Virtual Reality conference

Unedited posts from archives of CSG-L (see INTROCSG.NET):

Date: Tue May 17, 1994 12:06 pm PST

[From Richard Thurman (940517.1000)]

I just returned from a Virtual Reality conference in San Jose. During the week
I was away from CSG-L I kept thinking of what PCT had to say about the topics
presented in the sessions I attended. With almost every sentence uttered by
the presenters I couldn't help but think "No, you have it backwards -- quit
looking at behaviors and actions. If you concentrate on actions you are little
more than an animator. If you want your 'virtual actors' to be 'real' then you
have to get them to control what they can sense, not what they should do."

The consistency of the presenters mind set was astounding. Even those familiar
with classical control theory had bought into the 'control of behavior' mind
set. It seems that the two groups (behavioral/social researchers and
engineers/ programmers) feed off each other. The engineers/programmers look to
the social sciences to explain how people 'act' while the social scientists
look to the computer metaphor explain how people 'think.' They are both asking
each other to confirm their mind set. Astounding!!!

The most interesting session I attended was one on populating 'virtual space'
with intelligent actors. One of the presenters, David Zeltzer from MIT,
discussed the problems they were having trying to get a virtual actor to do
anything close to 'real.' It seems the biggest triumph he could think of was
something researchers were doing at Dartmouth to try and "get a robot to
follow a moving object with its eyes." He said after 5 years of research they
were getting close and that "no one else" that he knew of "had even come close
to being able to do that." I wonder what he would think of the arm demo?

Anyway I couldn't wait to get back and get my "CSG fix." I'm glad to have CSG-
L available and really appreciate the dialogue that goes on here. Even though
I do more lurking than talking I consider reading CSG-L to be a very important
part of my learning about PCT. I think its good to have healthy question and
answer sessions and I have appreciated the diverse points of view given on the
net. The think that has been most valuable for me has been the sharing of
insights, ideas and conclusions which PCT brings us to. I hope that does not
stop.

Richard Thurman

Date: Tue May 17, 1994 3:01 pm PST

From Tom Bourbon [940517.1657]   Richard Thurman (940517.1000)

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     concentrate on actions you are little more than an animator. If you want
     your 'virtual actors' to be 'real' then you have to get them to control
     what they can sense, not what they should do."

Welcome back to virtual reality of the csg-l kind, Richard. So, in yet another
group of people whom you might think would "get it," they don't get it.

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     engineers/programmers look to the social sciences to explain how people
     'act' while the social scientists look to the computer metaphor explain
     how people 'think.' They are both asking each other to confirm their
     mind set. Astounding!!!

This is really interesting news, Richard. The relationship you describe looks a lot like the one between cognitive theorists on the one hand, and (cognitive) neuroscientists on the other. People in each group look to those in the other group to confirm and explain their own work. And of course, thinly veiled beneath the surface are all of the lineal notions that place behavior-as-actions at the end of a causal chain that runs:

    environment-->neuro-cognitive information processing-->actions

with hardly a hint of a variation on the time-worn theme. Many of those people are so blind to the fact of control that they believe their ideas can easily explain everything PCT explains -- and more. All they need to do is say, "of course the relationship between organism and environment is reciprocal," and that makes everything all right.

So now even the very hottest hot new area in computers and technology is infected with the same old lineal notions about behavior. This must be what experimental psychologists are talking about when they look at the rapidly progressing disintegration of their field and say, "This is just the natural evolution of a science. Now we are giving away the fruits of a mature psychological science, which will be absorbed into an exciting array of new disciplines and fields." (I'm paraphrasing, but I've seen those ideas in a number of places in the past couple of years.) It sounds like the cutting edge in "virtual reality" is a lot like old warmed over "psychological hallucination."

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>   he would think of the arm demo?

That sounds like a video I saw at a workshop/summer school two years ago of a "leading edge" demonstration of an artificial arm attached to a camera-equipped computer that took several hours to work out all of the inverse kinematics required for the arm to reach a stationary target. When the trajectories were worked out, the camera turned off and the arm moved, blindly, to the target; it followed the plan-program worked out by the computer. A couple of days before, I had run a demonstration of the Arm program, but that was already forgotten. When I asked the obvious question with the equally obvious answer ("What happens if the target moves after you turn off the camera?"), the presenter (and several people in the audience) said, without blinking an eye, "It can't do it." That fact didn't seem to bother anyone.

Can you tell us anything else about the amazing and wonderful things you saw, Richard?

Later,   Tom

Date: Wed May 18, 1994 2:20 pm PST
Subject: Virtual Reality; understanding PCT; misc.

[From Bill Powers (940518.0930)]   Richard Thurman (940517.1000)

Your conclusions about the Virtual Reality conference were most interesting. It's frustrating, isn't it, to see these very smart and accomplished people going about solving the problem backward. When I was designing control mechanisms for people, I often went to the literature to see if I could pick up any hints, but always gave up and went back to my own simple-minded way. First you decide what variable(s) you want to control. Then you devise a sensor and input function that will create a signal representing the state of that variable. Then you find output devices that will affect that variable. And then you fiddle with the control system until the signal representing the

variable stays close to whatever reference signal you give it. Simple and effective, for the sorts of control systems I built. You can search the literature and textbooks all you like, and you'll never find the procedure laid out that way.

I always felt, however, that a real control engineer, with an advanced knowledge of mathematical analysis, could produce much better performance than I ever got. My systems worked well enough for the requirements of the job, but I always thought that they were crude. How I would love to see control engineers get into PCT, if we could find any who haven't already been contaminated by the control-of-output idea! There are so many brilliant young people out there who can program rings around a plodder like me, who can handle complex mathematical analysis, and who are full of the fires of spring. PCT is really going to leap forward when some little group of young hackers and engineers gets turned on by PCT and takes off with it with the same intensity they put into designing toys.

Incidentally, would you like Arm Version 2? It doesn't control quite as well as Version 1 because the dynamics of the visual systems aren't quite right for working with the dynamical model of the arm. However, it not only turns its head to follow the target, but its eyes track the target _individually_, so you get convergence of gaze as well.

The real difficulty in having the eyes track a real moving object is in discriminating the object from its background. "Object recognition" won't hack it, not the way it's done now. The system doesn't just need to know THAT an object is there, but what to call it. It needs a continual representation of the object that is unaffected by the background, and it needs to know WHERE the object is in retinal x-y coordinates at every instant. If anyone is close to solving that problem, I haven't heard about it.

Doing this in Virtual Reality is easy, because you can simply tell the system where any image is on the retina.

Best to all,   Bill P.

Date: Wed Mar 15, 1995 3:16 pm PST
Subject: Catching Up -- virtual bodies

[From Richard Thurman (950315.0840)]

Bill Powers (950313.1540 MST)

>   The real payoff of negative feedback comes when there are complex
     relationships between input and output. By feeding back from the final
     result to intermediate stages of the forward process, we can simply
     eliminate the complex computations that otherwise would have to be done.
     The feedback accomplishes with a few simple connections what would
     otherwise have to be done by computing the inverses of all the forward
     functions that lie between input and the final result. That's how the
     Little Man arm model can stabilize a 3-df arm in real time using only
     about 30 or 40 lines of code, where the equivalent open-loop performance
     using inverse kinematics and inverse dynamics would take a Cray computer
     to run as fast, and would use hundreds of lines of code.

I was in England at a NATO workshop on the uses of virtual reality in educational technology. While there I talked with several companies about the possibility of using PCT as a basis for building artificial (virtual) actors within these environments. Some companies are now using inverse kinematics for getting their virtual actors to move about. I tried to explain the problems of computing the inverses of forward dynamics as a way of providing movement (with some little success). At least one company was (sort of) interested in looking at PCT as a way of providing a less computationally severe approach to the problem (perhaps they were just being courteous -- after all they see me as a customer of their products). After describing the Little Man demo and telling them that it took less then 100 lines of code to get a stable arm-shoulder model, I took the liberty of asking them if they would be interested in loaning some equipment to develop a fuller model. They indicated they were willing to entertain the idea.

This may be an avenue worth exploring. I have tried for about a year to use the resources at my lab put the Little Man into a virtual environment, but so far have not been able to make it happen. There are just too many constraints here. (Mostly because I am not a programmer and I can't do the coding myself.)

Bill, (or anyone else) if I can talk them into loaning out some VR equipment (a UNIX based CPU and peripherals, some development software and 'C' library routines) would you like create a virtual actor? It may be an opportunity to get PCT out there as a 'standard' for creating virtual entities.

This is all very tentative but I thought I would at least try to see if the VR community and the PCT community have an opportunity to help each other. Is it worth pursuing, or do your interests head in another direction?

Rich