Work in Progress - Enhancing On-Line Interaction with Graphical Tools

Abstract - A limitation in many on-line interaction systems (discussion boards, wikis, chat rooms, etc.) is the lack of graphical tools. When using these types of systems to provide asynchronous help for engineering classes, the lack of integrated graphical tools ignores the need to communicate with sketches and equations. Due to the nature of the material and the limitations of current technologies, students tend to work in a mixed-mode environment. That is, they will work out their solutions to problems on paper, and then they have to duplicate or describe their work in a text only mode when they go on-line for assistance. The requirements, design, and implementation of a prototype system for allowing students to seamlessly integrate images, sketches, and equations along with text in on-line discussion board environment is described.

UT Engineering - Common First Year Curriculum

**Fall Semester**
- English 101 (3)
- Math 141 (4)
- Chemistry 120 (4)
- EF 151 Physics for Engineers I (4)
- EF 105 Computer Methods in Engineering Problem Solving (1)

**Spring Semester**
- English 102 (3)
- Math 142 (4)
- EF 152 Physics for Engineers II (4)
- Department Option

Courses Taught By Engineering Fundamentals

- **EF 151 Physics for Engineers I (4)**
  - Co-requisite is Calculus I
  - Fall 2011 Enrollment: 413
  - 80 additional students in Honors
  - Spring 2011 Enrollment: 136

- **EF 152 Physics for Engineers II (4)**
  - Fall 2011 Enrollment: 114
  - Spring 2011 Enrollment: 324

- **EF 105 Computer Methods in Engineering Problem Solving (1)**
  - Co-requisite with EF 151

- **EF 230 Computer Solution of Engineering Problems (2)**
  - Taken by about half the departments
  - Matlab

- **EF 402 Fundamentals of Engineering (1)**
  - Review of morning portion of FE exam
  - Taken by most departments
**EF 151 and EF 152 Physics for Engineers I & II**

**Physics**

**EF 151**
- Vectors and 1D Motion
- 2D Motion; Forces
- Conservation of Energy and Momentum
- Rotational and Rigid Body Motion

**EF 152**
- Statics and Fluids
- Harmonic Motion, Sound, Waves
- Thermodynamics
- Electricity and Magnetism

**Engineering**

**Communication**
- Written reports
- Oral presentations
- Engineering calculations

**Team Skills**
- Numerous small projects
- Large end-of-semester project

**Design**
- Open-ended design problems

**Introduction to Disciplines**
- Overview of all Departments
- Departmental fair

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**Lectures**

- All students in one lecture hall
- Meet 3 times a week, MWF
- Team Taught
  - Two instructors
  - One talks, one writes/comments
  - Interaction and conversation
  - Streamlines use of technology
- **Personnel Response System**
  - Immediate Feedback
  - Part of grade
  - Encourage participation and thought
- **Lectures are recorded**
  - Available online
  - Includes video and screen contents
  - Indexed

**Recitations**

- Meet twice a week, 75 minutes
- 24 - 28 students per section
  - Students sit at tables of 4
  - White boards at each table to facilitate collaborative learning
  - Teams assigned; 1 person from each quartile
  - New teams every 3 weeks
- Led by Graduate Teaching Assistants
  - Trained by faculty
  - Weekly planning meetings
  - Faculty drop into recitations
- **Variety of activities**
  - Problem solving
  - Labs
  - Demonstrations
  - Team projects

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**Custom Course Management System**

- Public/private model – promotes sharing of resources
- Announcements, course materials, calendar
- Parameterized homework with graphical notes
- Discussion board with links to individual homeworks
- Student lists, background info, photos, notes
- Gradebook – flexible, one course – multiple sections
- Feedback / surveys / forms
- Exam archives
- Fully usable on tablets / phones
- Full archival and availability of previous semesters
- Team assignments – tracking
- On-line rubrics
- Searchable programming examples library
Web-based Homework System

Students can type equations/notes here. EF staff view notes when providing help. Students can also upload images, e.g., pix text 2% penalty for each wrong answer to encourage students to think about answers. Try history can be reviewed to see errors (e.g., sign error).

Support for EF courses

Help Sessions
Several evenings per week; answers to individual questions

Discussion Board
Available 24/7; monitored at specific times

Sample On-Line Homework

Deadlines:
110% credit: Oct 12, 2011 13:30
100% credit: Oct 14, 2011 08:00
95% credit: Oct 15, 2011 08:00
90% credit: Oct 16, 2011 08:00
85% credit: Oct 17, 2011 08:00
80% credit: Oct 18, 2011 08:00
75% credit: Oct 19, 2011 08:00
70% credit: Oct 20, 2011 08:00
65% credit: Oct 21, 2011 08:00
60% credit: Oct 22, 2011 08:00
55% credit: Oct 23, 2011 08:00
50% credit: Oct 24, 2011 08:00
45% credit: Oct 25, 2011 08:00
40% credit: Oct 26, 2011 08:00
35% credit: Oct 27, 2011 08:00
30% credit: Oct 28, 2011 08:00
25% credit: Oct 29, 2011 08:00
20% credit: Oct 30, 2011 08:00
15% credit: Oct 31, 2011 08:00
10% credit: Nov 1, 2011 08:00
5% credit: Nov 2, 2011 08:00
0% credit: Nov 3, 2011 08:00

EF 152, Spring 2011
657 questions
2418 answers
78,924 page views

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Getting the Pictures . . . Setup

**EF Note Image Manager**

Current Files associated with hw 3-2-3 for wschlete

Selected image(s):  Delete

- Refresh the Page... OR Return to the previous page OR Admin Browse

**Loading Files**

- Create a new directory (eg file)
- Send a site message or email with attachment to ef151@engr.utk.edu. Include hw 3-2-3 in the subject or body of the message.
- Get set up to send images to the web site.
- Webfolder - send a site message or email with an image attachment to ef151@engr.utk.edu

No webfolder files available.

- From local file:  Browse
- From URL:  Load from URL

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Device Registration

**EF Mail Manager**

This utility facilitates the texting and/or emailing of images to the EF web site. To make this work, you must register your account as follows.

1. Use the desired source to send a message to the address ef151@engr.utk.edu with the subject 'hw 3-2-3' This tells the system that you want image attachments to messages from this source to be stored in your EF web folder.
2. After sending the registration message, you should see an entry in the list below with the status 'pending'.
3. Use this page to enable the entry.
4. After this is done, attach images from messages from the source will be stored in your EF web folder where they will be accessible from the EF website.

<table>
<thead>
<tr>
<th>NetID</th>
<th>Email</th>
<th>Status</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>wschlet</td>
<td><a href="mailto:wschlete@ux.x.edu">wschlete@ux.x.edu</a></td>
<td>Enabled</td>
<td>Conform Off</td>
</tr>
<tr>
<td>wschlet</td>
<td><a href="mailto:wschlete@gmail.com">wschlete@gmail.com</a></td>
<td>Enabled</td>
<td>Conform On</td>
</tr>
<tr>
<td>wschlet</td>
<td><a href="mailto:863842813@att.net">863842813@att.net</a></td>
<td>Enabled</td>
<td>Conform Off</td>
</tr>
</tbody>
</table>

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Adjusting Pictures . . . More Open Source

JCroop and ImageMagick

**Image Editor**

Original Image: [Click to view](image.png)

- Rotate: 0, 90, 180, 270
- Crop: Specify crop area on the image
- Size: 128 x 64 pixels
- Brightness, Contrast: Adjust
- Convert to: Transparency

Other ImageMagick Operations:

- Save As New
- Save As

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Picture Associated with Homework

**Problem 12: Problem Set: 13/730/0**

A 12 ton truck drives 60 min. with a speed of 60 mph. Fortunately, there is a runway truck ramp which is inclined at angle of 10 degrees to the horizontal.

**Problem Set:**

- Description: 13/730/0
- Numerical Value: 12 tons
- Speed: 60 mph
- Time: 60 min.
Picture Associated with Homework

A 32 ton truck loses its brakes and reaches the bottom of a steep hill. Fortunately, there is a narrow, steep curve which is nearly horizontal.

Determine the kinetic energy of the truck just before it reaches the bottom of the hill.

Get the Pictures . . . Sketching

EF Note Image Manager

Current Files associated with !hw 3-2-3 for wschle

Selected image:

Loading Files
- Create a new sketch (svg file)
- Send a new message or email with attachment to physics.elsevier.edu
- Include hw 3-2-3 in the subject or body of the message
- Getting set up to send images to the web site

Webfolder - send a new message or email with an image attachment to physics.elsevier.edu

No webfolder file available.

From local file:

From URL:

SVG-Edit – More Open Source Coolness

SVG-Edit – Annotation

check this value
The Survey Says...

<table>
<thead>
<tr>
<th>Picture Messaging</th>
<th>Did you use the picture messaging feature of the homework?</th>
</tr>
</thead>
<tbody>
<tr>
<td>14%</td>
<td>(13/96) Yes - it was helpful (1)</td>
</tr>
<tr>
<td>16%</td>
<td>(19/96) Yes - it was not helpful or hard to use (2)</td>
</tr>
<tr>
<td>10%</td>
<td>(15/96) No - didn't have a need (3)</td>
</tr>
<tr>
<td>13%</td>
<td>(20/96) No - didn't want to mess with it (4)</td>
</tr>
<tr>
<td>12%</td>
<td>(14/96) No - was not aware of it (5)</td>
</tr>
<tr>
<td>Avg: 3.34, NZAvg: 3.34, Sum=321, N=96, n=96</td>
<td></td>
</tr>
</tbody>
</table>

- It is a good feature I should have taken more advantage of.
- That was the best thing about the homework. It really helped being able to have the professors instruct us on where we went wrong.
- Cool feature.
- Never got around to it.
- Good idea!
- Didn't know we had one.
- I never figured it out.
- Good feature.
- I didn't use it but I will say I think it is a fantastic idea and should be kept in the course and improved upon.
- That seemed like more trouble than it is worth.
- I never knew how to do the picture feature and didn't really have the urge to try and figure it out.
- I used my wacom drawing tablet with it. It was awesome.
- Technology is crazy.
- I found it was easier to just go to help session if you needed to show your work.
- I figured out about it by the end of the year.
- The pictures and videos really help to bring some explanation to questions being asked.

Summary and the Future

- Greatly reduces time to provide help
- Student adoption has been slow
- Can expand the concept
  - Discussion Board (too much sharing?)
  - Other file types (Matlab, Word, Excel, One Note)
- Facebook link?
- E-portfolio