BME 100 Projects (2013)

A description of the end-of-semester projects
Overview

• Schedule
• General Requirements & Considerations
• Lit. Survey (4 pgs) + Talk
• Position Paper (4 pgs) + Poster
• Hands-on Project + Poster + 2 pg. doc.
• Conclusions
Schedule

• Lectures
  – See course outline + Webpage

• Tutorials
  – See course outline + Homework Guide + Webpage

• Projects
  – See Course outline + Homework Guide + Webpage

• http://www.ee.ryerson.ca/~jasmith/courses/bme100/
Course website

- [http://www.ee.ryerson.ca/~jasmith/courses/bme100/](http://www.ee.ryerson.ca/~jasmith/courses/bme100/)

- Only some things on Blackboard
  - Only grades & surveys, etc. are there
Twitter: Project Concept

• Sign up for Twitter account
• Follow @BME100Prof
• Send a concise summary of your project in a single “tweet”
  – After I’ve confirmed the project with you
  – See schedule.
Project Distribution

• One person per topic (ideal)
  – Three people with similar topic maximum
  – All projects are individual
  – Blackboard selection (1st, 2nd, 3rd, 4th)

• Ideal distribution: 1/3 each
  – 1/3 Lit. Survey
  – 1/3 Position Paper
  – 1/3 Hands-on demonstration
What are the Project Types?

• Position Paper
  – With poster

• Literature Survey
  – With in-class presentation

• Hands-on Project
  – With report + poster

• Electronic copy of projects required!
Your Audience

- Fellow students & me
- Has general knowledge
- Does not know much about your topic
- Reads at first year engineering level

- Avoid buzz words and alienating terms
- Your draft will be checked for this
  - Need to rewrite if it’s not appropriate level
“On-Message” Strategy

• What is the “point” of your project?
  – Be clear.
  – Single sentence summary.

• Be convincing & brief!
  – 30 second “elevator talk”
    • Distinguish yourself
    • Create interest in your project
Warning!

• This project replaces midterms, finals & assignments
  – Work throughout semester
  – Otherwise you’ll be swamped
• These are ambitious projects!
• They will take a lot of work!
• Finding relevant papers is a long process
• Don’t leave to last minute
• See Prof. & T.A. if you need help
Contest closes March 1, 2012

Students can write their way to a $500 award

Ontario engineering students who are passionate

The competition is open to all Ontario undergraduate Training (EIT) program. Canadian undergraduate e PEO website.

This year, there are separate categories for undergrad CONference.

CompetITION rules and winning papers from past th

If you do not wish to receive OCEPP news and event updates, please send an email to info@oce
Project 1: Position Paper
Position Paper: Two Parts

1. Four page written document
2. Poster and public presentation
Position Paper: Format

- Four pages
- IEEE Format Document
- Establish your view
  - Compare to state of knowledge (lit. survey)
- Poster presentation
Position Paper Sections

- Abstract
- Introduction
- Literature Survey
- Analysis
- Discussion
- Conclusion
- References
Discussing a Position Paper
Position Paper: Introduction Details

Three paragraphs:
1. Motivate the Problem
   - Why is it important?
2. Define the Problem
   - Terminology and framework
   - What are the main themes?
3. Present Argument
   - One sentence core.
   - Use paragraph to link to motivation and definition
Position Paper: Analysis

• Present argument evidence
  – Critically examine the existing research & references
  – Every paper has positives and negatives
  – Sometimes the authors “gloss over” or ignore negatives
  – If you can’t find evidence, then …
    • Rethink your argument, or
    • Look deeper!
Position Paper: Discussion

• What is the “take-home” message?
• How well is argument supported based on the evidence in analysis?
• What further evidence needs to be gathered to better support your argument?
• What further evidence could be found to challenge your argument?
Position Paper: Required References

- Minimum 3 professional references
  - Peer-reviewed journal articles
  - Scientific & engineering conference proceedings
  - **NOT** Wikipedia

- Optional **additional** references
  - Popular media (online, magazines, etc.)
  - Patents
  - Minimize these
Poster: Structure

1. Title
   • Gives main information - Attracts people
2. Subtitle
   • Brief expansion on title
3. Background
   • Who are the main actors?
   • What are the main arguments?
   • What are the main results?
4. What is your argument?
5. What is your method & solution?
6. What are the benefits?
7. What is the actual or projected result?
8. Memorable conclusion.
Poster: Questions to Address

Linear, Hierarchical Structure

1. Why ... is it interesting?
2. What ... is it about?
3. Who ... are the authors?
4. What ... is the existing story? (Lit. Survey)
5. How ... is the work done? (Methods)
6. What ... are the benefits?
7. Where ... is this going? (Future)
**Patient-Adaptable Biomedical Devices**

**Benefits and Barriers for Granting Patients More Control**

James Andrew Smith & André Seyfarth  
Lauflabor Locomotion Laboratory, University of Jena, Jena, Germany

**Background**

The goal of any treatment program is to stabilize or to improve the condition of a patient. Unfortunately, factors such as patient noncompliance can reduce the effectiveness of proposed treatment schemes.

Treatments that adjust to the patient, or are adaptable by the patient may increase compliance by engaging his or her motivational level.

![Figure 1. Repeating patient noncompliance.](image)

This work presents the merits of using adaptable devices to ameliorate patient compliance in the course of treatment.

**Problem: Noncompliance**

The development and customisation of medical devices is an expensive, time-consuming process. Therefore, treatments should make effective use of these devices.

Patient noncompliance reduces the effectiveness of said treatments. Sources of noncompliance [Smith and Smith, 1994; Plukey, M. S. et al., 1992] can include:

- living conditions or environment,
- psychological or physiological factors,
- insufficient counseling and education,
- other cognitive, motivational or emotional conditions.

![Problem: Noncompliance](image)

**Solution: Adjustability**

Adjustability engages the pro-active nature of many patients. The device should:

- allow the patient to make manual changes,
- automatically sense & react to new conditions.

**Rationale**

Many factors affect the level of compliance during treatment. However, the perception of barriers is the most significant factor.

Adjustability by and to the patient permits the patient to function with less disruption.

**Benefits**

The benefits to providing patient adjustability can be compared to barriers which lead to noncompliance [Jane and Becker, 1984]:

- Time & Convenience:
  - "My clinic appointment will take all day!"
  - "I can adjust it in five minutes at home!"
- Self-efficacy:
  - "Only my decision can adjust it."
  - "It's easy to adjust when I want to jog."
- Social approval:
  - "I can't wear high heels anymore!"
  - "I can adjust it for all of my shoes."
- Safety & Danger:
  - "I'm afraid to fall on the stairs!"
  - "It automatically adjusts for stairs!"

Replacing barriers with benefits will likely improve compliance.

**Example Implementation**

Adjustability is especially beneficial in situations with immediate and persistent self-motivation:

- pain relief [Draganich et al., 2006],
- manipulation, and
- mobility.

The Oscar Prosthetic Foot provides automatic and manual heel height adjustment, with these benefits:

- Improved convenience
  - Tool-less adjustment
- Improved efficacy
  - Better stair climbing

![Example Implementation](image)

**Conclusions**

Perceived barriers are a primary source for noncompliant behavior. To make treatments more effective, these perceptions need to be addressed.

Adaptable devices tap into the motivational nature of patients and are key to removing perceived barriers, thereby resulting in more effective treatment.

**Literature cited**


**Acknowledgments**

The authors would like to thank Daniel Burkard, Gary Burkard, and Angela Burkard for their continued support. Special acknowledgment goes to Dr. Robert Prince in the Orthopedic Research and Development Center at University of California Medical Engineering. This research was supported by Oregon Health & Science University Orthopedic Research Fund.
Poster Info & Resources

- [http://www.ee.ryerson.ca/~jasmith/courses/bme100/docs/UZH_poster_guideline.pdf](http://www.ee.ryerson.ca/~jasmith/courses/bme100/docs/UZH_poster_guideline.pdf)

- On-campus printing:
  - [http://www.ryerson.ca/acs/usersguide/print.html](http://www.ryerson.ca/acs/usersguide/print.html)

- Off-campus printing:
  - [http://torontoprint.com/wide.htm](http://torontoprint.com/wide.htm)
  - Behind ENG Building

- Tools & Settings
  - Microsoft PowerPoint
  - Creative, Artistic interpretation (pro-looking!)
  - Export to PDF for the printer
  - 36” wide printer (36” x 48”)
    - 1 - 1.5” margins
Judging Position Paper

• Paper
  – Position is clear
  – Argument is logical
  – Opposing views are discussed and contrasted
  – Template followed

• Poster
  – Argument is clear, logical and balanced
  – Display is visually appealing
  – Display is clear & concise
Project 2: Literature Survey
Literature Survey: Two Parts

1. Four page literature survey
2. 10-15 minute in-class presentation
What is a Literature Survey?

• An account of what has been published
  – By accredited scholars & researchers

• “If I have seen further it is only by standing on the shoulders of Giants” (Isaac Newton)

• Survey = Review

• See: http://www.utoronto.ca/writing/litrev.html
What is a Survey, Cont’d

• Purpose
  – To stimulate informed debate
  – Step one in future position papers
  – Step one in a future research project or thesis
• Concentrate on thoroughness and neutrality
• Outline all relevant themes
  – Not too narrow
  – Organize by theme
  – Don’t favour one more than others
  – Examine each theme critically
  – Remember Intro. & Conclusion!
Literature Survey: The Objectives

- The Survey must...
  - Relate to the research topic you are developing
  - Summarize results of what is known & not known
  - Identify areas of controversy
  - Formulate questions which need more research
Literature Survey: It’s a Story!

• It’s not a list
• It’s not a bunch of summaries
• The story is defined by guiding idea
  – Research objective
  – Issue being discussed
  – Argument thesis
• It should show trends & relevant theory
Planning the Survey

• What is the specific question being examined?
• What type of survey?
  – Theory?
  – Methodology?
  – Policy?
  – Experimental Research?
• What is the scope?
  – Publication types (journals, conferences, …)
  – Domain (nursing, engineering, administration, …)
How to Write a Literature Survey

• It’s a Story
  – Not just a bulleted list!
• Focused Story
  – Chronological
  – Thematic
• Objective Story
  – Pros & Cons
  – Successes & Failures
  – Ongoing and Finished
  – No opinions!
• Organized Story
  – Present your sources in terms of their overall relationship to your project
  – It’s not just a summary!
  – It relates your work to the other people in the field
Structure of a Survey

Introduction

Theme 1
- Paper 1
- Paper 2
- Paper 4
- Paper 3

Theme 2
- Paper 5
- Paper 6

Conclusion
Judging an Article

- Was the topic clear & significant?
- What is the theoretical framework?
- How valid was the approach?
- Was the approach objective?
- Was the argument logical?
- How does the article relate to my point?
Judging the Survey

• How good was the information seeking?
  – Thorough enough?
  – 10 to 20 articles typical
• Was the information critically analyzed?
  – Were concepts followed through?
  – Discuss strengths & weaknesses?
• Was it one-sided?
• Is it useful to conduct further work?
• Presentation
  – Clear
  – Demonstration of domain knowledge
Project 3: Hands-on Project
Hands-on Project: Two Parts

- Two page report
  - Different than in previous years!
- Hands-on project & in-lab demonstration
- Uses Arduino Lilypad system
  - You must purchase it.
- Follow Engineering Project Process
Engineering Project Process

- Identification of problem
  - What function is missing / deficient?
- Determine necessary functionality
  - What is possible?
  - Keep it simple & effective!
- Identification of relevant technology
- Risk evaluation
  - Never underestimate what can go wrong!
  - Failures always occur. What is the acceptable risk level?
- Prototype device, test & start again
- Tabulate Results
- Write Report
- Demonstrate
Lit. Survey for Hands-on Project

- Supporting sub-document
  - Relatively short (about one paragraph)
- Examine all relevant technologies
- Examine all relevant methodologies
- Critical comparisons
- Make it relate to your methods & results
  - Compare to what others have done
- Minimum 3 scientific / engineering references
  - Like position paper
  - Minimize additional “popular” references
Hands-on Project Writeup

• Introduction
  – No single-paragraph abstract needed
  – Include Literature Survey Background

• Methods

• Results

• Discussion & Conclusion

• References

• *Two pages*, two column, IEEE template
VELOCITY ADJUSTMENT IN A BOUNDING QUADRUPED

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INTRODUCTION
This paper presents the bounding gait for a 21 leg biologically inspired underactuated quadruped robot, the Platform for Ambulating Wheels (PAW). While the quadruped can use the traditional touchdown angle method [1] for speed control, it is shown here that the setting of liftoff angles can adjust forward speed. The trials are extended, through the use of small, actuated wheels located distally on the legs, to examine the effect of non-fixed toes.

Figure 1: Speed is adjusted by varying leg liftoff angles.

METHODS
The results of three sets of bounding experiments are shown in Table 1 in which the robot using mechanically blocked wheels to approximate fixed toes. Three bounding experiments were also conducted with the same touchdown and liftoff angles (17°, 15°) using actively controlled wheels. In both cases the robot was made to run for three meters in an approximate straight line. After allowing the robot’s pitch and roll motion to stabilize over the first meter, the speed of the robot was determined by measuring the elapsed time over the next two meters. A minimum of ten trials was performed for each experiment.

RESULTS AND DISCUSSION
Varying the liftoff angle of the front and rear legs of PAW is shown to have a direct effect on forward speed. As liftoff angle is made to be closer to the body’s vertical reference the robot is forced to increase its flight phase apex height, see Fig. 1. Likewise, if the liftoff angle is increased, the robot is brought closer to the ground during flight and increases its forward speed proportionally. Different from experiments conducted on a similar robot, Scout II, which uses touchdown angles to vary forward speed [2], PAW’s bounding stride frequency generally increases with higher forward speed, as shown in Table 1. This is due in large part to the tendency of PAW to have lower apex heights and smaller body pitch when liftoff angles (and corresponding forward speed) are increased, while the opposite has been observed in Scout II. The use of actively controlled wheels tests to decrease the speed and repeatability of the bounding gait and coincides with a marked variability in the hip actuators’ speed-torque characteristics, shown in Fig. 2.

Figure 2: The speed-torque characteristics of hip actuators for bounding with fixed toes (left) and active wheels (right).

CONCLUSIONS
Our results experimentally demonstrate the importance of liftoff angle in adjusting the forward speed during the bounding gait. The use of fixed toes is compared to actively controlled wheels and the result demonstrates that the dynamics introduced by the non-fixed toes can have a non-negligible effect, not only on the other active components such as the hip actuators, but also on repeatability and forward speed.

REFERENCES

ACKNOWLEDGEMENTS
James A. Smith’s was supported by Defence R&D Canada.

Table 1: Experimental bounding results with varied touchdown and liftoff angles, using fixed and actively controlled toes.

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Toe Type</th>
<th>Front Leg Angles (°)</th>
<th>Rear Leg Angles (°)</th>
<th>COM Speed (m/s)</th>
<th>Stride Freq. (Hz)</th>
<th>Repeatability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Fixed Toe</td>
<td>(-20, 10)</td>
<td>(-22, 12)</td>
<td>0.87</td>
<td>3.31</td>
<td>10 / 10</td>
</tr>
<tr>
<td>1b</td>
<td>Active Wheel</td>
<td>(-20, 10)</td>
<td>(-22, 12)</td>
<td>0.75</td>
<td>2.35</td>
<td>12 / 17</td>
</tr>
<tr>
<td>2a</td>
<td>Fixed Toe</td>
<td>(-20, 10)</td>
<td>(-22, 14)</td>
<td>0.99</td>
<td>3.49</td>
<td>10 / 10</td>
</tr>
<tr>
<td>2b</td>
<td>Active Wheel</td>
<td>(-20, 10)</td>
<td>(-22, 14)</td>
<td>0.83</td>
<td>3.57</td>
<td>11 / 11</td>
</tr>
<tr>
<td>3a</td>
<td>Fixed Toe</td>
<td>(-20, 10)</td>
<td>(-22, 18)</td>
<td>1.18</td>
<td>4.21</td>
<td>10 / 11</td>
</tr>
<tr>
<td>3b</td>
<td>Active Wheel</td>
<td>(-20, 10)</td>
<td>(-22, 18)</td>
<td>1.00</td>
<td>3.57</td>
<td>12 / 16</td>
</tr>
</tbody>
</table>
Judging the Project

• Two page report
  – Clear & Concise
    • IEEE Layout
  – Lit. Survey is relevant
  – How & Why of project clear

• Project
  – Demonstrable
  – Student understands functioning
A Note on Templates

• MS Word template files
  – Must be used
  – Must be adhered to
  – Marks (50%+) deducted for modifying template
    • Don’t modify font
    • Don’t modify spacing
    • Don’t modify justification
    • Just write your text

• Visually inspect it once you’re finished
Using the IEEE Template

Title is 24 pt Times New Roman TNR font

Student Name

Student ID

Write your name in the "header" here.

A subtitle which narrows the scope of your project is good!


Headings are in capital letters and numbered with Roman Numerals, in 10 pt TNR font.

Figures, drawings, etc. need to be cited (with the [H]) if you did not do them yourself.

Table captions are on the top. If you copy or modify someone’s table, you need to cite it (with the [H]).

Add an “Acknowledgements” section if you got help on your project.

References, based on the Refworks output, are in 8pt Times New Roman font.

Download the Template from the BME 100 webpage. Don’t make the document from scratch!

Write Student ID in the header Here.

Student ID and Full Name here.
Why Use a Template?

• Typesetting is the art of placing letters on the page
  – It’s challenging!
  – It’s time-consuming
  – You lack training!
• Templates remove the need for you to know
• All major conferences, journals use templates!

Example of Templates…

INTEGRATING TECHNOLOGY AND MEDICINE FOR A HEALTHIER TOMORROW
AT BOSTON MARRIOTT COLEY PLACE
AUGUST 30TH - SEPT 3RD, 2011

Program > Author Instructions

The EMBC 2011 paper system system is now open.

Papers can be uploaded here: http://embs.papercept.net/conferences/. You can use the template provided (click here to download the MS template) or simply create your manuscript online.

To help you prepare your paper for submission be sure your paper is formatted according to the Conference Paper Requirements. We have arranged for a manuscript creation/test site, PDF express. You can use the template provided (click here to download the MS template) or simply create your manuscript online. PLEASE read the information provided here to help you in submitting your paper. Your paper will be rejected by the system if it is not correct for the conference format style.

Key Dates

- Workshops/Symposia/Invited Sessions
  - Proposals: December 31, 2010
- Paper Submission Open
  - March 1, 2011
- Paper Submission Deadline
  - March 28, 2011
- Advanced Exhibition Booth/Table Reservation
  - May 28, 2011
- Notification of Acceptance
  - June 6, 2011
Where to use templates

• Required: your write-ups
  – One page draft
  – 2 or 4 page final write-up

• Optional (not required)
  – Poster
  – PowerPoint oral presentation file
What’s Next

• Present at Conferences
  – Local
    • Graduate Symposium
  – National
    • www.icue.ca
  – International
    • BMES Annual Meeting (bmes.org)
  – … and many, many others!