


# Samuel J Bobb

**Engineering Portfolio**

A photograph of a rock stack on a mossy rock at sunset. The stack is composed of several dark, flat stones balanced on top of each other, with a single, lighter-colored rock at the very top. The base of the stack is a large, rounded rock covered in green and yellow lichen. The background is a soft, warm gradient of orange and pink, suggesting a sunset or sunrise. The text "Every project requires testing and revision" is overlaid on the right side of the image in a white, serif font.

Every project  
requires testing  
and revision

PHOTO / SAN BOBB

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**An inukshuk, 14 inches tall** It took my brother a day of testing and revision to build this *inukshuk* on a camping trip in Canada, but it was still standing four months later when I returned and took this photo. Stone landmarks like this were originally used for navigation by the Inuit people of the North American Arctic region and traditionally have a human form.

# The Process

**The Toolkit** As I read, listen, and explore, I strive to acquire more problem solving tools. These tools include technologies, algorithms, contacts with knowledgeable people, specialized software, and hardware. The more tools I have, the more ways I can attack a problem.

**Testing and Revision** In problem solving, I use that toolkit to quickly develop a list of possible solutions. Rapid cycles of testing and revision allow me to arrive at a smart, effective solution with efficiency.

## Problem Solving Tools

### *Electrical Engineering*

- Digital and analog circuit design and development
- Control systems and industrial automation
- Embedded systems, micro-processor programming
- Sensing and motor control

### *Project Management*

- Logistics management
- Systems engineering
- Technical team coordination

### *Art and Graphics*

- Adobe Photoshop, InDesign, After Effects, Premiere
- Web and print design
- Video production

### *Information Technology*

- Linux server administration (Debian, Ubuntu, CentOS)
- Network architecture, switching, firewalls
- Linux, Apache, MySQL, PHP (LAMP) server deployment
- Video processing and delivery
- Virtualization and cloud computing

### *Web Development*

- HTML, CSS, PHP, jQuery
- Adobe Dreamweaver
- Open-source content management systems including Drupal

## General Dynamics Electric Boat – Groton, Connecticut



PHOTO / GENERAL DYNAMICS ELECTRIC BOAT / RELEASED FOR PUBLIC USE BY THE U.S. NAVY

**Virginia-Class Attack Submarine** The *USS Missouri* (SSN 780) is among those designed and built at Electric Boat for the United States Navy.

# Web Application Development

**Problem** Pick-Staiger's online video library of music performances outgrew a single-page list. Posting new videos was a complicated process for staff, resulting in errors.

**Result** I built a web video application that automates staff tasks, improves video delivery, and adds visitor features.

## Video Library

stage.mp4	<a href="#">Start conversion</a>
Gentlemen of NUCO Final.mov	<a href="#">Start conversion</a>
Kennedy Center New.mov	<a href="#">Start conversion</a>
SWE Maslanka Excerpts.mp4	<a href="#">Start conversion</a>
Corigliano Part 1.mov	<a href="#">Start conversion</a>
Circus Maximus Part 2 of 4.mov	<a href="#">Start conversion</a>
Circus Maximus.mov	<a href="#">Start conversion</a>
Koncertstück 2.mov	<a href="#">Start conversion</a>
Guarni Master Class Edited.mov	<a href="#">Start conversion</a>
Bronfman Piano Master Class.mov	<a href="#">Start conversion</a>
Figaro - Act IV.mov	<a href="#">Start conversion</a>

CONTENT / WWW.PICKSTAIGER.ORG

Staff can convert, tag, and post videos with just a few clicks from any web-connected computer.



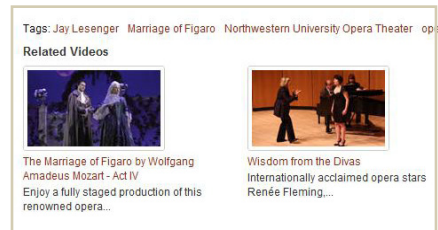
CONTENT / WWW.PICKSTAIGER.ORG

I conducted testing to identify layout and features of the video library and video pages.



CONTENT / WWW.PICKSTAIGER.ORG

With bit rate switching, the player measures a visitor's bandwidth and chooses the best quality that allows smooth playback.



CONTENT / WWW.PICKSTAIGER.ORG

Related Videos shown under the video player encourage visitors to explore the library. Related Videos are generated from tag similarity.

## New Features

- Video library offers search, related items, and RSS feed
- Open-source video delivery avoids expensive proprietary software licenses
- Tags and Related Videos helps visitors discover new content
- Visitors can share videos by using social media integration

## Site Statistics

- 67 videos and growing
- 250 public content pages
- 4,700 unique visitors per month

## Technologies

- Content management: Drupal 6 on Apache, PHP, MySQL, Debian 5
- Video delivery: lighttpd h264 module and JW Player
- Video encoding: FFmpeg, Python web interface



# Pick-Staiger Concert Hall – [www.pickstaiger.org](http://www.pickstaiger.org)

**pickstaiger** *at the Bienen School of Music*

CONCERT HALL

HOME EVENTS TICKET OFFICE DAVEE MEDIA LIBRARY RESOURCES WEBCASTS WORK AT PICK ABOUT US

Bienen School of Music, Northwestern University

## Winter CHAMBER music festival

January 7 - February 7, 2011

[More Details >](#)

1 2 3 4

### What's Next



Winter Chamber Music Festival: Violinist  
Arnold Steinhardt  
Sun, Jan 23, 2011 - 7:30 pm  
Pick-Staiger Concert Hall



Northwestern University Symphony  
Orchestra  
Sat, Jan 29, 2011 - 7:30 pm  
Pick-Staiger Concert Hall



Northwestern University Chamber  
Orchestra: From the British Isles  
Thu, Feb 3, 2011 - 7:30 pm  
Pick-Staiger Concert Hall



Symphonic Wind Ensemble  
Fri, Feb 4, 2011 - 7:30 pm  
Pick-Staiger Concert Hall



Marcin Dylla, guitar  
Sat, Feb 5, 2011 - 7:30 pm  
Lutkin Hall



Marcin Dylla Guitar Master Class  
Sun, Feb 6, 2011 - 11:00 am  
Regenstein Recital Hall

January						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

**Event Management and Navigation** Rebuilding the site provided an opportunity to improve existing features and add new ones. I created a flexible event management system to meet the evolving needs of Pick-Staiger staff and implemented horizontal menus to simplify navigation.

*Pick-Staiger Concert Hall  
at the Bienen School of Music,  
Northwestern University,  
Evanston, Illinois*

# Design Competition

**Problem** Design an autonomous robot to compete head-to-head with opponent robots. Robots collect and shoot balls to make goals.

**Result** We won first place in the competition out of 24 Northwestern student teams.



PHOTO / DAN BOBB



PHOTO / SAM BOBB

To avoid errors during the excitement of competition, we created a setup jig and documented startup procedures.

We conducted strategy planning sessions for game play logic and appropriate robot behavior.

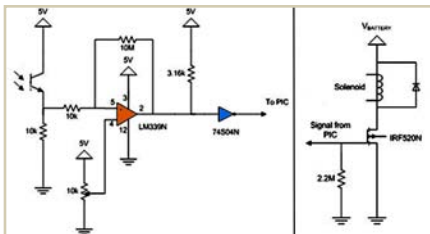


ILLUSTRATION / SAM BOBB

Modular circuit design allowed for easy troubleshooting, testing, and revision.

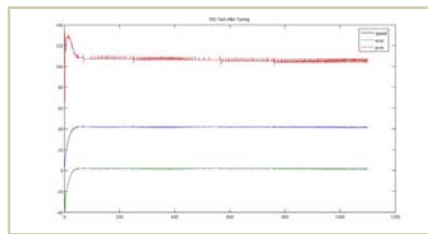


ILLUSTRATION / SAM BOBB

We ran tests and collected data to determine optimal PWM frequency and to tune the PID controller for the motors.

## My Contributions

- Circuit design
- Microprocessor programming
- Performance testing
- Logic design
- Control system design
- Mechanical construction and circuit assembly

## Project Details

- PIC 18F4520 processor
- 5 line sensors, 2 ball sensors, 2 motor encoders, 1 laser targeting system, 2 impact switches
- Differential steering
- PID controller with pulse width modulation for motor speed control
- Solenoid driven ball shooter
- 1100 lines of C code



# Northwestern University Robotics Competition 2008

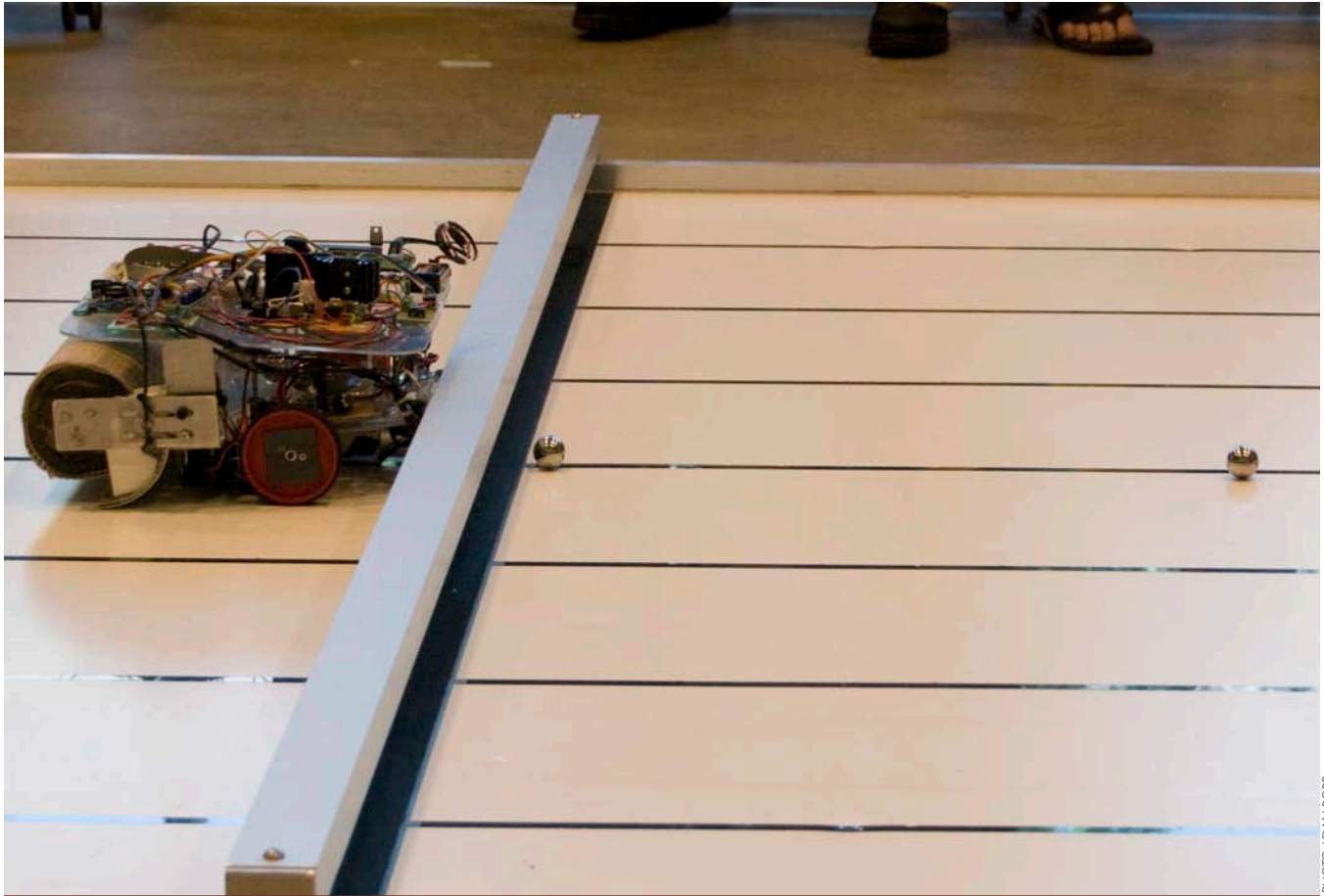


PHOTO / DAN BOBB

**Robot During Competition** After finding the goal by measuring laser reflections and checking for an opponent blocking the goal, our robot shoots a ball, keeps track of game play time, and makes decisions on shooting based on the remaining time.

**Project Planning** We developed our robot over 20 weeks with a \$200 budget.

**Teammate** Ren Chung Yu

# Dance Marathon Relocation

**Problem** Participation in Dance Marathon grew by 50% in two years. A new venue was needed to accommodate this rapid growth.

**Result** Dance Marathon 2009 was held in a large tent on the east side of the student center and raised \$900,000 for charity.

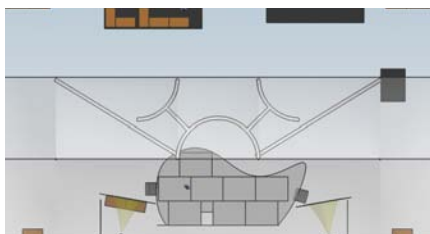


ILLUSTRATION / PAT MARKAN

After analyzing problems from past years, I encouraged our designers to create a stage that maximized opportunity for the crowd to get close to performers.



PHOTO / PAT MARKAN

By selecting a new location, we were able to use a larger tent to meet safety code constraints.



PHOTO / PAT MARKAN

To remedy lighting and moisture problems, I researched and ordered a tent liner to block condensation and diffuse light.



PHOTO / PAT MARKAN

I analyzed possible solutions from our vendors and university officials to provide power, networking, and accessibility to the tent.

## My Contributions

- Space planning for crowd management
- Integration of university organizations and design teams
- Troubleshooting during the event

## Dance Marathon Details

- Northwestern University Dance Marathon is the largest student-run philanthropy in the country
- Over 700 student dancers raise \$400 each to earn the honor of dancing for 30 hours straight

## 2009 Venue Details

- 7200-square-foot tent
- 20x40 foot stage
- Raised platforms provided space for lighting, sound, DJ, and visitors

## Northwestern University Dance Marathon 2009



PHOTO / PAT MARKAN

**Stage Configuration** The curved stage provided a wide area for hundreds of dancers to gather. By maintaining the production budget under \$45,000 I was able to keep the organizational overhead under 2%.

**Collaborators** Eri Okuma, Pat Markan, Alec Thorne, Phil Reich, Liz Banks, Northwestern University Staff

# Internship: Vehicle Impact Lab

**About TRC** An automotive proving ground that conducts durability, emissions, crash, and other tests for cars, trucks, and motorcycles.

**Internship Experience** For two summers, I assisted in crash testing at the TRC Impact Lab.



PHOTO / NHTSA/DOJ

I worked with a team of crash engineers and technicians to perform standardized offset frontal, side pole, and rear impact tests for automotive manufacturers and government organizations.

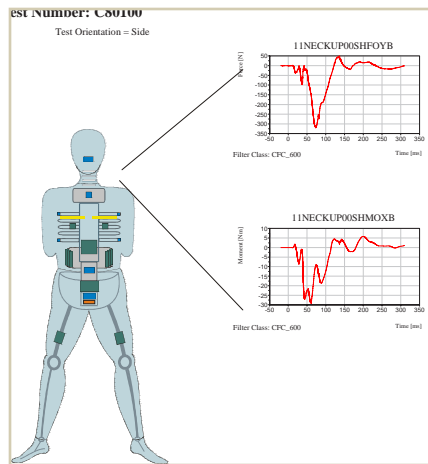


ILLUSTRATION / NHTSA/DOJ

After each crash test, I reviewed data to identify anomalies such as dislodged accelerometers, reversed polarity channels, and cut cables.

## My Responsibilities

- Installing instrumentation on vehicles
- Seating anthropomorphic dummies
- Checking data

## Crash Testing at TRC

- Major automotive manufacturers perform certification tests to license new vehicles
- Manufacturers crash prototype vehicles to test materials, construction, and airbag thresholds
- The National Highway Traffic Safety Administration develops new test procedures by crashing many production vehicles and analyzing the results



## Transportation Research Center, Inc. – East Liberty, Ohio



**Side Impact Dummy Before Crash** Accurate and repeatable instrumentation setup, vehicle placement, and dummy seating is critical for crash testing. Strict standards and extensive documentation ensure the integrity of each test.

**Time period** June to September 2006 and June to September 2007







## Contact Information

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## Website

[www.sambobb.com](http://www.sambobb.com)

This portfolio was designed and created by Sam Bobb with assistance from Professor Stacy Benjamin, Professor Penny Hersch, Dan and Becky Bobb.

PHOTO / SAM BOBB

