Sharing a PBL Design Course with Stanford over the Network

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Abstract

Tokyo Metropolitan Institute of Technology has been participating in Stanford's ME310, a PBL design course for post-graduate students, over the network since 1998. This paper describes our experience and discuss what were the problems and how we could overcome them. ME310 is a team-based activity, so that this is an example of how we can form a team over the network and how we can carry out global project-based learning. What should be stressed most importantly is that how effectively we can share our images; this is the key element for successful teamwork in global project-based learning.

I. Introduction

Tokyo Metropolitan Institute of Technology (TMIT) has been participating in Stanford's ME310 design course over the network since 1998 with Toyota Motor as a corporate partner. ME310 is based on Project-based Learning (PBL). PBL encourages students' initiatives and teamwork. Toyota Motor provides a global team with a different assignment each year. A global team is composed of three or four TMIT students and the similar number of Stanford students. So far, we have finished three projects and we are now doing the fourth this year. What we would like to point out is that the key element we consider most crucial for successful teamwork in global project-based learning is how effectively we can share our images. Interestingly enough, time difference and language barriers are not too much of a problem. But our experience shows understanding images or concepts is the hardest part in global project-based learning and communication, and often words do not help very much.

II. Development of a Paper Bike: Learning How to Work Together as a Team

A. Paper: What It Means

Developing a paper bike was the first assignment given in 1998 to our global team with the aim of giving them the opportunity to learn how to work together as a team. But it took a very long time before Japanese team members realized that there are papers strong enough for producing a bike on which a man can ride. For the Japanese, paper represents a thin and weak material which we can fold and make origami out of it. Thus, the image of paper with such strength was very difficult for Japanese members to understand.

B. Identifying the Common Goal

The next difficult work is to identify the common goal our global team can share. Because there are so much flexibility and variability in paper bike design, it is no easy task to really understand and to share the images of a final product. Sketches played very important roles in sharing ideas and in identifying and coordinating the goal.

We found out that teams work differently in Japan and in the U.S. In the U.S., a team works in a more strategic way, while in Japan they work more tactically. In Japan, we have been focusing in our design education on how we can get to our goal successfully. But such an assignment as developing a bike provides us with such extensively varying choices, that identifying the goal and sharing and coordinating it are the most difficult and crucial task.

In identifying and sharing the goal, TV conferencing systems played an important role. We used PictureTel. For identifying the strategic goal, team-to-team communication is much more important than one to one. The V.I.P (Virtually in Person) system developed at Stanford served a great deal for this purpose. It permits a user to manipulate a camera on the other side. Thus, even when one member of the other team responds "yes" in a positive way, we still can find out that others do not look very much satisfied. If such is the case, we might have to look for another strategy.

Figure 1. Paper Bike

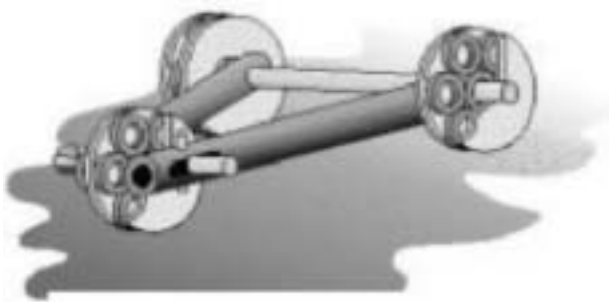

Figure 2. Paper Bike Sketch

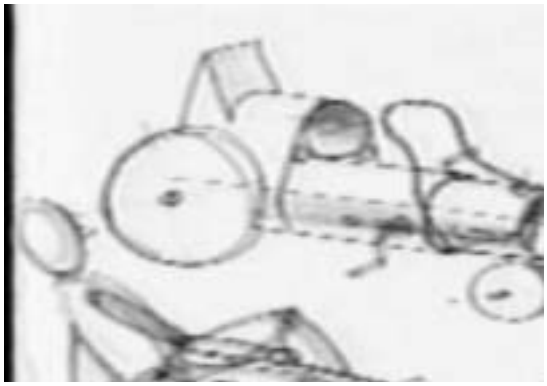

Figure 3. Paper Bike Sketch

Figure 4. V.I.P. System

III. The 98-99 Project: Development of Parallel Parking Support System

A. Parallel Parking: How It Differs between the U.S. and Japan

In our 98-99 Toyota Project, we developed a parallel parking support system. When we started to discuss, we found out we have different ideas about parallel parkingbetween Japan and the U.S. The English word "parallel parking" comes from the "start parking" action, because we stop in parallel to another car. But in Japan, it is called "line parking", because we pay attention to the end of parking action. After we realized this large discrepancy, using a radio controlled car, we could successfully develop sensors useful both for Americans and for Japanese.

B. Negotiating Constraints

In this project, Toyota asked us to demonstrate the effectiveness of the developed system on a real car and offered to provide two identical model cars, one to the U.S. and the other to Japan. But at Stanford, they have to follow the strict rules of the California Department of Motor Vehicles (DMV). We have to consider legal issues, insurance, etc. Thus, the Stanford team worked on a golf cart, and the TMIT team worked on a real car. Our global team developed the algorithm together over the network. And we televised it simultaneously between Japan and the U.S, using a real car and a golf cart to demonstrate the effectiveness of our designed system.

C. Face-to-Face Meeting: How It Is Important

When we developed a paper bike, all the activities were done over the network and there were no face-to-face meetings. But when we developed a parallel parking support system, three Stanford students came to Japan for a couple of days at the beginning of the project. They spent a day or two at TMIT, followed by a visit to Toyota Motor where they discussed the issues with them. As their stay was so short, there was not too much discussion. But the fact they met each other at the beginning made our subsequent work run in quite a straightforward manner.

D. Outcomes

Our global team developed a parallel parking system, using ultrasonic sensors. It is quite interesting to note that Toyota initially proposed and asked us to use more elaborate technology for the system, but we came up with a solution with much cheaper price and simpler technology.

IV. Summary

What impressed us, Japanese, most is the fact that through this course we learned how to manage and to find a solution against many unexpected situations. In Japan, we have been teaching students how to get to the goal successfully. Therefore, once they fail, they find it very difficult to recover from their failures. The lesson we learned is that as our requirements are getting more and more diversified, we would more and more come across the unexpected situations and how we can manage them is the key factor in our design activities. In fact, design is in essence an act of creation so it is very much natural we come across the unexpected situations. Otherwise, the design is not creative enough. So our experience of global teamwork in design served a great deal for our students to learn how we can overcome these unexpected situations and produce creative design ideas.

Acknowledgments

The author would like to thank Professors Larry Leifer and Mark Cutkosky, Stanford University.