Introducing Electromechanical Folk Art In Engineering Technology Programs

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Abstract

This paper presents the preliminary steps taken to introduce a course in Electromechanical Folk Art. The paper discusses the introduction of the idea to senior students enrolled in the Computer Engineering Technology Program at the University of Houston. The presentation included a 10-minute narrated slide show, highlighting the reasoning behind the proposed course, a demonstration of several electromechanical folk art gadgets developed by the author in support of the course, and a short survey completed by all students to assess the proposal's feasibility. This paper also describes compilation and analysis of the surveys, the process by which support for the idea was secured from colleagues, the department chair, and the college dean, and other potential benefits of offering this course.

Introduction

After many years of learning and teaching technical information, it became apparent to the author that creating gadgets using electromechanical components is not only fun but also an ingenious and challenging way to apply basic engineering principles.

As a student of engineering and technical content, the author was subjected to structured and often boring streams of scientific and philosophical facts and information without any regard for author's inner feelings and expression of creativity.

Thus, after many years, the desire to use this knowledge sparked in the author the idea of creating gadgets using electromechanical components with a touch of artistic flavor. This led the author to the belief that it is possible to improve the undergraduate curriculum in engineering technology by introducing an elective course designed to encourage students to exercise their knowledge base, creativity, and imagination in an unstructured fashion.

Innovation is an important educational goal, especially within the Engineering Technology Department at the University of Houston. Shortly after our faculty retreat, the author considered what could be done to meet some of the goals discussed during the retreat and considered the idea of using electromechanical components. After years of sweating in the lab building gadgets,

the author came to appreciate the artistic component of the efforts. The integration of these experiences, the thought process that went in to them, and thinking about innovation led the author to coin the term Electromechanical Folk Art (EMFA). An extensive search was conducted and since it did not produce any matching terms, it appears that the term is new. Ultimately a proposal to offer a course in EMFA was produced.

Potential Benefits

In formulating the thought process surrounding this concept, the author arrived at several meaningful justifications in support of the idea. Potential benefits, which could result from offering this course; are shown below.

- Applying good technology principles
- Learning about hand tools and machineries
- Collaboration with Museums
- Sources of income for the dept. from the sale/auction of gadgets
- Can be used as a model for other ET programs
- Learn about electronics recycling
- Publications possible
- A unique course
- Industry support
- Concept development
- Conservation principles
- Collaboration with community
- Improve imaginations
- Can be started as a pilot course
- Learn about standards
- Students enjoy taking the course
- Life fulfillment & enrichment
- Lifelong activities
- Creative thinking
- Collaboration with the college of fine arts
- Collaborative projects possible
- Empowering students just before their graduation
- Learn about environmental issues
- Funding possible
- Will bring recognition to the department
- Hobby development
- Additional income

The prospect of addressing environmental issues, in particular electronic waste and recycling, is quite appealing. There are numerous concerns about electronic waste, and warnings are echoed by leaders in the field. “Electronic waste is the most rapidly growing waste problem in the world," according to Leslie Byster, communications director for the Silicon Valley Toxics Coalition.[1]

Figure 1 shows E-waste in San Jose, California. Figure 2 shows typical E-scrapping dismantling operations in China.

Figure 1. Pile of E-waste in front of San Jose City Hall at June 19, 2001 press conference[2].

Figure 2. Migrant workers breaking down imported computers in Guiyu, China[3].

EMFA will be a course of choice for individuals with knowledge and training in electronics and mechanical disciplines and no formal training in the arts. The EMFA course will nurture the creative side of the students. Most technical students process left-brain functions, including paying attention, memorizing, analyzing, and judgment. They are seldom exposed to information directed at generating new ideas and visualizing the nonexistent, which are primarily the functions of the right brain. Similar sentiments are expressed by Michael LeBoueuf [4] when he states, "Creative abilities are the oil wells of our mind."

The Proposed Approach

A feasibility plan was designed and implemented. It consisted of three components: (a) presentation of the idea, (b) demonstration of the EMFA gadgets, and (c) conducting the survey. The plan was put to test in four senior classes: ELET 4108 (a project-based laboratory in Microprocessor Interfacing), ELET 4300 (Unix Operating System), ELET 4309 (Advanced C++ Programming), and ELET 4322 (Introduction to Java Programming). Each of the three components is briefly described below.

Presentation

The presentation consisted of several slides. The purpose was to introduce the EMFA idea to students. Students were happy to see that a new course was being planned, and they were involved in making it happen. The author firmly believes that when new courses are being planned, students should be contacted and be part of the process.

Demonstration

Several electromechanical folk art pieces were shown to students. Pictures of these gadgets at various stages of development, together with pictures of earlier gadgets, were made available to the students for viewing. Representative pieces are shown in Figures 3-6. As can be seen, space technology is the main theme in all these gadgets.

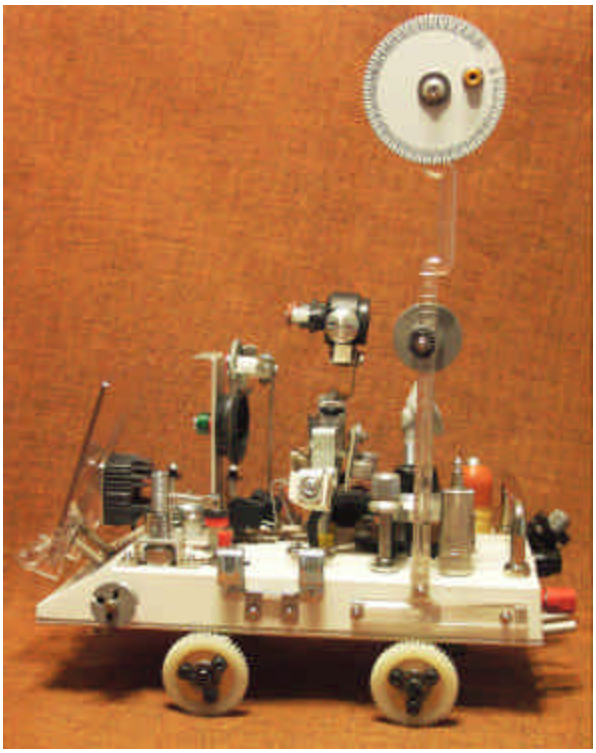

Figure 3. Space Rover

Figure 4. Space Soccer Player

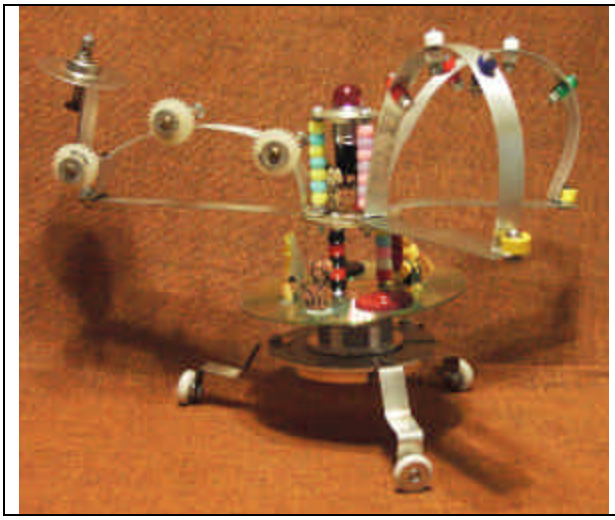

Figure 5. Space Exploration Helicopter

Figure 6. Space Tour Bus

Survey

The survey instrument (see Appendix A) consisted of eight questions. For questions 3-7, students were asked to state a reason for their answer. Question 8 was open-ended and encouraged students to provide general comments and feedback. Forty-nine students participated in the survey. Care was taken to avoid duplicates, as many students were registered in more than one of these courses. Not all students answered all questions on the survey instrument. Therefore, the data represents those who actually answered the relevant questions.

It is worth noting that the survey conducted in ELET 4108 took place at the end of the semester, immediately following their presentations of the senior project. Hence, the students had a better understanding of the idea, and their comments were more thorough, mature, and encouraging.

The data collected from the survey were quantitatively and qualitatively analyzed, as described below.

Quantitative Analysis

The quantitative metrics provide an immediate understanding of the feasibility of the idea. Of particular interest is the high percentage (92%) of students who would be willing to take such a course, favoring the course to be a senior level course (70%), the credit hours of three for an elective course (79%), willingness to pay modestly for essential tools not provided in the lab (87%), and an average range of dollar amounts they can spend ($17.00 to $58.78). The data was compiled soon after the surveys were conducted.

The data, shown in Table 1, the survey instrument (Appendix A), and the presentation slides, were submitted to the department chair for further consideration and for discussion with the Dean.

Table 1. Quantitative data collected from the surveys.

	Q3. Will take the course		Q.4 Level of Course				Q.5 Credit hours		Q.6 Willing to buy tools		Q.7 Amount willing to pay	
	Yes	No	Sr.	Jr.	So.	Fr.	3	1	Yes	No	Minimum average	Maximum Average
No. of responses	45	4	31	11	0	2	38	10	41	6	41	
%	92%	8%	70%	25%	0%	5%	79%	21%	87%	13%	$17.00	$58.78

Qualitative Analysis

The qualitative portion of the survey provided the author with additional feedback, which will help in designing the course. Samples of student comments and feedback appear in Appendix B. To save space, only limited samples are reported.

The responses to questions 3 and 8 indicate student enthusiasm. When asked why a student would want to take this course, responses included the following: interesting, fun, creative, idea building, something different, learning about electronic products, crossing several disciplines (electronic, mechanical, and folk arts).

An overwhelming majority preferred the course to be a senior-level course and provided one or more of the following reasons: stress reliever, maturity and knowledge in the field, good compliment to other senior-level courses, and help with senior project class.

Approximately 80% of the students favored a three-hour class. Students indicated that it takes time to do meaningful thinking and create gadgets.

At the time of the survey, the author did not specify any specific tools. Nor did the author mention anything about some of the tools, which would be provided in the lab. The compilation of the parts lists happened a week after the survey.

In general, a majority of the students did not have any problems with supplying their own tools. Several students already had some of the basic hand tools.

The amount of money that students can afford to spend will help determine the lab fee. If the course is going to be successful, it should become self-sufficient and generate enough credit hours to be sustained. Students were very gracious and willing to pay modestly for a course that would help them in the future.

The responses to the last question were interesting, informative, and varied. One student already tinkers with such ideas; many students liked the fact that the course will be an elective course; some would love to dismantle equipment and learn about components; some thought the course should be extended to other colleges; one student liked the idea of protecting the earth, and one student thought the freshness of the idea will sell well.

Future Plans

The plan is to develop the course during the summer of 2003. The tasks ahead include securing lab space, setting up the laboratory stations, developing the course syllabus, and ordering the parts. The information technology group in the college will provide six computers and make the necessary connections to the internet.

Conclusions

The proposed course in electromechanical folk art in engineering technology is quite viable. The survey results and the level of support from the colleagues and administrators are all indications of the feasibility of this effort. This area of study is still in its infancy and only time can prove its merit. The author is very optimistic that offering this course will be a success. Work remains to be done including setting up the workstations, ordering parts, preparing a course syllabus, and, most importantly, seeking external funding from agencies such as EPA and NSF.

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Dr. Attarzadeh currently serves as an Associate Professor of Computer Engineering Technology at University of Houston. His research interests include software design and code efficiency, programming languages, microprocessor-based control, web-based usability, and electromechanical folk arts.

Appendix A
Survey Instrument

1. Your major _____.

2. Your current standing:

   Senior ☐ Junior ☐ Sophomore ☐ Freshman ☐

3. Would you be willing to take such a course, if you were still in school?

   Yes ☐ No ☐

   Why? Please give a brief comment.

4. The level of the course should be:

   Senior ☐ Junior ☐ Sophomore ☐ Freshman ☐

   Why? Please give a brief comment.

5. The credit hours for the course should be:

   Three (3) ☐ One (1) ☐

   Why? Please give a brief comment.

6. Would you be willing to buy/furnish some of the essential tools for your projects?
   Yes ☐ No ☐

   Why? Please give a brief comment.

7. If you answered yes to question 6, please specify the range of $ amount you would be willing to spend. Otherwise, proceed to next question.

   $**_____ to **$_____

Why? Please give a brief comment.

8. Your additional comments are encouraged. Please let me know what you think about this idea, thanks.

Appendix B
Samples of Students Comments

Question 3

1. It would be a good creative outlet using knowledge and technology I already know about.
2. It is something different. Since the curriculum is so structured in all of our other classes, a class where our imagination can be used is appealing.
3. A chance to get a break from structured class & work, as well as a chance to learn about new parts of old devices & how they could be reused.
4. I like creating something that exercises all disciplines: liberal arts, creativity, technical, mechanical, electrical, computers, physics, programming, etc.
5. The current curriculum lacks creativity (with the exception of Interfacing). This creative oriented class would help student come up with interesting ideas or future ventures.
6. The class would have combine student's artistic nature to make our major more fun and creative. And I love to be creative.

Question 4

1. Seniors have more knowledge and also this class will give them a break from the traditional classes.
2. You want knowledgeable students who will take the course seriously.
3. This is a level where most of the students have been overwhelmed with dry, tedious classes. This class would give the students something to break up the monotony.
4. Some of the items you build could be integrated into the senior interfacing project.
5. This course would give seniors a good understanding of how products are built.
6. Students must need a good understanding of tools, electronics, and general assembly methods.

Question 5

1. The students will spend a lot of time in the lab to develop their project.
2. Any course involving arts should be given enough "in-class" time.
3. Ideas and thoughts encouraged by a class like this would require more than one hour to explore.
4. Hands on is always a better teacher and time is needed to fully understand.
5. One hour would not motivate true creative, resulting in last-minute projects.
6. You need time for this, with more time, will come better ideas, and better projects (gadgets).

Question 6

1. I have tons of old parts and computers I could use.
2. Within reason. Most college students don't have a lot of money to spend outside of necessities.
3. I already have a lot of tools, so I wouldn't mind buying a couple more. Anyways, most labs require some kind of lab kit to do the experiments.
4. Of course, special tools or drill bit sizes may be necessary, especially if homework is to be done. Showing how to build tools would be good too.
5. Screw driver, wrench, hammer, etc., all technology students should have these basic items.
6. I will be willing to buy small amount as long as the class is fun.

Question 7

1. I would love to spend money because it is a fun hobby.
2. Hand tools are probably all that is needed.
3. May want to buy nice stuff to create stuff that doesn't look hacked together.
4. Someone's creativity and dreams might go beyond the available parts or tools. I would buy all sorts of gadgets if I could not find them.
5. The recommended amount should not be too much however, if a student wants to put more of their own money into it, that would be ok.
6. This would be normal lab prices.

Question 8

1. Should have a design class to encourage students to design with their idea and knowledge. Designing programmable robot is what I always want to do. If this kind of course is available, I will be sure to attend.
2. I personally would take the course. I agree, it would provide a much needed diversion to avoid burnout. I think it should not be limited to college of technology. I think it should be available to other curriculums as well. Measures should be taken to make sure it stays fun!!!
3. This is a great course, and it is unique. Freshness ideas also sell to not only students but also to people outside the college.
4. I think this is a very good idea, and I think a few more sections should be added as well. Technology has been going down in the years that I have attended it. There aren't any real quality classes that I've taken. And this will help technology. But one thing I would suggest is let CET students into this course as well. They have to take a materials and process class. That would make sense to take it. Other than that, I hope this is just the beginning for rebuilding technology.
5. It would be nice if this course could eventually be offered to count as a visual/performing art requirement for the university core curriculum. It could then be opened to mechanical/electrical people from both the college of engineering and college of engineering students, and possibly even computer science students.
6. I think that this should be passed and entered into curriculum. In fact, I'd like to work with you on this effort since I love to thinker and build fun things out odd stuff/junk… email me.