NSF CAREER experiences, thoughts and advice

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NSF CISE CAREER Workshop — 3/2015

This talk is not about…

Embedded systems

Sensor networks

“RFID-scale” computing

- **HW/SW/PL support**
- **Energy harvesting**
- **Decade-long deployments**

This talk is about…

Two CAREER proposals

A few observations

Disclaimer

This advice is not guaranteed to produce a CAREER award.

It’s just what I did.

My first CAREER proposal

2004: PhD advisor on water skis!

lost the use of his right hand (for a month).

Not “my” CAREER but…

I did get writing practice

I did get to help spend the money

My CAREER Timeline

Robots/Pizza
2007

TARDIS
(timekeeping)
2012

Panels

CAREER
submission
2014

Mementos
(checkpointing)
2011

NSF Proposals
(not CAREER,
not funded)
2011, 2012

Ekho
SenSys
2014

Submit when you're ready

You only get 3 tries.

- Use them wisely

Start early

- I started writing in 2011
- Get real helpful feedback
- Work out the kinks

Find the right scope

Think big!

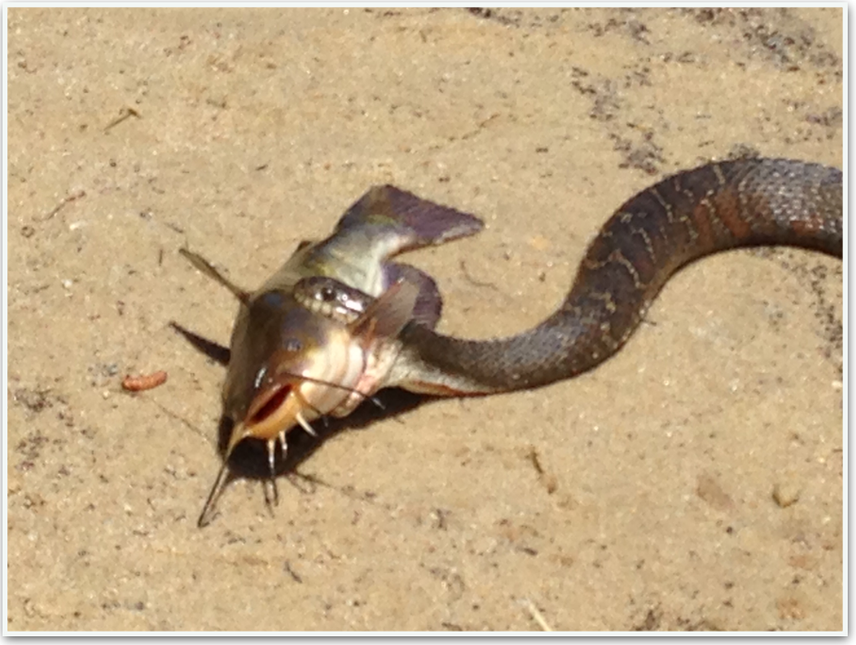
It’s a 5-year proposal.

NSF wants “transformative”

But not too big

You only have 5 years.

You have to be able to do it.



Get a good plan

How will you do it?

- What will you try first?
- What are the risks?
- …backup-plans?

What will you need?

- # of students
- equipment, materials, supplies
- collaborations

Preliminary Results

My feedback in 2011

+ Novel idea, important problem, but…

- We aren’t convinced you can do it.

NSF wants “transformative”

…and likely to succeed!

I built a tool

Ekho energy harvesting emulator (SenSys 2014)

Build your own panel

CAREER writing groups

- Met a lot of junior faculty in other depts
- Great questions/ideas

Get feedback

- Mentors, past awardees, program officers
- Give people time (start early)
- Ask until you get real criticism

Writing Tips

Clarity and organization

Panelists have a lot of papers…

…make yours easy to read.

Highlight key items

“The **goal** of this proposal is to…”

“Our **vision** is that…”

Get to the point, quickly

Get to the point (2011)

D.1 Introduction: Sensing in Uncertain Energy Environments

Energy is the single most important physical resource for any embedded system, and improvements in energy harvesting and low-power electronics are already pushing the reach of the Internet far beyond its wired edge. By harvesting environmental energy, tiny sensors can be deployed almost anywhere, streaming data for decades, and requiring little or no maintenance. Recent efforts to observe animals [29, 73, 86], habitats [33, 53], volcanoes [80], roads [28], public transportation [9], and humans [27, 37, 52] have shown that in-situ monitoring with embedded sensors yields transformative data at an unprecedented scale over long periods of time. Quite simply, ubiquitous sensing has the potential to transform our understanding of the natural world, our ability to monitor health and diseases, and reduce society's impact on the environment.

Despite of improvements, energy remains a significant challenge. Energy harvested from environmental sources is variable, often scarce, and difficult for system designers to predict. Improvements in battery technology have historically come slowly, and concerns about cell aging, environmental impact, and the added cost of battery protection circuitry have inspired a number of capacitor-based sensor devices [32, 68, 76, 83, 84] that harvest energy and often store enough energy for only a few seconds of operation. As sensor devices continue to shrink, small size will be accompanied by tighter energy budgets and more frequent failures—two conditions that are not well-supported by current embedded systems.

Our research objective is to develop a foundation of hardware, software, and networking techniques that enable embedded sensors to operate in uncertain energy environments and thrive despite of frequent power failures.

Get to the point (2014)

D.1 Introduction

Tiny battery-less RFID-scale sensing devices are poised to transform science and society by enabling long-term maintenance-free data gathering, but system designers currently lack the hardware platforms, runtime systems, languages, and tools needed to harness this potential. This proposal seeks to address this shortcoming.

Education Plan

Not an afterthought

Build on current activities/interest

Arduinos @ Edwards Middle School

Trust yourself

Remember: it's your career

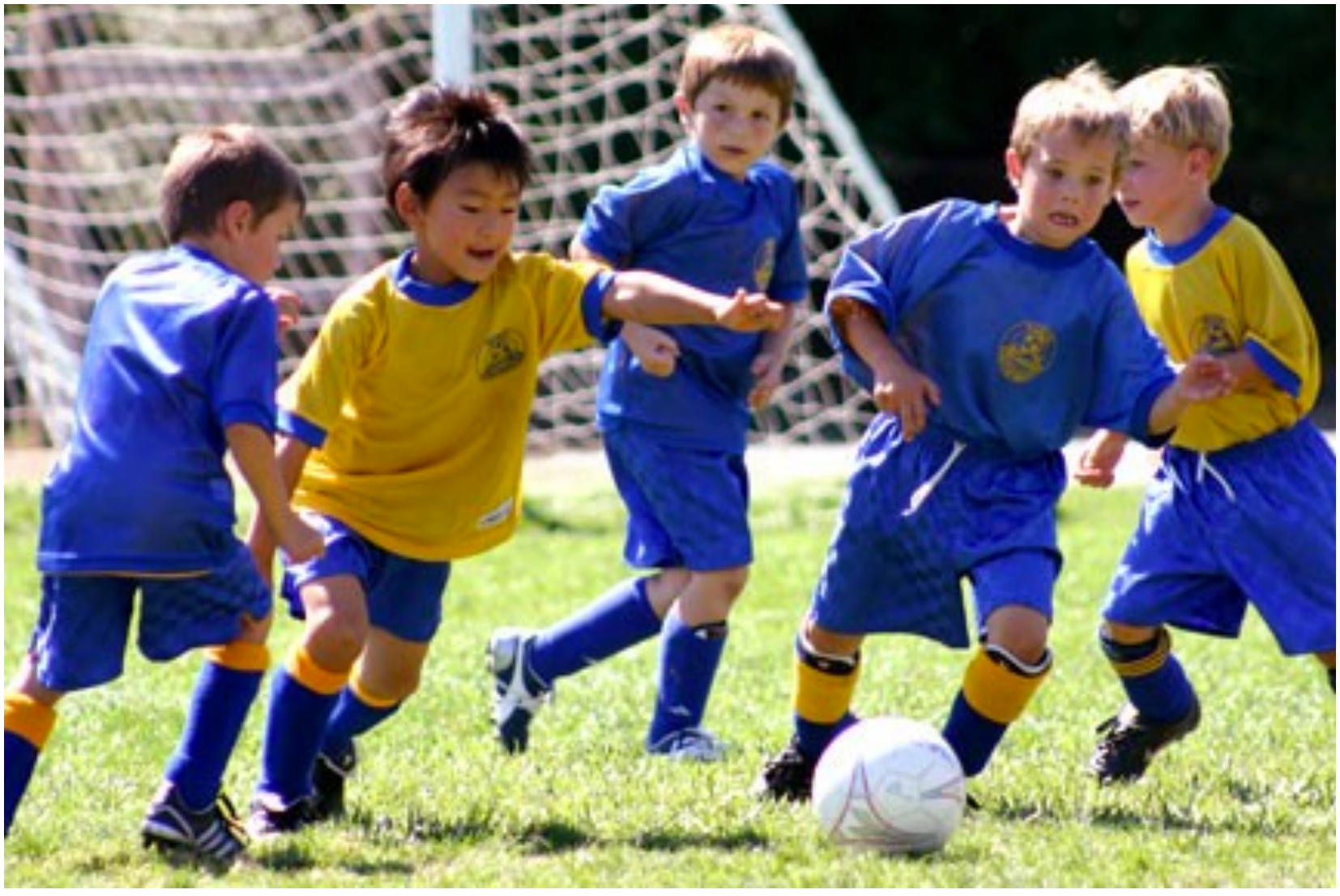
- What do you care about?
- What do you really want to do?

Pick problems that matter to you

- even if they aren't on a list of hot topics

Learn from others' examples

- but don't just follow



source: www.kids-play-soccer.com

“I skate to where the puck is going to be, not where it has been.”

— Wayne Gretzky

Final thoughts

Have fun!

You’re planning your next 5 years.

If it’s too stressful, you’re doing it wrong.

Program officers are your friends

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