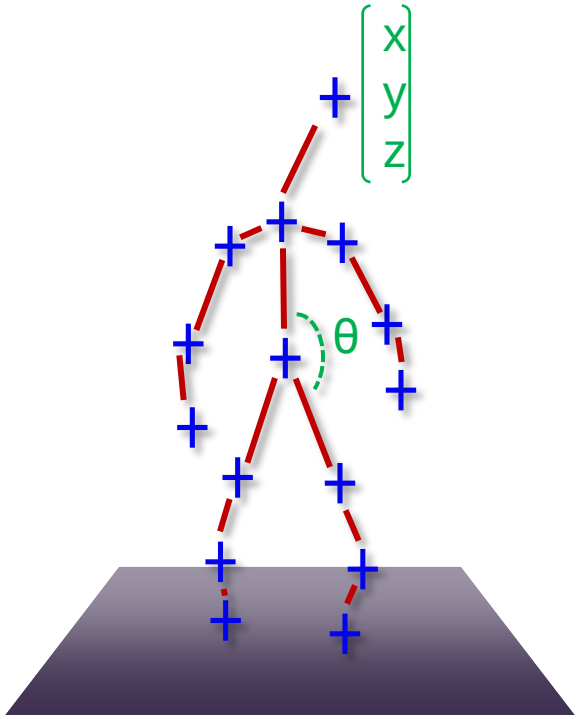
Motor

USB

http://www.microsoft.com/en-us/kinectforwindows/

Human pose estimation



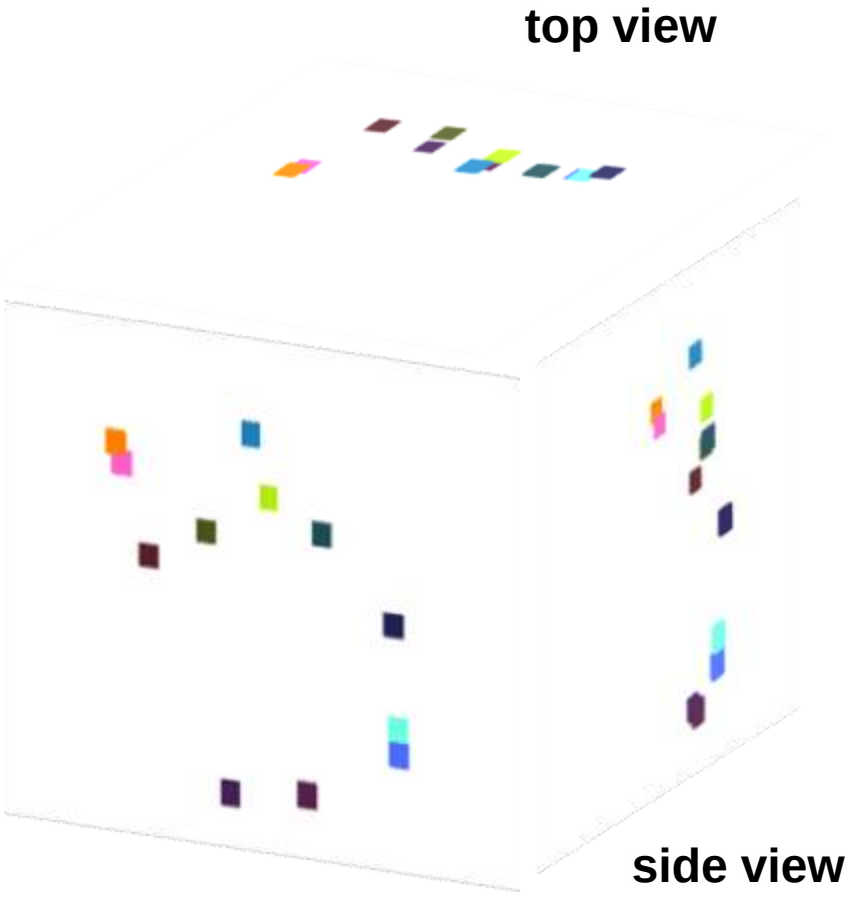


Kinect tracks 20 body joints in real time.

Skeletal Tracking

input depth image

inferred body parts &
overlaid joint hypotheses



3D joint hypotheses

Accessibility applications

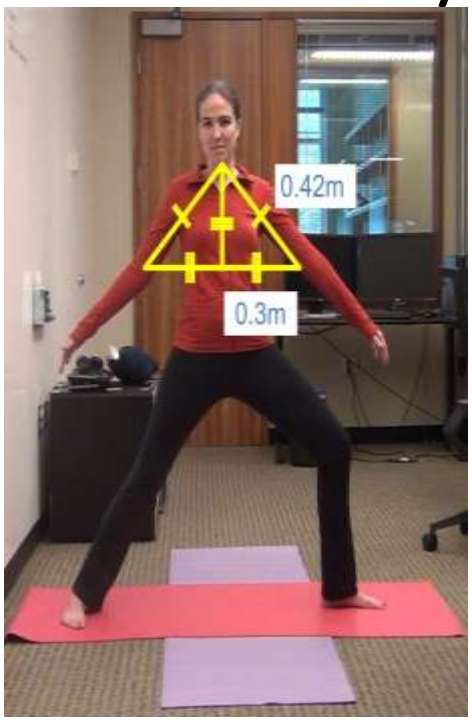
- Physical therapy
- http://www.youtube.com/watch?v=UPJkFVIdjWk
- Controlling assistive devices

http://www.youtube.com/watch?v=5Ev5XoC0wEw

http://www.youtube.com/watch?v=zu3k3oU3wSg

Accessibility Applications

- Eyes-Free Yoga Rehabilitation System



Jintronix

http://www.jintronix.com/

http://www.kurzweilai.net/kinect-based-program-makes-yoga-accessible-for-the-blind

Project Pitches

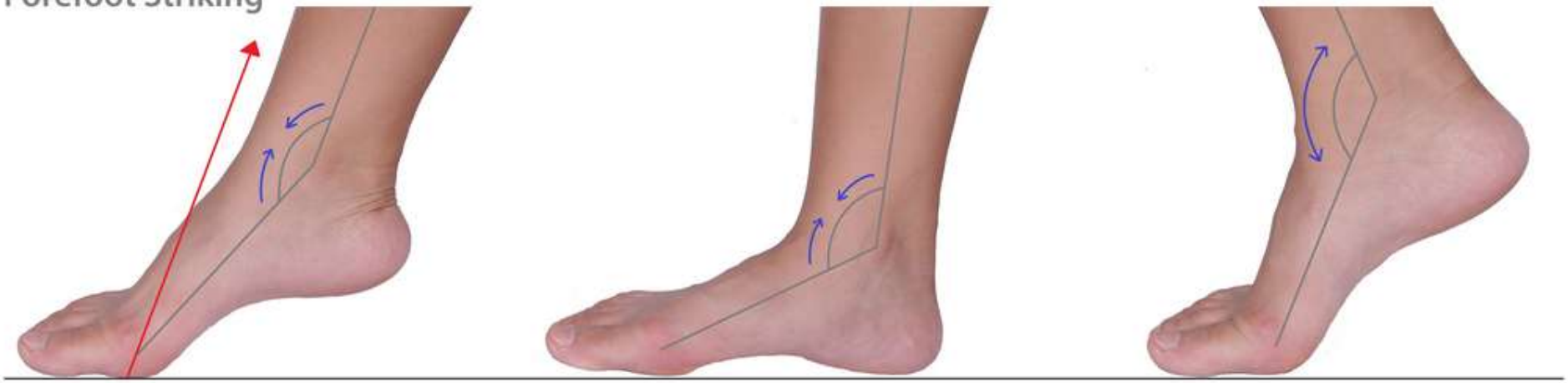
- **Projects suggested by Berke Prosthetics / Orthotics** - Gary M. Berke

- Amputee triathlon biking cleat system
- Prosthesis bike mount for improved pedal power
- External Achilles tendon replacement

On deck: Ryan Van Vert

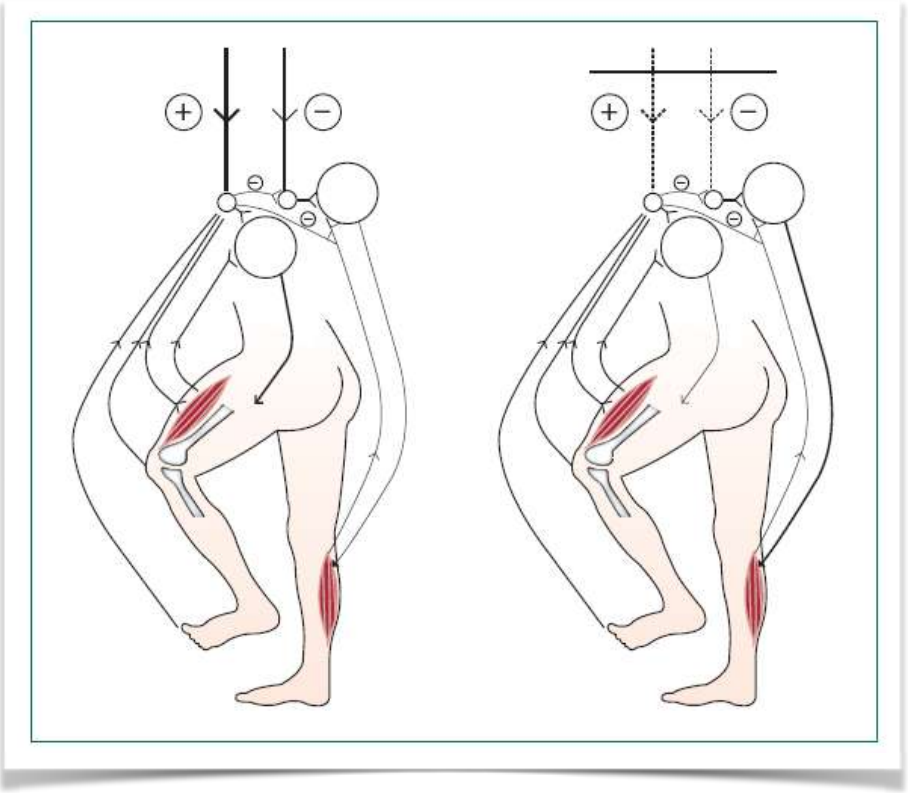
Gary M. Berke MS, CP FAAOP
Adjunct Clinical Assistant Professor,
Department of Orthopaedic Surgery

Forefoot Striking

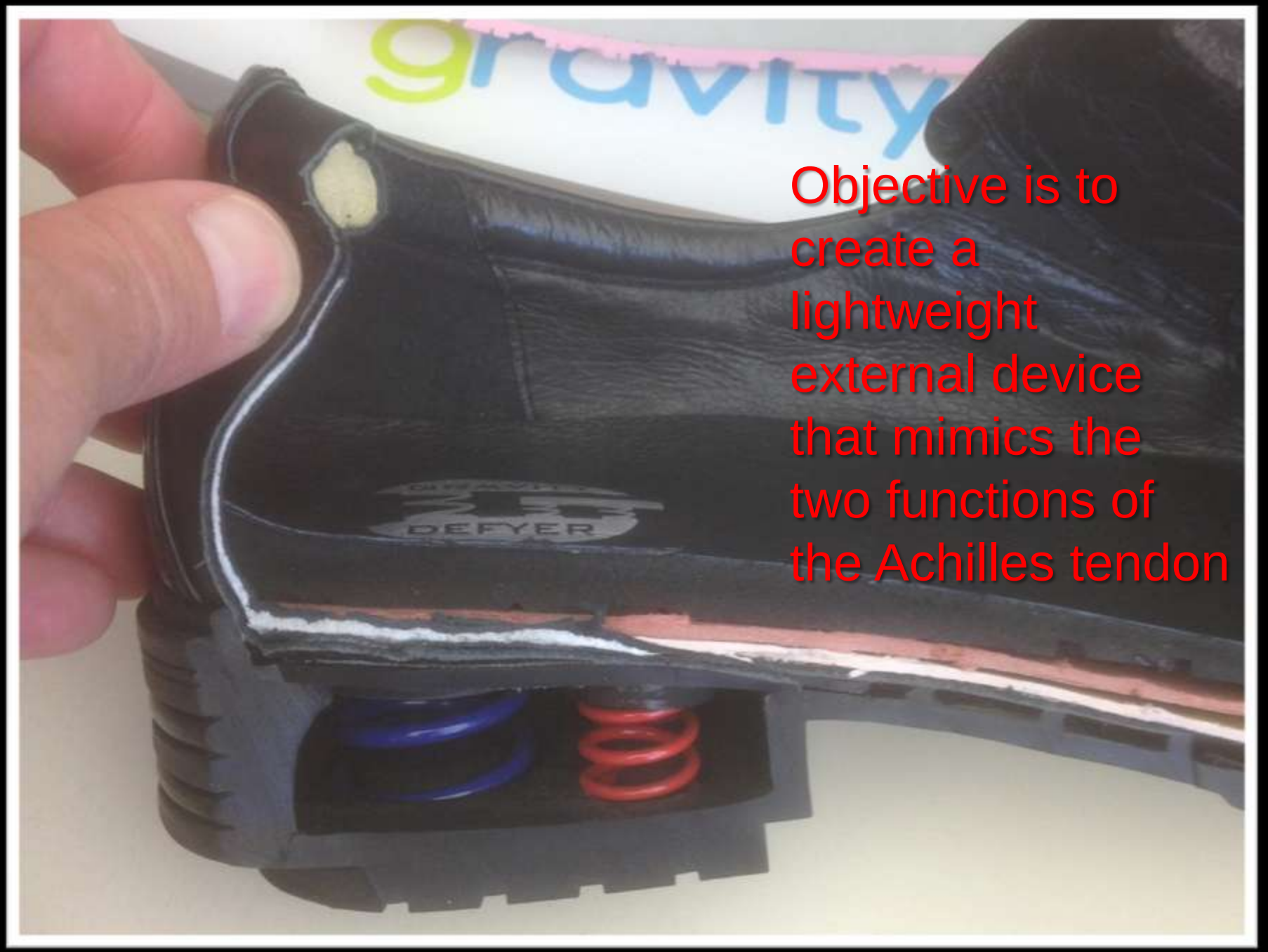


Spina-Bifida with Spasticity

- Weakness of the legs, combined with strong muscle contraction following rapid oppositional movement.
- Walks with a forefoot strike pattern and used the spasticity of the calf to walk



http://www.youtube.com/watch?v=IGanEVU77bU&feature=youtu.be



Objective is to create a lightweight external device that mimics the two functions of the Achilles tendon

- two separate projects

Triathlon Device


LAHNA

Project 2:

- To create a system that will allow use of a running leg or no prosthesis to contribute to the pedaling during a race, either through modification of the bike, the pedal mechanism and or the prosthesis.


LAHNA

Project 3:

- To create a system where a rigid prosthesis can attach to the bicycle to provide balance, safety and ability to stand up for one legged peddling, while still able to get on and off rapidly.

Project Pitches

- **Asthma Control Project** – Ryan Van Vert

- Explore ways to change the design or features of traditional flow meters and apps that would make them more attractive and fun for children to use.

On deck: Dan Gillette & Ted Selker

Project Pitches

- **Enhanced Access to Voting** – Dan Gillette & Ted Selker

- Enhanced access to mailed paper ballots

- Enhanced access to online voting

- Enhanced access to paper ballots

On deck: Sara Frankel & Donald Olgado

Project Pitches

- **Balance Buddy & Moxie Mobile** – Sara Frankel & Donald Olgado

- Balance Buddy - The project goal is to explore design concepts for an easily managed device to help older adults who are having balance problems in their homes.

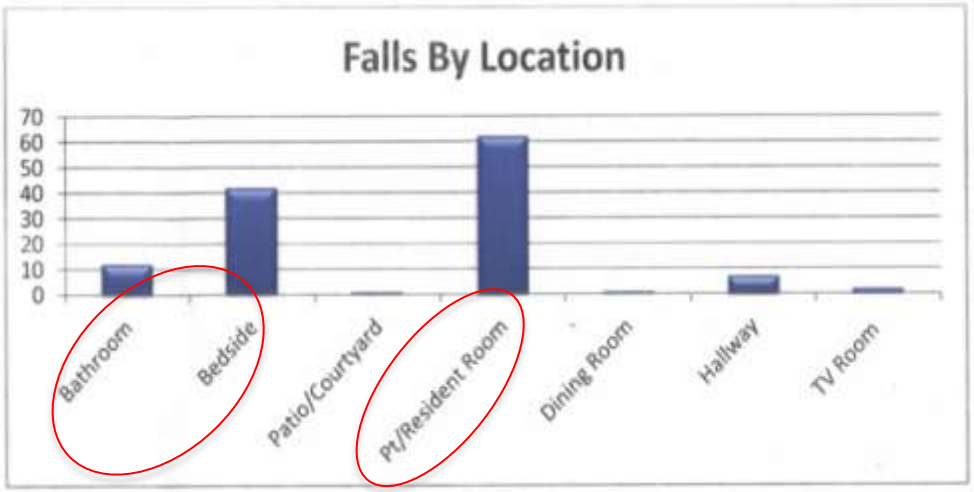
- Maxie Mobile - The solution(s) to be explored should propose a new mobility assistive device (or family of devices) which is not only easy to engage but also encourages use.

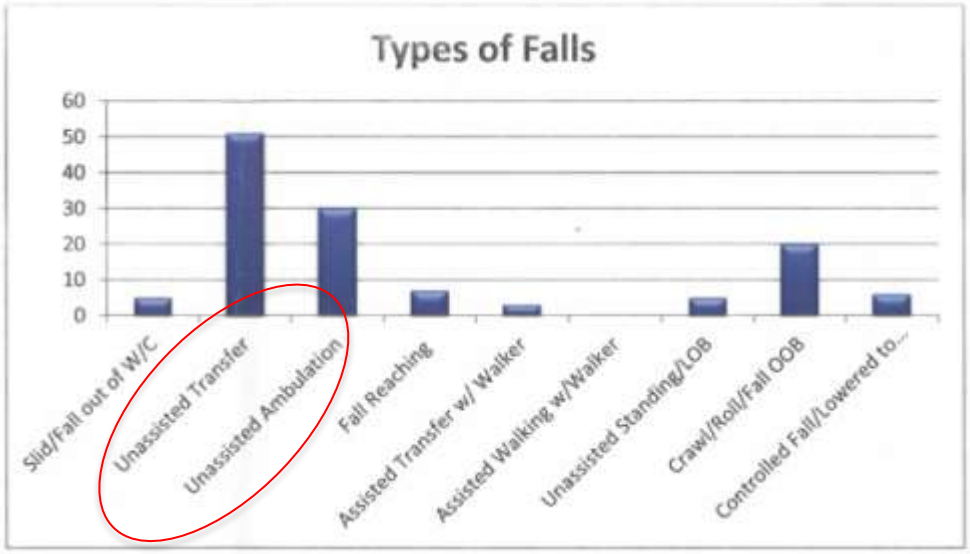
On deck: Chris Bayne

Moxie Mobile

Problem:

- Within the Skilled Nursing Facility (SNF), patient falls represent a major source of acute trauma and related, avoidable healthcare expenditures.
- Data suggests that unassisted ambulation and transfers within the room account for a vast majority of occurrences.
- Devices such as standard canes and walkers are made available. Whether it is an inability or unwillingness to use a device is unknown and a potential area of investigation and design improvement
- Anecdotal input from hospitals is that a majority of falls occur with more ambulatory patients getting from the bed and bathroom.





Moxie Mobile

Project Aim:

The solution(s) to be devised should propose a new mobility assistive device (or family of devices) which is not only easy to engage (***CAN***) but maybe more importantly, encourages use (***WANT***).

Scope / Latitude for Exploration:

Our only constraint is that it be a technology / product based solution. We are interested in further dissection of the cause of falls and potential solutions. This can be a mechanical design of new walker / cane or features thereof, a sensor or detection system, a aesthetic quality, shape, sound, feel that removes stigmas to using an assistive device.

Participation and collaboration

The Aditazz team is prepared to actively participate in the project. Our engineers are focused on other elements of the total suite of products to enhance safe patient mobility in a medical environment. We have design and analysis tools that may help with the development of the solution and access to fabrication resources. Our design studio is located in San Bruno CA.

Contact: donald.olgado@aditazz.com

Ideas to build on

Hurry cane – The ability for a cane to stand on its own allows the user to stash it and know where it is and find it. Potentially bedside. Maybe an integrated light as an addition. Allows hand freedom momentarily. (https://www.hurrycane.com)

Auto following walker – Imagine a R2D2 or Roomba walker that comes to you or follows you around, so its there when you need it. (http://www.matiarobotics.com)

Lighting – A guidance system to direct a user at night, its like a flashlight on wheels. Lighting has become an important part of room design. Elio handholds that are illuminated with LEDs to guide people safely (http://www.elio-itc.com/market-segments/healthcare-dme)

Aditazz Overview

- Aditazz is an innovative company founded in 2010 to bring technology adapted from the semiconductor industry to specifically address the challenges of design, construction and operation of a complex building such as a healthcare facility. Today's tools, methods, and processes face significant challenges. This gets further amplified by project delays, rising costs and increased complexity. As a result, the single biggest capital expense in a healthcare provider's budget is usually obsolete by the time it is built and ready to operate.
- The Aditazz goal is to revolutionize the process from start to end.
- The built environment and its design and operation starts with the most important unit: the patient. The patient care process is also archaic and Aditazz recognizes how patient mobility is a key component of recovery. We want to transform the care process from sedentary to active, with early and more continuous patient mobilization. Products that are easy, quick, and efficient to use in an environment that encourages early mobilization. Moving from something that is episodic to something that happens frequently and naturally as an integral part of a new non-damaging care model. And this, in turn, opens up an entirely new approach to the design and success of the patient environment.

Project Pitches

- **Wheelchair Adaptor for the ROTA Mobility RoWheel** – Chris Bayne

- Explore designs for a mechanical adaptor to attach / detach the RoWheel to / from most any make or model of rigid framed wheelchair.

On deck: Adriana Duffy-Hörling

ROTA MOBILITY

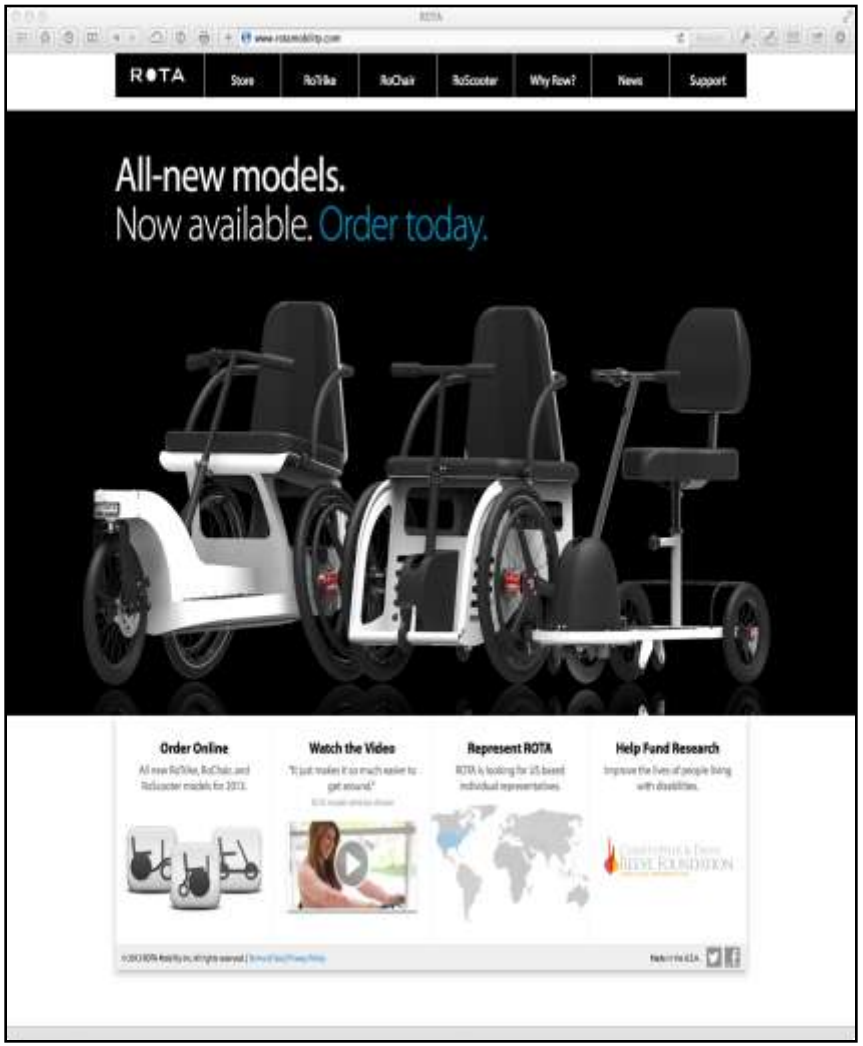
Project RoWheel™

- Stanford 2014

ROTA Mobility Inc. | Chris Bayne | Phone: (408) 402-5432 | Email: chris@rotamobility.com | Web: www.rotamobility.com

ROTA
MOBILITY

ROTA MOBILITY



http://www.rotamobility.com

ROTA MOBILITY

2011

Power-assist module

Marcus Albonico, Stephen Hibbs, Kevin Ting

2012

Transfer board

Rahul Sastry, Sofia Rojasova, Nick Akiona

2012

Parking brake

Tyler Haydell, Jai Sajnani, Mark Murphy

RoTrike™

RoChair™

RoScooter™

RoWheel™ ROTA's universal add-on system

ROTA MOBILITY

RoWheel™

Project RoWheel™

- Design a "universal adaptor" that you can develop facilitating the quick connect/disconnect of RoWheel™ with any make or model of rigid framed wheelchair *(omit pediatric and highly specialized wheelchairs)*.

- Design Criteria: Safe and durable, quick and easy to use, accessible for those with typical dexterity limitations, lightweight and inexpensive

- Scope: Analyze and develop a matrix of frames on the market, design a "universal adaptor" for quick fabrication, fabricate with Stanford and ROTA's facilities, develop criteria/procedure for test and evaluation, perform test and evaluation, summarize and present results with future recommendations.

ROTA MOBILITY

www.rotamobility.com

Chris Bayne

Project Pitches

- **Accessible Stroller for a Wheelchair-Using Parent** – Adriana Duffy-Hörling

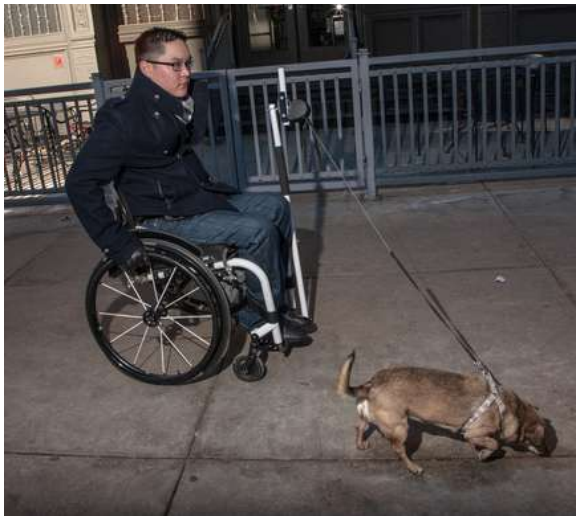
- Explore design concepts for an accessible stroller or a device that would offer similar features.

On deck: Elaine Levin

Project Pitches

- **Dog Leash Project** - Elaine Levin

- Explore designs for a dog leash system that will be easy for users to attach to their wheelchairs or walkers independently, prevent the leash from being caught under the mobility device, and avoid being tipped over by a strong dog.



On deck: Molly & Jeramy Hale

Dog Leash Project

- Video by Deborah Davis



Project Pitches

- **Wheelchair Adaptation for Easy Transfers** - Molly & Jeramy Hale

- Explore mechanical designs for onboard handrails that would provide easy to use, safe, independent standing transfers including to a toilet.

On deck: Adam Bernstein

Transfer Assistance

Project Pitches

- **3D Printing of Tactile Graphics / Objects for Teaching Blind Students** - Adam Bernstein

- Design and document the foundations of an online collaborative accessible database library of physical learning tools, 3D printable objects, and tactile graphics for use in education.

On deck: Debbie Kenney

benetech

TECHNOLOGY
SERVING HUMANITY

ENGR110/210
Perspectives in Assistive Technology

Project Pitches

- **Projects for persons recovering from stroke** – Debbie Kenney

- **Standing Straight Project:** Develop a dynamic device that would aid the person to realize their true center thus enabling better rehabilitation of their limbs.

- **Cellphone and Tablet Holder:** Explore designs for a device that would make it easier to hold and use cellphone and tablets with one hand. This would serve individuals who have had a stroke, who have arthritis, cerebral palsy, or are amputees.

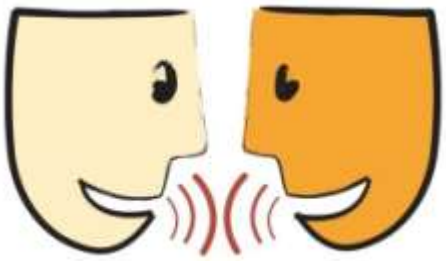
- **Activities of Daily Living:** Explore designs for devices that would help persons who have had a stroke, who have arthritis, cerebral palsy, have limited arm or hand strength, or are amputees to perform activities of daily living such as cooking, cleaning, or other common household tasks.

On deck: Michael Bernstein

Short Break

Break Activities

- Stand up and stretch
- Take a bio-break
- Text message
- Web-surf
- Respond to email
- Talk with classmates
- Reflect on what was presented in class



Short Break

Laptops Galore

Project Pitches

- **Project employing the Leap Motion Controller** – Michael Bernstein

- Explore an application for a person with a disability using the Leap Motion Controller product. Examples include enhanced computer control and accessibility for those with limited manipulation abilities, physical therapy coach, control of household appliances (lights, TV, music system), operation of Bluetooth devices (iPhone), and implementation of an on-screen keyboard.

On deck: Dave for Mark Felling

Project Pitches by Dave

- **Project employing inexpensive voice-recognition technology** – Mark E. Felling

- Explore an application for a person with a disability using an inexpensive voice recognition product. Examples include enhanced computer control and accessibility for those with limited manipulation abilities, control of household appliances (lights, TV, music system), and operation of a hospital bed.

On deck: Dave for Deane F. Denney

Project Pitches by Dave

- **Pooper scooper for canine companions of wheelchair users** – Deane F. Denney
- Explore designs for a pooper scooper system that will be easy for pet owners with a disability to use.

On deck: Dave for Karen Parecki

Project Pitches by Dave

- **Handbike Leg Positioning Project** – Debbie Pitsch
- Explore designs to prevent knee hyperextension while operating this competitive handbike as well as protect the leg from contact with the bike's wheel.

On deck: Dave for Evi Klein

Project Pitches by Dave

- **Microphone Comfort and Appearance Project** – Evi Klein
- Explore designs that address comfort, adjustability, positioning, and appearance issues.

This project is suitable as an individual rather than a team project.

On deck: Dave for Deane F. Denney

Project Pitches by Dave

- **Enhanced bed control for veterans with spinal cord injury** – Deane F. Denney
- Explore solutions that would enable veterans to more easily operate their beds, including voice activation.

On deck: Dave for Deane F. Denney

Project Pitches by Dave

- **Enhanced access to touch-screen devices** – Deane F. Denney
- Explore ideas that would enable users to make their selections more accurately on their personal touch screen devices.

On deck: Dave for Brian Higgins

Project Pitches by Dave

- **Guide Robot for the Blind** – Brian Higgins

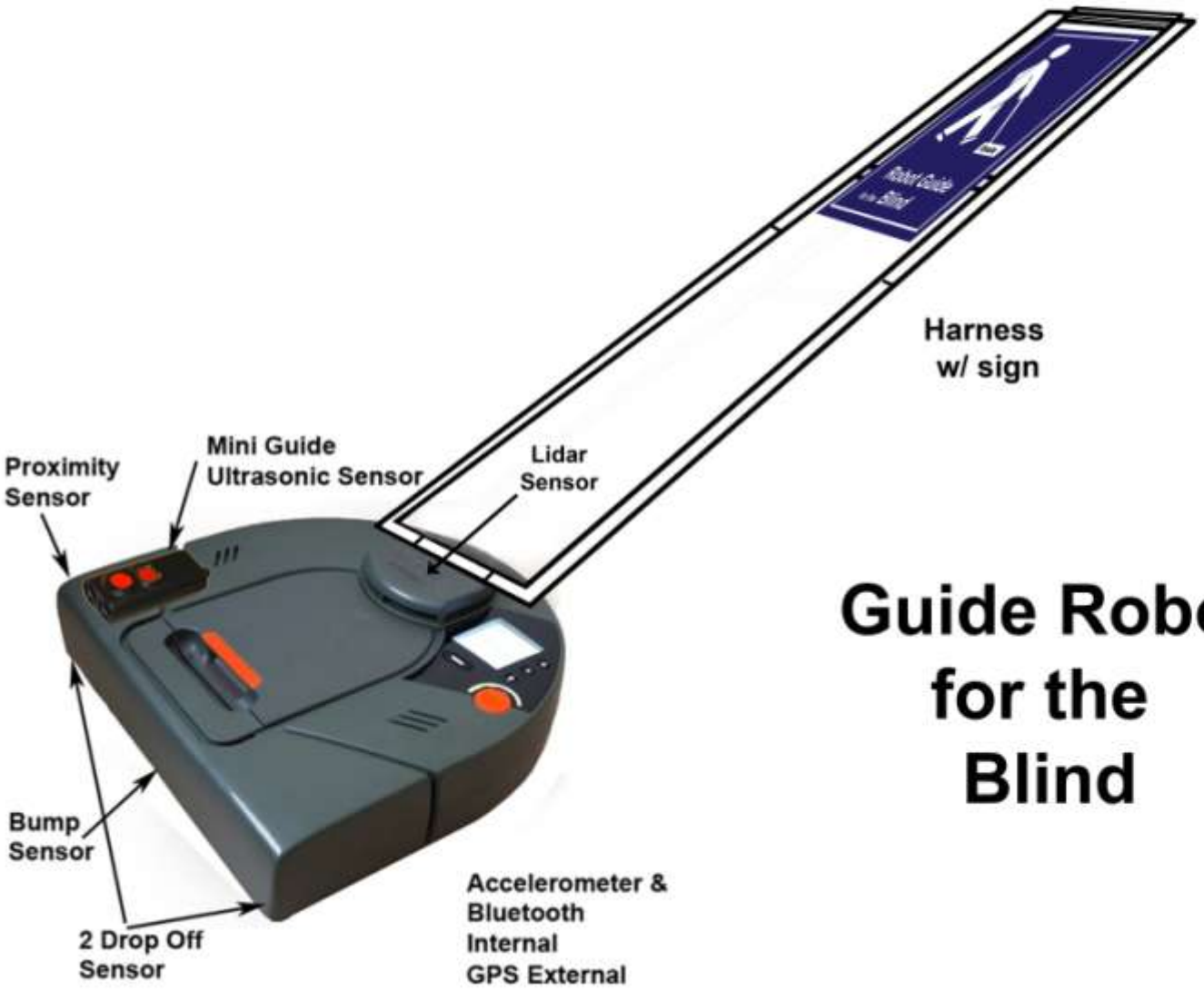
- Build a user-interface that facilitates communication between the robot and the user as well as the platform that supports the motorized computerized robot device.

On deck: Aman Kumar

Guide Robot

Guide Robot for the Blind

User-Interface Project



Guide Robot for the Blind

Background

Intellisight is a business that is developing a system for guiding people who are blind and visually impaired along a clear path that uses Lidar-type radar to sense the presence of obstacles or other terrain features and warns the user.

Problem

Current orientation and mobility solutions for individuals with visual impairments or blindness include the White Cane, Guide Dogs, Trekker, Mowatt Sensor, and Mini Guide. While these items provide basic information
suitable for getting around, they do not provide substantial details about the users environment.

A guide robot is under construction that will provide a blind traveler with information beyond what is currently available with current solutions. *Intellisight* is tackling the following portions of the project: wheels, motors, motor controllers, power system, sensor array, computer hardware and software systems.

Aim

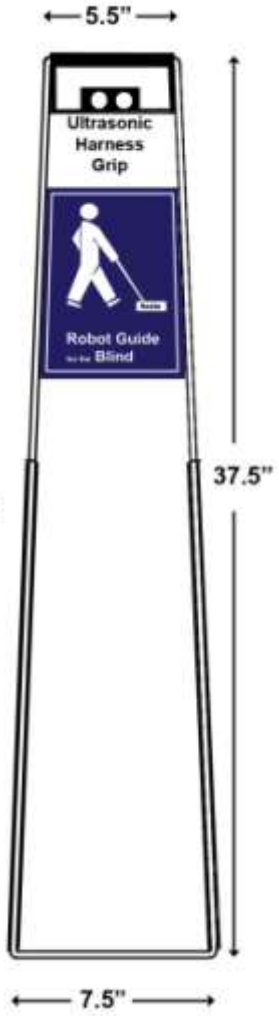
Build a user-interface that facilitates communication between the robot and the user as well as the platform that supports the motorized computerize robot device.

User-Interface Design Criteria:

1. Employ a telescoping handle that is able to support the entire weight of the robot
2. Provide a tactile interface to user
3. Include a power switch
4. Have available an adjustable height handle

THIS HARNESS IS MADE UP OF .05" ALUM.

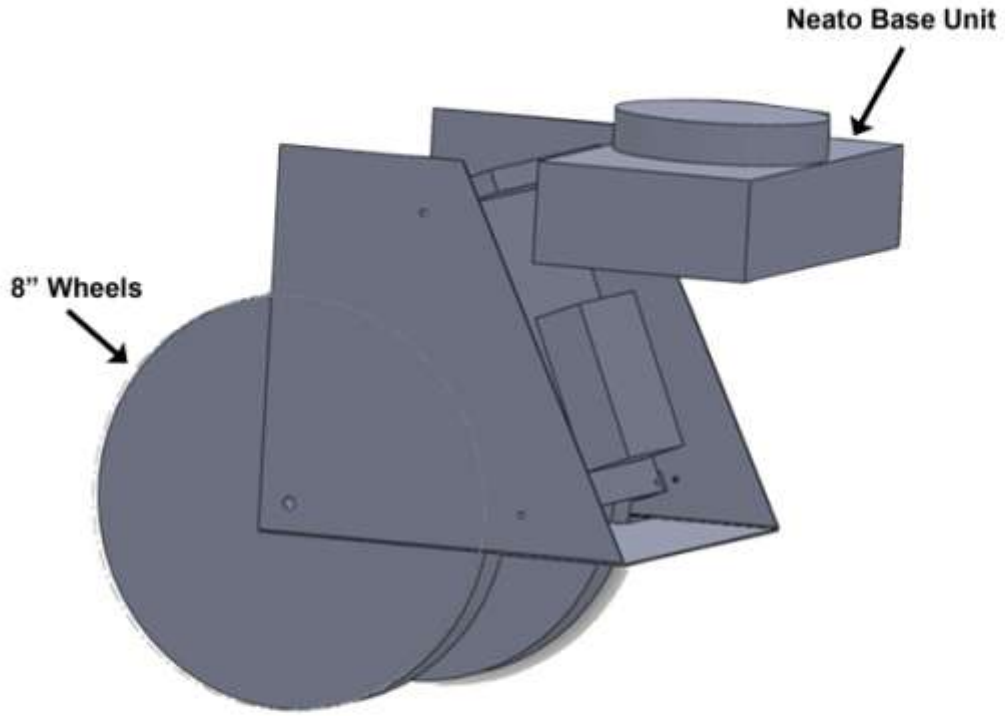
This Harness could telescope into itself @ the half way point. It locks into place with pins.



Platform Design Criteria

1. Accommodation of selected motors, motor controllers, and a computer system
2. Consisting of lightweight material
3. Ability to travel over rough terrain and down stairs

Prototype Platform Design



Platform for Neato

Prototype Goal

The completed prototype will be able to detect a clear path and provide object avoidance information; detailed information about the local environment. It will be able to scan the interior of a building to determine its room layout and employ GPS information.

Contact:

Brian Higgins
Intellisight - Autonomous Travel for the Blind
Los Altos, CA 94022
650/906-9412
http://intellisight.org
seeneye@comcast.net

Project Pitches by Dave

- **Projects suggested by Aman Kumar**

- Design a prototype device or app for communicating and visualizing symptoms of retinal detachment
- Design a prototype device or app that would assist health care professionals in assessing the effects of stuttering therapy
- Design a prototype device or app that would provide audio feedback of stutterers speech and video feedback of muscle disruptions that accompany stuttering
- Design a prototype device or app that would connect health care professionals with stutterers living in rural areas to provide care and therapy

On deck: Dave for Pat McCarty

Vision + speech

A few project ideas

Perspectives on Assistive Technology
Winter Quarter 2013

Aman Kumar
aman@cs.stanford.edu

Retina

- Vitreal detachment happens to almost everyone as they age; some of these become retinal tears/detachment
- Most common in people with high myopia (5%)
- Painless, symptoms of flashing and floaters
- Left untreated, results in total blindness within 24-48 hours

Retina: problem

- Vision is a scary thing
- People with changes don't know to communicate symptoms, think they will clear by themselves
- By the time they realize something's wrong, it's often too late

Retina: solution

- Create an app (iOS, Android) that allows patients at high risk for retinal issues to quickly describe and communicate symptoms to their doctor
- Can be expanded to other urgent ophthalmological conditions
- Prior work: look at DigiSight Network / SightBook, a tool for remote visual diagnosis

Stuttering

- 1% of all adults stutter — 60 million people
- they are teased, ridiculed, unaware they have a condition that can be improved with treatment
- speech disorders remain some of the last disorders socially acceptable to ridicule
- massive need to facilitate education, therapy, awareness, advocacy

Stuttering: solution

- Create an app that monitors and classifies speech disfluencies for research and therapy
    - Researchers can collect field data, patients can self-monitor
- Create an app that connects speech-language pathologists to people who stutter in underserved areas
    - All you need is a good videoconference to diagnose and provide therapy
- Prior work: Stutter Social, National Stuttering Assn

Project Pitches by Dave

- **Walker for Stroke Survivors** - Pat McCarty

- Explore designs to make it easier for stroke survivors to use a walker or a wheelchair used as a walker.

On deck: Dave for Deane F. Denney

Walker for Stroke Survivors

Walker for Stroke Survivors

Project Pitches by Dave

- **Customize the Wheelchair Project** – Deane F. Denney

- Explore ways to add a personal aesthetic to wheelchairs.

See Project Pitches from 2012: (pages 28 - 37)
http://www.stanford.edu/class/engr110/2012/01b-PitchDay.pdf
and listen to recorded audio:
http://www.stanford.edu/class/engr110/2012/01b-PitchDay.mp3

On deck: Dave for Deane F. Denney

Project Pitches

- **Wireless Treat Dispenser** – Deane F. Denney

- Explore a design for a simple wireless treat dispenser for service animals that would operate by a switch or a wireless signal.

On deck: Dave

Wireless Dog Treat Dispenser

Problem: Many wheelchair users with severe disabilities have service animals, but have no way to reward them.

Challenge: Design a wireless dog treat dispenser which attaches to the wheelchair and is activated by:

- voice
- cheek-mounted bluetooth EMG
- a laser mounted on glasses
- a Dynavox with headtracker
- some other mechanism that does not require use of the hands.

Project Pitches

- **Shower / Bathtub / Sink / Toilet Cleaning Project** – Deane F. Denney

- Explore and design a solution for the shower / bathtub / sink / toilet cleaning problem for an older adult with a disability.

See Project Pitches from 2012 : (pages 98 – 99)
http://www.stanford.edu/class/engr110/2012/01b-PitchDay.pdf
and listen to recorded audio:
http://www.stanford.edu/class/engr110/2012/01b-PitchDay.mp3

On deck: Dave

Shower / Bathtub / Sink / Toilet Cleaning Project

- User is required to:
  - Bend over (shower floor)
  - Reach in an awkward manner (behind toilet)
  - Smell and inhale noxious fumes (cleaners)
  - Lean out supported by one hand (clean tub)
  - Get close to work surface (poor eyesight)
  - Take a high step with leg (clean tub)
  - Reach high over head (shower walls and ceiling)
  - Pressure weak wrists (scrubbing)
  - Get up from a low seat (cleaning floors)
  - Sanitize cleaning tools (toilet bowl brush)
  - Remove mold (difficult work)
  - Notice drips and leaks (hearing and eyesight issues)
  - Access to cleaning tools and supplies (high or low storage)

Project Pitches by Dave

- **Projects for veterans with spinal cord injury** – Deane F. Denney

- Explore and design solutions to one of the many problems expressed in the following areas:
  - Manipulating objects
  - Accessing the real world
  - Recreational activities
  - Caregiver (family, nurse, and therapist) assistance

On deck: Dave

Dave's Project Suggestion

- **Creative Expression**

- Explore ways to enhance creative expression for people with disabilities. This could include the creation of new activities or fabrication of new tools.

Dave’s Project Suggestion

- **Designing Your Afterlife**

- Explore ways to preserve one's essence after death. This might manifest itself as a first-person interactive system that responds to queries, retells stories, relates experiences, shares expertise, and expresses humor. The pre-dead user would be able to create and program his / her eternal persona before her / his demise.

Project Pitches

- **Other project options**
  - Accessible interfaces for commonly used devices
  - Online multi-site tele-video games for seniors
  - Projects listed in NSF guide
  - Student-defined projects (with Dave's approval)

Project Pitches by Dave

- **Software projects suggested by Project: Possibility – link**

- Project: Possibility goal: create and support innovative software projects that are empowering for the software developers who implement them and for the persons with disabilities who use them.

Tuesday, Jan 14th

Gayle Curtis - UX Design Consultant

John C. Tang, PhD - Microsoft Research

Need Finding for Assistive Technologies

Open Question Time and Non-Random Access

Who is working on team projects?

What are your top choices?

Get more info from project suggestor

Identify others interested in same projects

Have course questions? Ask Dave

See Dave if you are working on an individual project

Class Dismissed