



Smithsonian

National Museum of American History

Lemelson Center for the Study of Invention and Innovation

**Jose L. Hernandez-Rebollar Innovative Lives Presentation,
August 3, 2005**

Presenter: José Hernandez-Rebollar
Participants: Maggie Dennis (introduction), audience (Question and Answer)
Date: August 3, 2005
Location: Carmichael Auditorium, National Museum of American History

DENNIS:

... through our Innovative Lives program this afternoon. My name is Maggie Dennis, and I'm a historian here at this museum with the Lemelson Center for the Study of Invention and Innovation. What we do at the Lemelson Center is we document the history of invention. But we also work with living inventors. Innovative Lives is one of our most successful programs where we like to try to bring young people to the museum, meet inventors face to face and have an opportunity to find out about what inventors are like, how do they invent things and what are some inventors today working on that we might see coming up in the future.

Now I'm pretty excited about today's program. We spent a lot of time setting this up. This may be, I think it's safe to say, our first tri-lingual Innovative Lives, which is to say that when José comes up here he's going to give his presentation in English. Is there anyone in the audience that speaks Spanish? I should ask in Spanish. I'm not going to do that, but if you like, if you want to ask José questions in Spanish, he can answer in Spanish also. Also we have Alyssa who is here in front of me. She's our sign language interpreter, and she will translate the entire program in sign language, and if you have questions that you would like to ask in sign language, she can help you with that also.

Well, today we get to meet Dr. José Hernandez-Rebollar, and he's going to tell you more about himself so I won't go into that too much. But he is a young man from Mexico who came to this country on a Fulbright scholarship and studied engineering at George Washington University, just up the street. So we have a nice local inventor to meet here today. He's going to tell us about his life, what it's like to be an inventor, how he invented the AcceleGlove, which you'll be seeing soon, and how it works. Now I'm willing to be that you guys already know a little bit about the AcceleGlove even though you've never seen it. The first question I have for you is, I'd like to know if anyone here

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

knows what a prototype is? Not you guys. [laughter] Who else? Does anyone want to throw out an answer of what they think a prototype is? Okay.

AUDIENCE:

A working model of a product. It's like a first working model. You do your design engineering, drawing and then evolve your theories and your () your state of the art and you come up with the prototype is just a working model, and that's something to show potential backers so that you can get funding and go into production.

DENNIS:

That's right. Very good definition. I hope you heard that. [applause] That's one use of a prototype. The AcceleGlove that we're going to see today is a prototype, and I want to point that out because it's a bit quirky, and it's not something that you can go to a store and buy yet. But so it's kind of I think a good experience of fun and a unique experience to have the opportunity to see something like that because we don't normally unless we visit labs, we don't normally get to see prototypes. So the AcceleGlove is a prototype.

Then the other question I have for you is how many of you have played with or are familiar with Lego Mindstorms? Okay. So we have folks in the audience that play with those, that are familiar with those. As you know the Lego Mindstorms use sensors. They sense light or motion, sound those kind of things and you can use those to build robots. The AcceleGlove also uses sensors to translate sign language into speech. So it's probably easier to understand how that works. Now before José, when José comes up he's going to tell you about his invention. He's also going to demonstrate the AcceleGlove, and at some point I think he's probably going to need some help from somebody in the audience and whoever gets to help him will get this prize. It is a Spell Well American Sign Language game for the computer that you can take home and try yourself. Also for anyone who's interested we have a gift bag that you can grab on your way out that has some invention related activities that you can take home and try for yourself and play with them and share with your children, that sort of thing. So I'm going to get off the stage now but I want you to give a warm welcome to José. [applause]

HERNANDEZ-REBOLLAR:

[slide 1 & 2] Thank you Maggie. Thank you all for coming. I'd like to start first with something I'm very proud of. That I'm a Mexican, and that is very important to me, and I think it's also important for the whole project. So I was born in Mexico in a state that is in the central part of the country. [slide 3] It's called Puebla. In a very small town I couldn't find on a map. So I just found this. [slide 4] The name. The sign for that name. That is Chietla, and it means "the place where you can find bitter things." So it wasn't bitter at all to live in that place. So the question is how this thing becomes this thing. [slide 5]

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

That's part of the question. How do you become an inventor? One of the things we were discussing during, when we were trying to prepare this presentation was about the perception you have of about what an inventor is, and maybe most of you are familiar with the image on your right than with the image of your left. So I really don't know how this thing happened. I didn't see it coming because I used to play with my friends as any other kid. [slide 6] I used to dance as any other Mexican kid. I used to be kind of pushed by my professors to be always good and behave and get prizes, awards and stuff like that. I enjoyed my family, extended family.

But maybe one part of it was very important to me when I was growing up was this car, this family car. [slide 7] As you saw in the previous picture we lived in center of the country. So one day my father decided to go to the beach and take this car with us. So you can see in this picture the car was very old. It was 1959. It didn't actually work well all the time. So we had to fix it, and it broke down on the way down to the beach. So but my father was always pushing me to be interested in mechanics and be able to repair the car. So when I was growing up, I was having all the knowledge of how to fix the car, and the engine of this particular car is very, very simple. So I learned actually how to fix the car to the point when I was about eighteen, that I would close my eyes—[thump against mike] I'm sorry—I would close my eyes and just by listening to the engine I would know what was wrong with it. I would know, oh it's this.

So I told my father I would become a mechanic engineer some day or maybe I will have my own repair shop. Well, he said no, you have to be an engineer. So I couldn't go to, I couldn't get to the mechanical engineering because there was no mechanical engineering school, but it was electrical engineering. So I said, all right. Sounds like familiar. So I went to the electrical engineering school in University of Puebla, the state university, and then after that it was very funny because when I started my professor said, "All right guys, the first place. All right, situation in Mexico is kind of harsh. So maybe you have to get a master's when you graduate and then you will get a job." All right. So we continue, we got a degree. So I went to the master's, and the situation in Mexico was really harsh. So I went to the master's. I complete my master's, and then it still was harsh. So I didn't get a job. It wasn't easy. So this professor came to me when I was in the master's and he said, "You know what. If you want to get a job in this institute, get a Ph.D." So I say all right. Then I was lucky to get a scholarship as Maggie said already to come to the U.S. through the Fulbright program, and I started my Ph.D. in 1998 at the George Washington University.

Before that I had an experience. In 1996 I came to the States when I was doing my master's thesis. So I had some contact with the culture. Then I never saw my, I never see myself as an inventor, and part of the problem is we don't know exactly what is an invention. So do we really invent or do we innovate? [slide 8] So I had these two columns, and to invent we have to create something that is original. Meaning it's something never built before. You haven't seen this before. According to the U.S. Department of Patents it has to be not obvious, right. So when you see it you wouldn't know what it is by just looking at it. So that is not obvious. But yet has to be reproducible by somebody with enough expertise in that area. Innovate on the other

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

hand, the other column, is to improve upon an existing object. So you have to add the ER meaning faster, cheaper, smaller. That is innovation.

So I was thinking, can we really invent? When we saw birds flying, we wanted to fly. [slide 9] So we came up with an idea of having some wings like in the picture here, but we couldn't really fly. Why? Well, because we are not strong enough to support all our weight. So somebody came with a different idea. Let's have a bigger, larger wings and this thing kind of worked for a while and then fell down. Then someone said, oh add some more strings. So the mechanical parts were included here to move the wings. But it never took off. So how do you really get to fly? You need engines and you need space to control the engines. So this is a process as you can see. One is improving upon the last one until you get to this. [loud noise – jet plane flies across screen] [laughter] Wow. So who really invented the airplane? So birds actually are the inventors of flying, not humans. We are trying to imitate things, and then someone is going just to add something else we missed.

So but let's try. Let's try to invent. There should be a way then to invent anything. Let's do the cane case. [slide 10] What are the two main particular features of a cane? I will say in the upper row, the handle, and in the vertical column, the tip. So if you have a curved handle with a flat tip, you get this cane. All right. We're going good. A round handle with a flat tip or a curved handle with a pointed rounded tip. What is missing? Whoever answers this question gets a prize?

AUDIENCE:

[Inaudible].

HERNANDEZ-REBOLLAR:

Right. So congratulations you're an inventor. So this one is a particular way to do inventions. We are inventing already. You invented already something that was not there. But to invent you have to have knowledge. So you have to know what are the features you are looking for and what is the problem you want to solve. So the method, the methodology actually helps out inventors to come up with new things. You can say that you are just improving upon existing things.

So the AcceleGlove, how this thing came to my mind. Well, I saw this as a communication problem. I said, in 1996 I came to the States with a master's degree. So I went to this company to help them out to simulate things using mathematical formulas to move a telescope, and it was a huge telescope like fifty-meter diameter, 150 feet diameter. So it was very heavy. You cannot just build it and just test it. You have to simulate. So I was in this company and I came to the place, and then I told the engineer in charge that I was going to start simulating the antenna. I said, "I have some experience with this program." So he came to me and he opened the computer and then he said, "All right. This is the mouse." I say, "Okay." "So if you click in the mouse and you move it you can open an icon." I say, "Okay. I have a master's." [laughter] "So I have used

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

computers before.” He looked at me and said, “The right button of that mouse opens a menu.” I said, “I have used a program before. I know math and I have a master’s.” What was the problem? The problem is I didn’t speak too much English. So he thought I didn’t actually know the hardware and the software. So it was a communication problem. So he assumed that by not knowing the language and by having this problem communicating, I would be some kind of, I would say impaired. So it was a translation problem.

But who is really impaired? [slide 11] That is the question. Who is impaired? All right. Let’s see, if there is someone that for some reason cannot do something, I would say I would () that definition. So you are in an accident and then you lose your thumb, you won’t be able to grasp. So you are grasping impaired. All right. So if you cannot see, you are visually impaired. If you cannot hear, you are hearing impaired. So that sounds more or less mainstream knowledge. So okay, what if nothing happens to you. You are not impaired. Is that true? What do you think? Let’s see. So let me see if you understand this. [slide 12] [laughter/audience comment] What about the rest? [audience comment] So something is wrong because last time I checked I took it from a newspaper today morning, and this newspaper is read by millions of Japanese. So something is wrong with you. Okay, okay, okay. This one. Who understands this one? Umm. Same thing. I checked and millions were reading the newspaper and they were able to read it as well. Something is wrong with you. Let’s try another one. Let’s try this one. Let’s see what happens. [silence] Ah. Who understood that? One. Who else? Two. What about the rest? Something is wrong with you. Let’s try a different approach. Let’s try this. [Spanish] All right. What happened? Who understood that? Okay. So what about the rest. [audience comment] So something is wrong with the rest. So you are Spanish impaired.

FILM:

[film of actor telling a story, first in sign language, then in Spanish, and finally in English] Long, long ago when the forest was new, all birds were black or white or black and white. None had colors.

HERNANDEZ-REBOLLAR:

Now, who understood that? So maybe we are all impaired to some degree. So the perception is wrong. In some way it’s wrong about who’s impaired and who is not. So maybe we are all impaired. Then when I saw that, I really felt bad, and I felt bad because when I was in California in ’96, I thought okay. This guy doesn’t understand me but there’s no problem. I know that I have a master’s, and I know I just cross a river to the south and I will be fine. Everybody is going to understand me, and they will respect my master’s.

But what if you are already home and nobody understands you. There is no way to go. There’s no place to go and be safe. So that is something that I have deep in my mind, and when I saw the problem of American Sign Language, I thought I was in the same

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

situation before. So with American Sign Language happens something very similar. You have this language and it's originally from North America, the United States, but you don't have translators, I mean, electronic translators. You don't have automatic means to translate American Sign Language as we have from English to Chinese or from English to Spanish. We have this very nice electronic devices. You can type anything in English, and just by pressing a button you will have the translations right away into Chinese into Spanish, Italian or whatever. But we don't have it in American Sign Language. So why? Why we don't have that one.

So I started doing my research. If I wanted to invent something to solve, I had to have more information. So the first thing you have to know is what is a sign because it's a language composed by signs. [slide 13] So what is a sign? Do we have a description of a sign? Do we know what is a sign? So I found that signs are made up of subtle expressions. Who signs? Do you sign? Yes. You or you, yes. Okay. So do you sign? All right. Who has signs? Do you? Hmm. That's weird because she did something like this. What does it mean? No. So that's a sign already. She's expressing something. So that is just by the facial expression. So what if she said, I don't know. Right. So this is, no. This is, yes. So that, we're expressing an opinion. So what, wait a minute. Who told you that this means yes and this means no? [audience comment] Exactly. Yes, so it is culture. So for some of us in this side of the planet when we say me, we say this [gesture]. On the other side of the planet, when they say, they will do something like this. [gestures] () would be me, me and we here in the south would say me like this. Me. So that is just cultural. Then those kind of things you have to learn. You have to learn those things. So those have a meaning that has been assigned arbitrarily. There is no way you may know what is the meaning if you are not in the culture. But what if I say something like this. [gestures] What am I doing? I'm drinking. So that's already giving you a clue of what I'm trying to say. What if I do this? I'm walking. Right. So those are pantomimic. You are doing, you are acting the signs. So all of those combined make up a sign language. So from all those kind of things, what can you really, really, really capture and then translate.

Well, I was thinking that maybe I could just go into the program of capturing and translating those signs that really need an interpreter. You don't need anything for pantomimic and you don't know anything for facial expressions because they're so cultural. You need something for arbitrary signs. So for arbitrary signs I concentrate only on hand and arm. For gathering that I went to the literature, I went to the factories, and I find these different ways to capture movement of the hand. So many of them are very similar. [slide 14] The upper row, those are using resistive sensors. So when you bend the fingers a resistor is changing resistivity. You can take that into an electronic circuit, and actually measure how much are you bending. The other ones in the middle row they are using light. This one uses light. This one uses light as well. So all of them are working fine, but the problem is that they were not designed to capture American Sign Language. So they are used in other games. They are used in virtual realities and other labs and games. This one is for gaming. So I need to know that and I need to know American Sign Language.

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

So I was looking into all the different hand shapes you have to do when you want to communicate using your hands. I found about forty-two different postures, hand postures. Those are combinations of fingers bent and palm in a different orientation. Like vertical, horizontal, upside-down. So by combining those bending and orientations, you can start giving some clues about what do you want to say.

So what is the other part? Besides hands shapes you have to know where the hand is all the time and then capture the movement. So I came up with my own glove. [slide 15] First of all because the other gloves were very expensive, and I didn't have any money. So necessity is really something that pushes you to improve things. So we didn't have any money. We have to come up with a very cheap solution. So these sensors, I got them for free. I have to say thank you for the factory for sending me this sensors for free, and I spent about eleven dollars in putting all these things together. That was because I have to buy the battery (), and a professor of mine gave me the first microphone and said, okay, play with it. The plastic () you can see here is the one to capture the elbow, how it bends and this () here measures how your arm is twisting. So by knowing those angles, you do some geometry, and then you will find the position of the hand with respect to your body. That is very necessary for American Sign Language because if you want to do something like this, the palm on your head, that is going to mean something different than the palm on your chin. So those are two different signs. So this sign if I'm right is for father, and that one is for mother. I don't know why male signs that refer to male are up on the head and signs that refer to the woman, female are down on the head. My wife always said, it's in a fight why she doesn't get the other way around. But I won't go into that detail. That's why, it's not to me to solve.

So once you do that then you need to know what the position all the time. So you will know if you are moving forward towards right, left and so on. So what are the properties of this device? [slide 16] We have () the position of the fingers and they have to be independent of size because if you have a big hand and a small hand, they have to be the same when you close your fist. This is an A. An A is independent of size. So with the other gloves I found that they were dependent of size. But with this one they are not because the sensors are here, and they are just looking into how much are they facing gravity. So if they are pointing down, the measure is going to be always the same regardless of size. The () also help me out with the problem of different arm lengths because normally how big, how tall, how skinny you are every time you bend your elbow to some degree and twist it like this, they will end up on your opposite shoulder.

[End of Tape 1, Side A]

[Start of Tape 1, Side B]

HERNANDEZ-REBOLLAR:

By the same degree. It really doesn't matter how tall you are. So the only thing that as missing was a microphone in order to get all the signals and send those signals to the computer. I came up with a methodology to detect all this sensors in a very fast way and then relate everything single movement to an American sign, a sign from American Sign Language. [slide 17] So let's do a, let's see what we can do actually signing with this thing. I have a computer. This is a computer right here. This computer is very portable. I'm going to try to demonstrate how it can do signing. The glove is all wired, and I'm going to set this, all right. So the computer is working with a special program we wrote for this special occasion. Cross your fingers I think it is going to work. Okay. So one thing we need to know is where your hand is. So as I said if you do something like this. Okay. But you have to turn it on. [tapping] Okay.

ACCELLEGLOVE:

Hi.

HERNANDEZ-REBOLLAR:

Okay. Start with a ()

ACELLEGLOVE:

Good Afternoon. Welcome to American Museum of History. This invention translates sign language to people and voice and written English. You understand. [applause]

AUDIENCE:

I have a question.

HERNANDEZ-REBOLLAR:

Yes.

AUDIENCE:

Can you show thank you and good, and we can see the difference between the two, between thank you and good. Can it recognize the difference between the two?

HERNANDEZ-REBOLLAR:

Yes.

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

ACELLEGLOVE:

Ready.

HERNANDEZ-REBOLLAR:

Oh. The difference for those do not know American Sign Language, the difference between thank you and good is movement. Thank you starts at the chin and then goes away like this. Good goes from the chin down. It is a sign that is performed with two hands. So formally you would have to use your second hand to say good. Good. But it has been modified for this particular application so we can use only one hand.

AUDIENCE:

[inaudible]

HERNANDEZ-REBOLLAR:

We have a second glove, the left hand already connected. The problem we are facing is the way to indicate the computer that the sign is about to be performed and that the sign has been performed. So in this application that I'm showing is that one hand portable translator with only one hand. I'm using my second hand, the non-dominant, to indicate to the computer that the sign is about to start and the sign has finished. You have both gloves, the approach we're using is using a microphone in front of you, of your lips, and then you will blow to indicate that one sign goes after the other. So that application is a little more complex and is going to take me some time just to figure it out. How to actually break down those sequences. A good thing is that we can also use any some devices to put whatever is on the screen to place in front of your eyes. So you will be sure that the computer is actually recognizing the beginning of the sign in the right way before you blow to indicate the beginning. Then that version hopefully is going to be finished by the month of October. We are going to present that to a conference. We already submitted the paper. So I went to do the demo for that conference and there's going to be another public demonstration in November where we are trying to show the two hands. So ()

ACELLEGLOVE:

Thank you. Good.

HERNANDEZ-REBOLLAR:

Those are the thank you and good. The signing, the device is able to detect up to eleven different positions with respect to the body. It's able to detect head, chin, cheek, chest, shoulders, front of the head, front of the chest, front of the stomach and elbow. With more precise positions, we were able to detect side of the head, right side of the head and

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

front side of the head. But we didn't have the sign that used that original position. So that is another problem. The glove itself can detect different postures, but those postures are not used in American Sign Language and there are some postures in American Sign Language that are used, but the glove was not able to detect. So that is a compromise. So far we have about 330 different signs performed with two hands, 220 performed with one hand.

So we're trying to improve the glove as I said. We're going to innovate the glove. So we're going to be able to detect more hand shapes and then more movements. If you combine forty-two different postures with six basic movements and eleven different locations, how many combinations you have? Hmm. I don't know. But the system needs initial position and movement and final position. The initial position is made up of forty-two different postures and eleven different locations. So that is forty-two times eleven. The movement is six different movements so that's eleven times forty-two times six and then the final is another forty-two postures with eleven positions. So that's eleven times forty-two times six times forty-two times eleven. So whoever gets that number right gets a prize. [laughter] So it's a huge number.

AUDIENCE:

() more processing space or memory?

HERNANDEZ-REBOLLAR:

One of the problem is sensors. That's one of the first problems. They are not accurate enough, but the processing is very fast. It is enough as it is right now. We are using a Pentium processor. We are killing, overkilling the application, and the memory is really, really reduced because the way we broke the signing as just initial positions, movements and final positions, those really small amount of memory. There are just a matter of new sensors.

AUDIENCE:

() improve the performance of it.

HERNANDEZ-REBOLLAR:

One thing we're looking into is to change the skeleton for another infrared sensors that are going to be mounted on the shirt. Basically a triangular set of sensors. One here, one here and one here. Those are going to send signals to the glove, and the glove is going to answer back. So by knowing these three positions and by knowing the distance that we, the glove and each one of the sensors need to know, you get to know where the hand is with respect to the body. But we haven't developed that yet. We know all the theory. You have to implement that. The sensors are not yet available to us. They are available for a company, and so we're looking for the company say they will allow us to get to the

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

system and modify for our purposes. So that is one thing. I think that is going to be done, oh I hope in the future.

There is another line, as you saw I'm doing word by word. So there's another professor at Georgia Tech working into this signing phrase by phrase. That is going to be faster. So you have to keep your eyes open, and I keep you posted.

Then what are the applications of this thing? [slide 18] I just told we can already translate sign by sign. But we cannot feel, we cannot yet do sign language translator because we need more words. You cannot communicate with only two hundred or a couple of hundred words. So what is the first step we want to try? Okay. The first application is a dictionary. As you saw I can actually distinguish between one sign and the other just by placing my hands. One problem, big problem that I had when I was studying American Sign Language is that I knew this, but later on what does this mean? Father. Will you remember that quick? [audience response] Good. Okay. You knew it already, but the problem is when you are learning a new language you need a dictionary, and there is no American Sign Language dictionary out there. So there is no way you are going to remember this if you don't have a supporting book, a dictionary. So right now you can go to the bookstore and find from English to sign, from father to this. So what if you know this and you are looking for father? There is no way you are going to do that with an English to American Sign Language dictionary. It's the same thing. You want to look for a word in Spanish by having just an English to Spanish dictionary. Makes no sense. So one of the first applications we're going to try is () the thing, put it in here and the computer is going to tell you oh, maybe it's father. But if you move it is not father. So that is a dictionary already.

The second one is of course the translation. When you are learning American Sign Language, you want to know what does it mean and then to practice by doing it the right way. The other one is learning tools. The first thing you learn when you are doing American Sign Language is the alphabet. That is a little bit simpler, a little bit. Because in that one you don't need movement. You just need postures and games. Those games used in American Sign Language.

So I'm going to switch to the games. In this game we're going to have a prize. So let me see how many hands are up when I ask who knows the American Sign Language alphabet. Who wants to volunteer? Yes, can you choose it. All right. [computer USB port sound] So this first game this game is about finger spelling. It is a challenging game. It will show you first all the alphabet. You know the alphabet.

CHILD:

Um hmm.

HERNANDEZ-REBOLLAR:

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

Okay. So if you already know the alphabet you can skip this one. But now you are going to practice. So keep an eye on this guy, called Marvin and--

CHILD:

() H

HERNANDEZ-REBOLLAR:

So can you work (). Go ahead. () all the way. Okay. All right. So H, is it? () O, [pause, quiet talking] R. And this one. All right. Do this, don't stop [laughter/applause] [Break in taping.] () so you see this program now is being used to practice finger spelling. My first challenge when I was learning American Sign Language is I didn't have anyone to practice with.

CHILD:

Can I go down?

HERNANDEZ-REBOLLAR:

Yes. So this program is challenging the most difficult part of finger spelling that is the perception part. It is really easy for me or maybe for you to do the finger spelling. But when someone is finger spelling back to you, you are in trouble. So this one is going to challenge you to understand finger spelling when someone is spelling to you, and it is going to ask you to practice. So that is the first game, actually the second. The second game we are going to try to improve, and for those who are experts I have a challenge. You got it right. [audience comment] No, I'm just challenging you. Okay. Yeah. [perhaps audience activity] Can you spell it back? So you got it? You got it?

AUDIENCE:

[saying letters] [DISEASE?]

HERNANDEZ-REBOLLAR:

She gets a prize. Finally the last game I want to show you is the game for kids. This one goes one step further. This one you know a little bit of sign language already and just you want to practice how many words you know. They are eleven different categories. I would choose just this one, colors, and it will show you the sign and it will show you the object. Here you are supposed to spell what this thing means, which is colors. So right now the software accepts the key word so you can spell just by typing, but the idea is you are also supposed to practice finger spelling. So this one is very controversial word because it can be spelled like this or with an E. So there was a fight. Does an E mean anything? So we found a dictionary you can actually spell it without the E. That's

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

another different color. Oops. Yellow. It's a game because you see the bucket going through the maze and gray, green, and green. Blue and I won.

So these are the applications we think are practical right now. These programs were developed using funding from the Department of Education. We really appreciate that help. That money is going to be used this year to conduct a user study. The piece we want to prove is this device and this program together can actually accomplish a faster acquisition of English and spelling for kids. Hopefully it's going to be proved right and not proved wrong. So for the last part of the talk I'm just going to pick up questions, and I will try answer as best I can, in Spanish as well.

AUDIENCE:

I want to know how you're adapting to each person. I was just wondering how this can adapt to each person because each person has their own sign style?

HERNANDEZ-REBOLLAR:

Yes. One thing we have to be very careful with the devices when they are new is that they ask the user to accommodate to the device at the beginning. Something similar happened when graffiti, the interface for PDAs was introduced. If you have used that device, you have to type every single letter in a different way. I wanted to use my handwriting. I never got it right. So I have to accommodate my handwriting to be capitals, capital letters. The new devices, they are better. They can actually accept some of the handwriting. Loose handwriting. This thing is very similar, has a very similar problem. The first thing we did when we designed this thing was to ask seventeen different users to do the A, B, C, D, et cetera. We averaged the different postures. We had some good postures and bad postures. That tells us that the device was good for almost every single posture except for [very difficult to differentiate is M and N] M, N. So the problem with M and N is that they are very close to the S. So we found out that N can actually be performed like this. M, like this, N, like this, N. So this one is easier for the glove. So the glove is going to recognize this N only and this M only. So we are asking the user to accommodate for some particular hand shapes and some particular postures. The position of the hand is not a problem. That is fine. Whatever you do is going to be picked up right. The postures are going to be required to be signed in exact way. So nothing like this for the R, but this. Nothing like this for the B, but this. So it requires do the formal execution, and that's a must.

AUDIENCE:

[inaudible].

HERNANDEZ-REBOLLAR:

The methodology is made in the way that you can actually program the output of the device to mean different ways, different things. I want to say this. When you do this you

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

have the palm in your head. You just tap and you finish with the palm on your head. That means what happens to me father in American Sign Language. So we have a different language maybe this thing means different. So it really doesn't matter what language you're using, you just have to change the output or the meaning. I said, and that was a very strong argument in my presentation. I said that every single sign is performed just by combining poses and movements. So it really doesn't matter what sign language you are using. It has to be a sequence of poses and movements. Poses are just composed by hand shapes and orientations and positions. Movements are just a change from one pose to another pose. So if you are now trying to use this for this particular sign language, the only thing you have to make sure is the glove is actually able to detect the postures for that particular sign language. The rest is just sequences of poses, movements and poses. We haven't done that yet. We haven't changed this to another language. But that's a theory behind. Yes.

AUDIENCE:

I have two questions. [inaudible]. First is since you're translating between different spoken different languages () translate from American Sign Language to English () therefore () your glove can then be () spoken () be translated to any word.

HERNANDEZ-REBOLLAR:

The answer is yes. But at this point it is going to be word by word. Word by word and as you know it is very difficult to translate one word from English to another word exact word in Spanish or any other language. It's very difficult. It would mean, it would lose meaning. That's the most I'm sure it is going to miss the meaning. But this is the first step. It has to be, you have to take into consideration the meaning of the whole sentence if you really wanted to do an exact meaningful translation. But right now it's yes. The answer is yes. You just change the output from father to papa, from mother to mama, or if you want from morning to matina and Italian if you happen to know Italian. So it is possible but the translation is not going to be that accurate until you get the whole phrase and then translate the whole phrase to keep the meaning.

AUDIENCE:

What was your introduction to ASL () and had you had experience in sign language or signs or the alphabet or ()?

HERNANDEZ-REBOLLAR:

No. No. My only introduction to the problem of languages was my experience in 1996 when I had my master's. It's also funny. When I started doing this thing and I went to the professor, American Sign Language professor, and I told her that I wanted to take the course. I didn't want to pay for the course. I just wanted to audit the course because it

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

wasn't going to be counted towards my credits for Ph.D. So I told her I wanted to take the course, audit and then I explained why. I want to do this American Sign Language translator. She said, "Forget it. Forget because it's impossible. It is impossible to translate one language to another language by an automatic means." She was right. So it is not possible. What you can do is just go step by step and then do sound by sound, phrase by phrase but the language to another language by automatic means I don't think that's possible. So I said, "Ah. But I want to do it." So I started taking the classes and it was out of curiosity and the question is why, why there's no American Sign Language translator if the technology is there. That was the main motivation. Yes.

AUDIENCE:

How much more time do you think ()

HERNANDEZ-REBOLLAR:

That depends on what fully functional really means. I'm going to say ().

AUDIENCE:

()

HERNANDEZ-REBOLLAR: Yes. The first, the application for this gaming is almost complete. You have a glove that already detects all the twenty-six different postures. We invented this one to say enter like in the keyboard and we invented this one to say backspace for example. It works, works fine. But the prototype is not ready for the market because it breaks and is very fragile. So we are right now we are looking into a designer to come up with a better design that is () and lasts longer, and you can actually drop it and do whatever you want with it and it won't break.

[End of Tape 1, Side B]

[Start of Tape 2, Side A]

HERNANDEZ-REBOLLAR:

Than we have right now. So by having new sensors, and I just got yesterday by the way, we are going to be able to do that. We are going to be able to reduce the wiring. We're going to be able to reduce the size and price. So that's another thing. When you want to go to the market there are more different variables you have to consider. One is who is going to work this thing. How much are they willing to pay for it. Those are not part of the research for a scientist to decide. So there is someone else looking into those variables right now. We hope that by the end of, I was hoping by the end of the summer, but I don't think it is going to be possible. So by the end of the year we have a good answer to that question. Yes.

AUDIENCE:

[inaudible]

HERNANDEZ-REBOLLAR:

Where is it? I have it here. The question about the voice. The voice right now is being reproduced by this synthesizer. So it is not part of the computer. This one can be programmed to have different pitch and different frequencies. So it can be programmed to have different voices but not quite different. There is another voice synthesizer on the market that can actually be programmed to have a female voice, a male voice, a kid, like a children. But this one in particular is not that kind of synthesizer. Even though the other one is cheaper, I didn't know about it when I started this demo. But they are different synthesizers in the market.

AUDIENCE:

I have a second question. [inaudible] find an English order () ASL syntax because () English word order, and my second question is it seems like it is only one-way communication from the deaf person to the hearing person. So how would you propose from a hearing person to a deaf person?

HERNANDEZ-REBOLLAR:

The answer to the first question is unfortunately, yes. We have a word to word, sign to word translation. Then you have to sign using exact signing, English exact sign. There's a justification for that, and that is that when I speak Spanish to someone that is not proficient I speak in a different way. I do not use slang. I do not use any word that comes from my region. I do not sure any Mexicanisms. That's a bad word. Anyway, I change my way. I change the way I speak Spanish. When I speak to someone that is Mexican, I do all the bad things. [laughter] The same thing happens with American Sign

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

Language. When you talk, when American Sign Language native speaker or native signer, signs to a non-native signer, it is going to change naturally because you know that the person is not proficient. So they will try to accommodate to their needs.

So that is one justification. That justification is not enough. There is also another problem from the engineering point of view. But we are working on a phrase by phrase so you will have to, you will sign in the ASL order, and then after you sign the whole phrase, it will be translated into an English sentence in the English order. The problem with that is that you are going to be constrained to signing only those phrases. If you think about the freedom you have when you have all these words and you can combine them in any way, you will see that it's different when you have only phrases and you can actually do it that way. So one is freedom, but not grammatically correct. The other one is constrained but grammatically correct. Which one you are going to choose is going to be up to the user. Yes.

AUDIENCE:

[inaudible—two questions]

HERNANDEZ-REBOLLAR:

All right. That's a good question. Here is the answer. The answer is yes. The glove recognizes finger spelling, and that's the thing we did with the games. That's just finger spelling. The way this thing is programmed allows you to actually come up with your own sign. Then I will show you just quickly this dictionary. This is my dictionary. So I just said, as you can see the palm on your head, away, it's hi. But now it's written in Spanish. It says hola. Right. This is the only thing you have to change in the dictionary to come up with a different language. Now it's Italian, ciao. So if you come up with your own language, then you can change whatever you want. Then instead of doing this, you want to change it to what, this. To this. So you just change here the initial hand shape and you do uh, now it's going to (). It's going to go (). So now this sign describes this sign. This is your particular sign, and this is your particular meaning. So whenever you do this, it's going to say ciao and that's yours.

AUDIENCE:

It's an interesting topic. If we were interested in either your work or other work in a related field, do you have any recommended URLs that we can visit on the web perhaps ones that would allow us to branch off into different areas?

HERNANDEZ-REBOLLAR:

I [computer beep] give you then my email address and give you my web page, URL. So you can write to me and I will share all I know about this. [slide 21]

AUDIENCE:

José Hernandez-Rebollar Innovative Lives Presentation, August 3, 2005

Archives Center, National Museum of American History

()

HERNANDEZ-REBOLLAR:

De nada. So that is my email address. That's my home web site. But any complaints that, it gets into that email. If there's no other questions.

DENNIS:

Yeah, that's the end of the program, the official time but if you have questions, you want to come se up close, José will stay (). [applause]

HERNANDEZ-REBOLLAR:

Thank you.

[End of Presentation]

Transcribed by L. Altizer, January 26, 2006