Oral History Interview with

Allen R. Hanson

April 15, 2021

Via Zoom

Conducted by Jeffrey Yost

Charles Babbage Institute

Abstract:

This interview was conducted by CBI for CS&E in conjunction with the 50th Anniversary of the University of Minnesota Computer Science Department (now Computer Science and Engineering, CS&E). Professor Hanson briefly discusses his early education and interests through his graduate education completing his doctorate at Cornell (dissertation was on games and prediction problems). Most of the interview focuses on his career and he was one of the early faculty members of the newly formed Computer Science Department at the University of Minnesota. He discusses the early department, interaction, and teaching, and research. His research focused heavily on vision and computing, pattern recognition, and AI. He partnered on early research with University of Massachusetts Amherst's Ed Riseman and later left University of Minnesota to join the CS faculty of UMass and lead the lab in this collaboration. Among other topics, he outlines his evolving research, applications in medicine, autonomous vehicles and other areas, as well as reflects on a range of issues on research funding, and computing and society. Finally, he briefly discusses Applied Imaging, Dataviews and concurrent enterprises he led/helped to lead.

Keywords:

University of Minnesota, Computer Center, University of Massachusetts, Dataviews Corporation, Amerinex Applied Imaging Corporation, Cornell University, computer vision, robotics, artificial intelligence, computing and society, and medicine.

Hanson: Hi!

Yost: How are you?

Hanson: Pretty good. How are you doing?

Yost: So, are you ready to just get started?

Hanson: Sure! Whatever you want to do. I'm not sure how much I'll be able to give you, but we'll see.

Yost: Ok. Well, I hear that a lot and oral history is really useful. People tend to remember more than they think they will.

Hanson: So, who have you talked to already? Anybody I know from back in the 70s?

Yost: An oral history was done long ago before I came to the Institute, CBI, by Bill Aspray with Marvin Stein.

Hanson: Oh, yes.

Yost: And on this project, I've interviewed Jay Leavitt—

Hanson: Oh! How long ago did you talk to Jay?

Yost: It's been probably about nine months.

Hanson: How was he doing when you talked to him?

Yost: He was in a hospital bed.

Hanson: We can get back to this later. But go ahead. Who else have you talked to?

Yost: And then I interviewed Maria Gini. She is an AI person and was hired after your time.

Hanson: I don't know her.

Yost: Kurt Maly.

Hanson: Kurt? Yep.

Yost: And Bill Franta. That's it so far. I've got some lined up with people in the near future and I think the department is going to want to do about three of four of these a year and collect oral histories with many of the faculty members that are still with the department but nearing retirement.

Hanson: When I first came here, I think Ben Rosen and Marvin Stein were acting department heads. The department was in the throes of just being formed and there were a lot of issues in the process of getting resolved.

Yost: Right.

Hanson: It was kind of chaotic. Everyone was focused on both teaching and getting the department functionally organized.

Yost: Ok, well, I'll just begin with the interview and start with a preamble now and then onto a few basic biographical questions and then move on to your education and then onto the University of Minnesota and beyond.

Hanson: Sure.

Yost: Can you tell me when and where you were born?

Hanson: I was born in Jamaica, New York in 1942. When I was in third grade, we moved to the small town of Morris in upstate New York. It was a mostly a farming town, probably 800 people at most. Do you know where Utica NY is?

Yost: Yes, I do.

Hanson: We lived about 40 miles south of Utica.

Yost: I guess, before I asked that, I neglected a brief preamble. This is an oral history being conducted by the Charles Babbage Institute. I'm Jeffrey Yost, a professor at the University of Minnesota, and director of CBI, interviewing Allen R. Hanson, and this is out of the Computer Science and Engineering Department's 50th anniversary project. It's April 15, 2021 and I'm in Minneapolis and are you in Massachusetts?

Hanson: Yes, I am. We are located in Shutesbury, MA, a small town about 6 miles east of Amherst.

Yost: Ok. Can you describe yourself as a student? What were your interests in primary and secondary school and were there certain aptitudes that you had that you or others noticed?

Hanson: No, I don't think so. I was just a normal kid and was interested in a lot of things. It was a very, very, normal childhood in a small town. Everybody knew everybody else and everybody knew what everybody else was doing, what they liked, what I liked. I played basketball, football, volleyball and the like. The high school was so small that all the students, men and women alike, played most every sport. I enjoyed it very much. I look back on it and I think that a lot of my long-term beliefs and ways of dealing with things can be traced back to the small-town nature of Morris and the people I knew. I'm still very good friends with a many of them.

Yost: Great. Can you tell me how you came to decide to go to Clarkson College of Technology?

Hanson: Well, not in any way that would make it sound like a well thought out decision. First, let me say that I was always interested in science and mathematics. I was talking to a friend of mine when we were all trying to decide what we were going to do. Both of us had always sort of been interested in electricity, electronics and the like and we had both sort of settled on electrical engineering as a possibility. Since Clarkson was nearby, and was a good school, we both decided to go there. There was no deep reason for doing that - the decision came fairly easily.

Yost: Did you know you wanted to major in electrical engineering from the start?

Hanson: Yes, I knew I wanted to do engineering. And like I said, I always had an interest in electrical things, so electrical engineering was an obvious choice for me. It wasn't hard. This was before computers were widely available.

Yost: Before they had a computer?

Hanson: Well, this was in 1960, yes.

Yost: Oh, yes, but the ENIAC was the first electronic digital computer and that was in 1946 done for the Army at Penn's Moore School.

Hanson: Yes, right, but commercial computers were not in widespread use yet, especially in small colleges etc. Sure, there were experimental computers all over the place, but—

Yost: Right.

Hanson: But high schools didn't have access to them, and when I first went to Clarkson, there weren't any available to students. In fact, well this is probably getting off the subject line, but a friend of mine and I were wandering around the basement of one of the buildings at Clarkson and we came across an apparently abandoned IBM computer. If memory serves, it was an IBM 1130 (I think). It had been donated to the college. No one really knew what to do with it, so they put it down in the basement. Just for fun, we got an extension cord and plugged it in, and it worked, surprisingly enough. We didn't know what to do with it either. Bottom line is that I really didn't have much experience with computers until I went to Cornell.

Yost: In majoring in Electrical Engineering, did you think at all about computers in the first half of the 60s when you were at Clarkson or was it just other aspects of electrical engineering and engineering that you were thinking about at that time?

Hanson: I should mention that it was during this period at Clarkson that I met Edward Riseman. Ed and I and couple of other people who were also interested in computing started looking into computers and their capabilities. There were, of course, an ample number of books available on all aspects of computers, from physical structures to artificial intelligence. Ed became a lifelong friend and colleague. In later years we started the Computer Vision Laboratory at the University of Massachusetts.

To get back to your question, my electrical engineering background is more in system design, both electrical and computational. But, yes, the little computer that we found was kind of interesting and got me interested in it enough to start looking into it. When I went to Cornell in 1964, I was still in electrical engineering because they didn't have a computer science department yet. Consequently, the people that were doing computing there were in the electrical engineering and mathematics departments. It was there that I got really interested in computers and computing as a potential career path.

Yost: Early in grad school, did you take any courses in computing or programming at Cornell?

Hanson: Yes. They were just starting to look at the applications of computing in systems, and so there were one or two courses that I took. My MS thesis advisor there was in electrical engineering and was very interested in computing. Because of this interest, my master's degree was in parallel logic circuits and how to represent problems in simple computing networks.

When I first I got there, Cornell had a CDC 6600 if I'm not mistaken. Eventually, they replaced it (not sure exactly when) with an IBM 360 system that IBM later updated with one of the first time-sharing systems. The upgrade failed to keep up with the user load and was eventually removed and the machine downgraded for a while until the next system version was ready. Consequently, a lot of the work I did on computer game playing (logical games) was on that. I should note that all of the programming was done on punched cards.

Yost: The timing certainly would've been right for back in 1964 for a System 360. Time-sharing installations were common at a number of universities.

Hanson: Yes.

Yost: Including at MIT of course with CTSS then Multics.

Hanson: I think it was a common problem all over. People were just starting to get used to what you could and couldn't do and how to do the things you didn't know how to do at the time when you did it. Things didn't work out exactly right.

Yost: With the early T-S systems (at Dartmouth it was T-S the Dartmouth Time Sharing System (DTSS)) there wasn't security and people hadn't thought a whole lot about that, Multics stood out with a security design. Who was your advisor, and can you describe this person as a mentor to you?

Hanson: Yes, my advisor at Cornell was David Block. Dave was a well-published mathematician who later focused on problems of learning, pattern recognition, artificial intelligence and self-reproducing machines. He worked with Frank Rosenblatt (who was also on my committee) on the Perceptron, a self-organizing machine. My thesis was on learning how to play very simple games on computers and on convergence of their learning algorithms. It was a very rewarding experience. Dave was a really warm and expansive person. He stayed a close friend and mentor of mine until he died in 1978. He was also the advisor to Edward Riseman, who as I mentioned earlier was a longtime good friend and colleague of mine here at UMass.

One of things I remember most about him was his ability to push gently in the right research direction and to draw ideas from you that you never could have done by yourself (at least at this stage of development). The other thing I remember most about him (and Frank Rosenblatt) was that while they were brilliant mathematicians, neither of them was too astute when it came to physical things in the world. I've got many anecdotes about the two of them and the problems they got into.

Yost: So, your dissertation was, if I have it correct, entitled, "Adaptive Systems for Prediction Problems," but it was still primally about games.

Hanson: Yes, primarily about games and how to predict what the winning move/sequence of moves was. The games I worked on were very simple like Last One Loses and simple board games.

Yost: And what drew you to this topic?

Hanson: Dave Block did because he was interested in it. Because he was so exuberant about what he was doing he got me interested in the long run. In retrospect, this was the impetus to my getting interested in AI and what I eventually wound up doing.

Yost: In graduate school, were there any early computer scientists in AI that you were reading, or their work was influential to you, those in CS and AI outside of Cornell?

Hanson: Of course. There were many seminal papers dating back to the 1940s and earlier that were the building blocks of what is currently known as AI. There are several very complete histories of AI that trace fundamental ideas way back to early Greek and Jewish history, through the mechanical /clockwork age etc. that set the groundwork for mechanistic views of behavior and thought, and into the electronic age and the likes of Alan Turing, Norbert Wiener, Mculloch and Pitts, and so on. To name just a few, Feigenbaum and Feldman's book had just came out, Minksy's paper on "Steps Toward Artificial Intelligence" had been published, Selfridge was working on learning, Newell, Shaw, and Simon were working on generalized problem solving, and so on. All of these, and many more, had a deep influence on me (and others) at the time.

Yost: Was Cornell the beneficiary of IPTO funding from ARPA in the 60s to your recollection?

Hanson: Not that I'm aware of. Most of the faculty members that I worked with there had National Science Foundation support. There may have been ARPA funding, but I wasn't aware of it.

Yost: Yes, it's not on the list of schools I associate with that 1960s IPTO funding like MIT and Berkeley and Utah, some other places, but thought I'd ask—

I'm curious in the way your research trajectory evolved. Obviously very heavily oriented toward computer vision. Was there an interest in graphics when you were in grad school and were you following work being done by Ivan Sutherland and others in graphics?

Hanson: Yes. We were. That was kind of a side interest. But both Jay Leavitt and I got interested in computer graphics and displays because Jay Leavitt's wife was an artist. I don't know if you knew that.

Yost: Yes, that came up in the interview.

Hanson: Good. Ruth was a very good artist so eventually Jay and I built a sketching system for her on the CDC machines we had at UMinn. One of the machines had a large interactive CRT display which was new (to us) at the time. The system we built allowed her to visually sketch and edit her pictures/images (mostly abstract). Have you seen any of them?

Yost: No. I'm aware of the book that he did.

Hanson: Yes, there is also a book called *Artist and Computer* that Ruth edited.

Yost: Yes.

Hanson: I taught a class on using computer graphics in art with a faculty member in the Art Department at the University of Minnesota who did very well-known aluminum sculptures. Jay and I built a system that she and the students could use to create layered abstract artwork that could also be converted into silk screen films to create multi-colored overlaid works. As a result of all this, we organized a conference called Computers in the Humanities that was held at the University of Minnesota in the early 70s. I believe this conference is still going on.

Yost: I interviewed William Wulf and he was very interested in computing and the humanities at Virginia at an early time, the 1970s, I think.

Hanson: Yes.

Yost: As you were finishing up your degree and defending in 1969, did you know you wanted to be an academic? An academic computer scientist, or were you thinking about the possibility of industry as well, or government?

Hanson: I never seriously considered government. As I was getting ready to finish at Cornell, I considered both industry and academics. I interviewed at a couple of large companies and decided that industry wasn't what I wanted, for a number of reasons. I then started to think seriously about a University position in computer science. At the time Ed Riseman and I were beginning to look at the confluence of artificial intelligence and computer vision (which at the time was primarily graphics). The university research environment seemed to be ideal for following through on this idea. The end result was I wound up at UMinn and he wound up at UMass.

Yost: What was your first impression of the brand-new computer science department at the University of Minnesota?

Hanson: Well, I had a couple of first impressions. First of all was the city. When we visited Minneapolis, Joan (my wife) and I spent a day or two just wandering around. Minneapolis was the biggest city I'd ever considered living in. After my parents left New York City and moved to Morris, I always lived in a small town and went to college in small towns. I like small town life for a variety of reasons. Consequently, Minneapolis was quite a change, both socially and mentally. But one of the things that struck us was how friendly Minneapolis is to people. In most cities, when you walk down the street nobody pays attention to you or much of anything else. When we visited Minneapolis, people would walk down the street and say hello, and that struck me as being very, very positive. The department itself was also attractive. There were some people I had very good conversations with there. Jay, for example, was one of them. Bill Franta was another. You've talked both of them, right?

Yost: Right, yes interviewed both.

Hanson: The bottom line is that I had a very positive impression of both Minneapolis and the department. Let's see, Kurt Maly wasn't there yet, I don't think. Have you talked with Don Boyd yet?

Yost: I haven't, but he's on my list of people to talk to in the near future.

Hanson: The reason I asked is because people that I worked most closely with in the department were Jay Leavitt, Bill Franta, Don Boyd, Peter Nicholson, Oscar Ibarra, Krzysztof Frankowski and eventually Kurt Maly. I had a very pleasant experience there and made a bunch of new friends, many of whom I'm still in touch with. It was a hard decision to make to move so far from home but the other places I had offers from were not as welcoming as UMinn was nor did they seem as vibrant. That drove my decision a lot.

Yost: So, you mentioned about a half dozen people and you talked a little bit more about Jay. Are there any other recollections you have about conversations or influences, discussions with William Franta or Ben Rosen or some of the others?

Hanson: You mean during my interview?

Yost: No, just in the years that you were there—

Hanson: Oh.

Yost: And did you collaborate at all with anyone or was that all—

Hanson: Well, that turned out to be a long-term part of the problem. Jay and I wrote a couple of papers together. Bill was in an area that was quite a bit different from mine. But we had interesting conversations about the future of computing and what one might expect in 10-15 years down the road. There was a lot of speculation, and all the people that were there were pretty bright. I was lucky about that. So, I'm not sure exactly where you want to go with this. At the time, writing technical papers was not as important as it is now. Consequently, a lot of the things we concerned with had to do with how to structure the department for the future, what should it look like, what kind of sub-degrees or sub-interests were there, what else should we be looking at and so forth. There was a very close relationship between the Computer Science Department and the Electrical Engineering Department at the time, if I remember correctly. I'm trying to remember some of the people from EE, but names escape me. I think one was Bruce Lee—who wound up as the department chairman, I think. He came after Ben Rosen and Marvin Stein.

Yost: But before Kurt Maly was chair?

Hanson: Yes, before Kurt. Kurt and I worked fairly closely together, and we wrote a book while I was there called *Fundamentals of the Computing Sciences*. In it, we were foolish enough to suggest that maybe people should start looking at computer languages that were based on strings and maybe not so much on numbers. So, we used SNOBOL (one of the first symbolic languages based on strings) as one of the examples. It didn't do that great, but it sold a few copies and it was an educational experience. Kurt and I spent a lot of time together talking about what computers might become or what computer science might become.

Yost: In terms of the curriculum for the students, do you recall any debates or discussions about the kind of strategic directions the University of Minnesota should go, how to manage the challenge of covering all these new areas of, that were emerging in the field of computer science or specialties to stand out?

Hanson: Well, there were many discussions and friendly arguments about how the department should be structured, what it should look like from the outside, and what future to aim at. There were the usual arguments whether it should be mathematically orientated or more systems orientated but pretty much people had the same notion —that it wasn't an either-or case, it was how should we integrate both into a smooth curriculum? The idea was we wanted a good mathematical background for our students but also wanted them to take a look at systems as a whole, how systems are designed, and how that is related to the mathematics. But, yes, there were many very eye-opening discussions. There were loud discussions, but everybody walked away from them still friends. And from these discussions arose a department.

One of the interesting aspects of the early discussion concerning course development (particularly graduate level courses) was input from a group of graduate students in the department. In particular I recall people like Dale Grit, Tom Sturm, Michael Rebmann, Arvind, Jim Seck and others joining into the curriculum discussions and also providing input into research directions. Interestingly, Dale Grit wound up on the faculty at Colorado State University. Some time later, after I had left UMinn, two of my graduate students from UMass also wound up there.

Yost: You mentioned a strong connection to electrical engineering. Did you feel there was also a strong, connection with the Mathematics Department?

Hanson: Yes, but I wasn't as involved with the Math department as others in our department were. A lot of people in the department had strong mathematical backgrounds or were in fact mathematicians – Marvin Stein for example.

Yost: Yes. He was in numerical analysis—

Hanson: As an aside, one of the people on the math department that I did a little work with (at the level of discussions) was also British and an avid soccer player. He talked me into learning how to play soccer with a team he had put together just for fun. I discovered that most of the people on the team were serious players and they were all British. Their idea of 'fun' was pretty far from my definition.

Getting back to your question, everybody agreed that you needed a good math background to do what we thought was going to be the future. And I guess we were pretty much right about that in most cases except we didn't put as much emphasis on symbolic computing as we should have.

So while I didn't work closely with the folks in math, I really didn't need to since a lot of the faculty members in the newly formed department had very strong math backgrounds or actually came from math – Marvin Stein, Jay Leavitt, and Krzysztof Frankowski to name just a few.

Yost: I will be interviewing Frankowski soon.

Hanson: So, I think there was just a general assumption that you're going to need a math background to do computers and we structured the curriculum to include that.

Yost: Do you recall what courses you taught in those early years?

Hanson: I taught a lot of the intro programming courses. And at the time, Bill Franta was very, very interested in APL, the programming language with a very odd syntax. And so, we talked a fair amount about how to think about programming in this odd language. I taught the intro APL course and quite a few other 'intro' programming courses. I also taught data structures, most of the artificial intelligence and pattern recognition type of courses, computer graphics, a few specialized courses like Computers in the Arts, graduate seminars, and was on quite a few MS and PhD student committees. A few of these courses were offered on the closed-circuit TV system that connected us to Control Data Corporation, 3M, Cray Research, Medtronics and a few other local companies.

Yost: Was there a strong interest of students in pattern recognition and early AI?

Hanson: No, there wasn't. PR and AI were just catching on as potential areas of study and as a result the early courses initially weren't very large. When I started tying AI and PR into medicine, the arts, and other 'practical' applications etc. the interested deepened to the point that a couple of faculty members from other departments would occasionally sit in. The game playing courses were much more popular with students. Attendance increased over time, of course.

Yost: In terms of supporting research, were there particular funding agencies, was it NSF, that you were going to in the early years. I know that you were funded by many different places including NSF and DARPA over the years.

Hanson: Yes, NSF was really the most popular national source. I think Jay might have had an NSF grant and I think Bill Franta had one. But it wasn't like today. The grants were small, and it was expected that a lot of the research work was done as part of your normal teaching responsibilities – for example, using students from classes. And of course, back then you didn't need really specialized heavy-duty equipment like powerful computers with multiple graphics displays, huge amounts of disk storage, and things like autonomous vehicles to do the work.

Yost: Right.

Hanson: It was mostly thought work and small experiments.

Yost: And compared to a lot of schools, the University of Minnesota had an impressive computer center.

Hanson: Yes, they did.

Yost: Can you reflect a bit on the computer center, and did it have a significant influence or impact on you having those resources?

Hanson: Well, Marvin Stein was the head of the computing center, I think.

Yost: Right. Yes.

Hanson: So, we never really hurt for access time as far as I remember. We had pretty much whatever we needed.

Yost: Which was a luxury—

Hanson: Indeed it was. I think James Foster was also associated with the department as well as the computer center, if memory serves me. I think he was there with Marvin Stein. Does the name ring a bell?

Yost: I haven't come across that name.

Hanson: I think he was Assistant director, maybe, with Marvin? Bill Franta was also part of the computing center at the time. Larry Lidell (I think) was also part of the center and he was associated with the department. I think he was a research associate in the department or the equivalent. So, there was a very close relationship between the department and the computing center early on, and I can say for sure we got special treatment.

Yost: My understanding is that Marvin Stein, Bill Franta and Kurt Maly as well developed a lot of relationships with the Minnesota computer industry and at that time, we had Sperry-Univac, Control Data, and in the early 70s, Cray Research formed, and did the local industry, as you saw it, have a major impact on the department and if so, in what ways and what, if any, for you personally?

Hanson: Yes, the local corporations had a substantial impact on the department. As I already mentioned, we had a closed-circuit TV system tied into several of these companies and we offered many of our courses to them. I had a pretty close relationship with 3M through Claude Fennema and a couple of our students had internships there. Bill and the systems faculty had a close relationship with Control

Data, and it was through them that the department received research funding and got huge breaks on the newest computers and peripherals. I never had a very close relationship with them particularly, just a secondary one through Bill and the others. But we had people from CDC in the department quite often. We also had people from 3M there quite a bit and I was directly involved in that relationship (as I mentioned before). We certainly got presential treatment from CDC at least and maybe even Cray.

Yost: I think Bill wound up with quite a lot of funding and actually over his career, more funding from industry than from NSF.

Hanson: Yes – I believe that's true.

Yost: And they also, the computer center, I think, was in part a beneficiary of some donated equipment.

Hanson: My guess is the center didn't pay full retail price for any of the computers and peripherals. And I also think CDC put money into the department through Bill and probably Marvin and the guys that were actually associated with the center more than I was.

Yost: Looking back, what do you see as kind of the greatest opportunities moving forward and the greatest challenges at the University of Minnesota after you'd been there a few years but before you moved on?

Hanson: First, the department was intellectually a great place to be. All of the faculty there were very good at what they did, willing to share in opportunities for research, and forward thinking. One of the problems I was having was a divergence of research interests, and this is not a criticism, it's just the way things worked out. Many of the people in the department, like Marvin, Ben and some of the others, were much more orientated toward developing the mathematical/system side of computing than I was. I was more interested in the potential applications of computers, particularly the complex problems like those arising in Artificial Intelligence. I didn't see the department pushing to hire people whose interests were convergent with mine – they were not going down the line that I was interested in. And that was ultimately the biggest reason for my departure from the department. That and the fact that my whole family, and most of my close friends, were on the east coast and it was hard getting back and forth from Minneapolis to home very frequently. So, from a professional point of view, I didn't see the department developing in ways that were particularly consistent with what my interests were, and my family was far away. Both of our children were born in Minneapolis and they hardly knew their grandparents. In addition, our research at the University of Massachusetts was starting to pick up steam and they had hired a couple people that were in areas of interest to me. So, from my perspective, things were going sort of sideways in Minnesota and going uphill in Massachusetts, and that eventually led to a tipping point. It was a hard decision. My wife and I liked Minneapolis and the friends we had made, and I think I got along very well with most people in the department. My wife was engaged in volunteer work and put in a lot of time at the Environmental Library of Minnesota for example. In addition to the technical part and the academic part of the department, there was also a social part and we had a lot of fun together. I'm still in touch with a lot of people from my days there.

Yost: Can you tell me a bit about how your intellectual and research interests began and evolved with computer vision and visual systems?

Hanson: Well, I think there were a couple of threads that came together. Towards the end of my time at Minnesota and the beginning of my time at UMass, the post office was really interested in automating the mail system, including reading envelope addresses, and we got involved in that. While the research we were doing was essentially pattern recognition, we were also beginning to look at ways of using higher-level information (like letter and letter sequence frequencies) to automatically correct the errors that the pattern recognition system typically made. This was an integration of visual information obtained from cameras and related external information (for example, the letter and letter pair frequencies were derived from actual problem data). We also had one very good student at Umass (who's still a very good friend of mine), who was ultimately responsible for pushing Ed Riseman and I in the direction of looking at vision in general as a computing problem and as an interesting research problem. It naturally evolved from there - the interest went from two-dimensional characters on paper to three-dimensional objects in the world. It was a natural transition when you stop and think about it. We used the same idea in the visual world – the use of information like what you and I acquire as we learn how to do some task but in the context of visual interpretation of images. And so, we used local context and global semantics of the world to help us detect and correct the errors that you make when attempting to interpret the raw data. This eventually evolved into using this information during the recognition problem from the start, into how to detect and correct at all levels of the problems, and how to build a coherent multi-dimensional model of what you're looking at. That was where the research was going. And then that fanned out into all kinds of applications in many different fields over the years.

Yost: So, you and Edward Riseman were focusing your work in this area and doing pioneering work. Were there other computer scientists, nationally or internationally, that you saw as especially critical to this early community that was forming and doing research in this area computer vision?

Hanson: Oh, yes. We weren't alone. There were people at Carnegie Mellon, USC, MIT, Berkeley, Stanford, UMD, KTH, Cambridge, INRIA and elsewhere, to name just a few. There were probably, at the very beginning, about a dozen or so university programs and several industrial research labs that were starting to look at similar questions.

Yost: And PARC and SRI.

Hanson: Yes. Control Data did a little bit. IBM did a little bit. SRI was probably the largest commercial player there.

Yost: So, can you tell me about the center at U Mass that you directed?

Hanson: Well, it started off with one student, and when I retired, we probably had probably 50 people or more involved in the Vision group at UMass. We started with support from NSF. This was an odd time politically – the Vietnam war was going on and we were kind of reluctant to take federal money for various reasons. Eventually we had a lot of support from many different sources, including DARPA and we also had a lot of money from various companies.

Yost: When you say, ‘reluctant to take federal money’, does that include NSF or—

Hanson: No. NSF was our primary provider for the first, I don’t know, probably eight or ten years.

Yost: So, that refers to Department of Defense and DARPA?

Hanson: Yes, DOD money. It was a bad time. There were anti-Vietnam and anti-military riots all over the country, particularly at Universities, so we kept a low profile. One of our vision lab facilities at UMass was occupied because the protestors thought we had DOD money. As you can probably guess, it’s a long story.

Yost: Yes. In Wisconsin, our neighboring state, the computer science lab was blown up.

Hanson: Right. It was a bad time all over the country. So how is Minneapolis doing today given the current political situation? Just to change the subject for a second.

Yost: It’s been a tough time in Minneapolis. It’s very upsetting how—we have a liberal city, but we have a number of police officers that police in what I feel is a racist way. And I think the latest incident was an accident but—

Hanson: Anyway, they claim.

Yost: But, an accident in the actual act but not in the way there's underlying racism and bias in the way that traffic stop occurred and the reaction and fear and that's a major problem and it needs to be solved.

Hanson: Are the problems disrupting the university in a fundamental way?

Yost: It shut down for a day but other than that, it really hasn't. With George Floyd, that killing and the riots, that was really bad. I mean, a good part of Lake Street, the businesses were all burned.

Hanson: I watched part of that on TV. I remembered Lake Street from our time there just by looking at it on TV. It surprised me – it looked pretty much the same.

Yost: Yes. I live in south Minneapolis by Lake Nokomis. I actually live on Chicago Avenue, just down the street from Cup Foods where George Floyd was killed. It is just two miles north for me. And so, yes, the protests and just the activity that affected Minneapolis was very apparent with the aftermath of the police, of Derek Chauvin and his accomplices killing George Floyd, but this recent killing was in Brooklyn Park and so most of the protests or a lot of the protests have been, or Brooklyn Center, rather, they're adjacent. And so, it's been less visible to me and also, I haven't been vaccinated yet, so I'm not spending a whole lot of time outside except for walking around the lake near me (Nokomis). I'm not spending time in various parts of the city; I'm still working from home.

Hanson: Right. My wife and I are old enough that we got our vaccinations early on.

Yost: I got scheduled for next week.

Hanson: Good.

Yost: And I think it was going to be the J&J but I think they have secured enough doses of Pfizer, so I still have the appointment.

Hanson: I wouldn't be surprised if they find the J&J is fine.

Yost: Yes, it's pretty low numbers for them to potentially slow things by limiting, it could have a much greater effect on the overall population.

Hanson: You know, one of the things that amazes me is that sometimes I feel guilty that we developed the computer systems that we did because we are basically providing communication facilitating all these crazies that are out there pushing all these wild theories about vaccines through Facebook and all the like.

Yost: Yes.

Hanson: It bothers me a lot when I stop and think about that we (Computer Science) did that.

Yost: I'll send you a think piece that I just wrote. We have an outreach electronic journal called *Interfaces* trying to connect history to current events in computing.

Hanson: Thank you.

Yost: And, you know, I look at the way HCI developed and the way AI developed and kind of different mentalities, it's not really critiquing AI so much, a lot of the work at Universities, with that, I see a lot of very positive work going on. I know a lot of AI scientists at Universities but the profit motive and capital and just kind of surveillance capitalism, I feel has really pushed AI in certain directions within corporations, especially Facebook, but also Google and some others in directions that are counter to societal good. We held a major event at the Babbage Institute last October called "Just Code: Power, Inequality, and the Global Political Economy of IT," and we had scholars from different fields from around the world come to this. It was going to be a physical event, but it became virtual. We had our biggest event ever, had about 345 people that attended and we're doing a book out of it and looking at the importance of assuring that code doesn't reinforce bias in society inadvertently. That it's not used in biased ways intentionally. And also, by Just Code, just in the sense of justice, but we interpreted the term 'code' broadly to be both code itself or software code but also surrounding cultural codes and legal codes and policy codes around IT that have in some cases led to greater inequality in societies. That's a really fundamental issue for us at the Babbage Institute.

Hanson: That's the document you said you will send to me?

Yost: Yes, I just did a 4,000-word think piece. My colleague at UC Davis Gerardo Con Diaz and I are doing a book out of this event called Just Code that's being published by Johns Hopkins University Press, and that will be out in about a year. And we got a Sloan grant, so it'll be open access so when that comes out, I'll definitely send you the link. But this was just kind of to connect with our stakeholders, and we, I'd written a couple of these essays in this essay journal that we do called *Interfaces* and some of my colleagues at the Smithsonian and other places, Colorado, and some other schools have done essays, and we publish about an essay a month, and then it's a push email to our subscriber base.

Hanson: Yes, I'd like to see it. I experienced a particularly acute event this morning. I live in a small town with a population about 1,500. We just (a couple of years ago) got high speed internet and set up a NextDoor site for the town. If you haven't seen it, NextDoor is a system within which it's easy to set up dialogues and exchanges with members of your particular localized group (e.g. a town). One of the exchanges I was looking at made it clear that some of the people in our town have bought into this anti-vax BS that's being pushed out by rightwing groups, and it just made me feel bad. It really, really did. Anyway, we're getting off the subject.

Yost: Right. Yes. Someone who does really important work on fake news is our Senior Research Fellow Bill Aspray, really two Sr. Research Fellows of ours, him and Jim Cortada. I don't know if you know Aspray. He's a historian but he became executive director of CRA for a number of years so knows many in CS.

Hanson: That name sounds familiar.

Yost: You may know him from that, but one of his areas of research has been kind of the longer history of fake news and how the technology is different, and the technology makes things far more impactful in recent years but fake news is an old phenomenon. And so, he's or they are looking at the history of Facebook in the last half-dozen years but also looking at fake news and its long historical trajectory and the impact it's had on politics. So, it's quite interesting work.

Hanson: Great! I think there are going to be quite a few retrospective views coming out in the near future given what's going on.

Yost: So, your center did work in many different areas from industrial automation and medicine and environment and ecology. Can you talk about some of these projects and how the center evolved and how your research within it evolved?

Hanson: Well, there's probably a dozen or more different threads running through our research that evolved over the years. Some of the more interesting ones include a DARPA project to do 3D reconstruction from aerial images (both low flying and high flying). This was one of our longest projects because it evolved into projects like surveilling corn crops (disease detection) in the Midwest and flyovers in the Amazon where we estimated the degree of forest loss (which is a significant problem there now). We did a number of other projects that also depended on the aerial imaging system we built. We also did a fair amount of work on autonomous vehicle navigation. We had a HMMV vehicle here from DARPA/CMU that we loaded with sensors and computers. As you can guess, that also spread out into a bunch of other areas. We've done work in medicine. For example, a friend/acquaintance of mine is a brain surgeon at one of our local hospitals. We developed ways of looking at the initial x-rays taken of a stroke victim in a time-sensitive way to rapidly figure out how to best treat this particular patient - that is, how to save the largest amount of brain tissue given a battery of available medical techniques and medications.

So it was things like this that you get involved in and the next thing you know, you're spending half your time learning new things. I didn't know anything about stroke victims when he first approached us but by the end, after a lot time invested into learning new material, you wind up knowing a fair amount.

Yost: Right.

Hanson: So, we did a lot of medical stuff. We got interested in aging. We had a very close research relationship with the robotics lab at UMass, and a close relationship with the school of nursing. The robotics lab did a lot of interesting work on small-scale autonomous robots. When I say small-scale robots, they were balancing robots (two wheels) about two feet high with a visual system and two manipulators (arms). We developed a joint program here with the school of nursing, a couple hospitals in Boston, and the VA on the use of robotics in aging and how they could help the elderly and motion compromised people around the house (which is now of more interest to me than it was then because I'm getting old). In general, the work that we did was spread all over the place and we typically got involved in projects by accident (someone talked to someone to knew someone that had an interesting project/problem). I don't know if you want to go into any more detail on any of these projects or the many others we did, but over the long haul it was fun. You learn a lot when you take on a new project in a new field. You go into something knowing nothing, you come out knowing a little bit, and that's what makes research interesting. So, your knowledge spreads as much as the research spreads.

Yost: Yes, keeps it interesting and it forces learning in new areas and domains which is always exciting.

Hanson: There were two main threads in our research that stayed somewhat intact over time. One of those was interpretation of complex images using semantic information to improve the efficiency and performance of the visual process. Semantic information here refers to a prior knowledge, the physics of structures that you have knowledge of, or any other information that might improve the interpretation process. The interpretation process then becomes a strategy for applying this information to recognize something in an image or to perform some task. One of the real problems in general was devising ways in which this information could be represented so that it could be efficiently used during the interpretation process. And so that was one of the main academic threads for our research work for a long time. Most of the applications came about because somebody saw what we were doing and said, "Gee, what you just showed me might work on a problem we have, could you take a look?". And so, after looking at it we would find that the same technical approaches we used in the Amazon worked on brain images (as an example). And not only did we learn about the individual fields, but we also learned a lot about the commonality of visual information structures and how you can interpret those structures in different ways given the application. So that was pretty much our focus for years. The second thread was how to interpret images from sensors in motion in which we used the same technical theory approach to that as we did for static imagery.

Yost: Can you talk about the major professional societies, the ACM and the IEEE CS and the impact of those organizations in building community in disseminating scholarship at conferences in your area?

Hanson: Well, I don't think that's much different from other technical areas. I found conferences and workshops to be of particular importance, perhaps even going beyond the typical dissemination mechanisms like published papers. When you go to a physical meeting you can sit and talk to people that you wouldn't normally sit and talk to. You'd read their papers but when you sit and talk to somebody, you get a much deeper sense of what their particular approaches to problems are, how they are going about solving them, and what future they're imagining. I think this is extremely valuable, particularly for students. And I suspect that's true over most research areas. From an intellectual development point of view I would much prefer going to a conference, presenting a paper to a group of peers who are doing the same kinds of things I am and discuss open problems with them and their students than having a paper published in a journal. Or discussing problems with a group of people way out of your line of research and finding common problems and/or potential solutions or approaches to these problems. Certainly, when you publish a paper in a widely circulated journal it reaches more people than a conference proceeding will. On the other hand, journals have much longer lifetimes than conference proceedings do, so both are necessary in the long run but you don't learn as much as you do from sitting at a conference, talking to a small group of people with similar interests and arguing about what the best way of doing something is. Or what the interesting problems are or what a potential approach that maybe nobody thought about but all the sudden there's three of four or you talking about it and a light goes off - maybe we could do this. So, I find conferences very important. I find journals important primarily from a point of view of careers and longevity of ideas. This is just my personal opinion. What about you?

Yost: I completely agree. I find workshops and conferences extremely valuable and one thing at CBI that I really pushed since being director is taking what was largely a historical research center and making it far more interdisciplinary and that involves collaborations with people in technical fields in the sciences and engineering but also a range of humanities and social science fields. So, the event Just Code that we had, had scholars from informatics, from social informatics from sociology, anthropology, communication, media studies, geography. And I find I learn the most when people from different disciplines are looking at topics such as AI or HCI from many different angles and theory and knowledge and understanding from their discipline because I learn the most.

Hanson: Yes. The other thing I find important about conferences is that typically some of your better students go along with you. The cross communication among students and among the faculty is very important because ideas propagate through the student information structure as well. And then you find that some of your students are cooperating with a group in Germany (for example) because they both brought the same/different ideas/solutions to the table. Typically, some really good ideas/solutions/thoughts come out of these kinds of interactions that might have a significant impact on both the students as well as on the direction of the research as a whole.

Yost: Yes, I definitely agree. I'm a professor in the History of Science Technology and Medicine, and we have a thriving Ph.D. program in that area and have one of the largest faculties along with Harvard and a few other schools in history of science and technology. But our students connect with students from around the world in very creative and important ways. So does the faculty. So, I'm curious on the timing when was the ARPA unmanned ground vehicle and can you talk about that project, that research a bit more—

Hanson: When was it?

Yost: Yes, and how has it evolved over time.

Hanson: I'm sorry. I missed the question. When it was or what we did?

Yost: Both. When was that and can you describe the project, its evolution?

Hanson: UMass was involved in the DARPA/DOD sponsored UGV (Unmanned Ground Vehicle) Project that ran in the early 1990s or thereabouts through the late 90s and beyond (variations are still in place today). We got involved in this because of the work the vision lab and the robotics lab did on small mobile robots, similar to the one I described earlier for the aging research program. We built various small wheeled and legged vehicles over the early years for two reasons – they provided the basis for the robotics research work going on in the Laboratory for Perceptual Robotics at UMass and for the work on motion understanding and perceptual vehicle navigation going on in the Vision laboratory. Work in both these areas (as well as others) continues at Umass to this day. We worked fairly closely with the folks at Carnegie-Mellon, SRI, Hughes Research, Lockheed-Martin and the like, so when DARPA announced the UnManned Ground Vehicle program, we got naturally drawn in. DARPA had a very broad range of interests behind its funding for robotics research, most of which had a military basis. During this time (middle to late 1990s), CMU had built (with DARPA funding, I think) a mobile vehicle built on a military ambulance body called the NAVLAB II. They subsequently built a second similar vehicle that was sent to UMass and used in our DARPA research programs on navigation, etc. The programs of most interest to us were related to both on- and off-road navigation using vision with and without traffic, obstacle detection and avoidance, and the like.

We were focused on trying to get a vehicle to drive itself without colliding with other vehicles or people. In fact, we had one interesting experience. We ran our vehicle in a partially wooded area on campus through which a walking/bicycle path wound. We were very careful to close this area off when we were running experiments there – signs, monitors, etc. During one experiment a runner on campus had managed to get through all the people we had watching the entrances and along the road. He also managed to run right in front of the vehicle. The vehicle picked up the runner perceptually and succeeded in stopping itself before any damage was done. We were ecstatic that our collision avoidance system actually worked because we had never ever tested that part of it with people. Nobody their right mind wanted to run in front of the vehicle to see if would stop, right? More seriously, it also taught us that our safety features were not sufficient and there were multiple cases where the outcome would have been much worse. We had to do a lot more. I shudder a little bit when I hear the claims from current car companies about self-driving vehicles and how close they are to true autonomy. I personally don't think they are anyway near close to it, but that's my opinion.

Autonomous navigation based primarily on visual sensors was a very large program focus for us. We had that vehicle for years and subsequently looked at quite a range of what we thought were interesting problems related to autonomous vehicles. We never ran into any problems from the funding agencies when defining the problems and the nature of potential solutions.

Yost: And when you say that you're talking about the funding that comes from corporations to universities?

Hanson: Yes, with what money comes from corporations or from the government.

Yost: To the university.

Hanson: Yes. We never found any strings attached to proposals that ultimately funded any of our general research programs. However, given the current news reports it's clear that many people don't believe this. It's a real problem interfacing science with the rest of the world.

Yost: Yes, there's a large problem in the way Facebook is kind of deceptive in trying to profile and use people's data and also the lack of or inadequate controls, also the fact that they built something that is difficult to control with regard to misinformation. I think they are really trying to address the problem now. But to have 2.5 billion networked users, there's going to be white supremacist content that gets through the filters.

Hanson: Personally, Jeff, I think that's one of the biggest problems we're facing right now and in the near future. We need to deal with that particular problem because it has the potential of disrupting our government, our country, our beliefs, and I really worry about it.

Yost: Yes, I think that we've been very slow to regulate the giant IT corporations. I mean, not only in terms of being anti-competitive, which, you know, there is a long history of that with not really being a strong remedy with regard to IBM and later Microsoft, but really the past decade— Well, you look at it historically, at the greatest concentrations of capital within a particular industry, and oil and pharmaceuticals, it's never even been close to five or six IT companies constituting 25% of the S&P 500.

Hanson: Right.

Yost: And having such resources and scale and users and powerful lobbyists, that it makes regulation difficult. I was very pleased to see congress forcing some of the leading IT CEOs, Bezos, Zuckerberg and others to testify. But there needs to be some regulations panel or democracy is at risk and a lot of things in our society are at risk.

Hanson: It is.

Yost: I definitely think inequality has been greatly extended accelerated by some systems of Google and Facebook.

Hanson: Yes. The problem that I see is the level of access that these companies have to the public. They have almost unlimited direct access to most of the public, and that's unheard of. Newspapers are nothing compared to that. And so, we have a problem of a magnitude that we've never faced before.

Yost: Right.

Hanson: It's going to take some big, clever ways of controlling or at least monitoring this and people are going to complain, "Well, I've got my freedoms." Well, you do, but with freedom comes responsibility, so it's time, I think, for responsibilities to be recognized.

Yost: Right and with these platforms, I mean, a lot is seen to the user as, "Oh, well great! A free platform that, one that collects profiles, that has your health information, that has your financial information. It's one of my areas of research and I'm doing a book with MIT Press on the history of computer security. One of the problems is that if data is collected and data analytics applied, even if the company isn't misusing or selling your data, there's been breeches so it gets out there and risks with consolidating data even if an organization tries to control use responsibly and many of course don't—

Hanson: Right.

Yost: —just wreaks havoc on people's lives. And there doesn't need to be this concentration of data collection in most cases. In Britain and the Euro zone, there are now taxes on corporations using personal data. There's a corporate tax. Most definitely users are the product and the companies advertising are the customer to Google and Facebook and others and if that's the case, then taxes and regulations seem appropriate to me.

Hanson: We'll have to see what happens.

Yost: Yes.

Hanson: So, were/are you actively involved in mechanisms for controlling some of this stuff? Do you have any federal or private support for this? The reason I'm asking is I'm kind of curious about whether the US government understands that there's got to be a lot of research done on social aspects of computing in this sense. So, do you see that happening?

Yost: We have been fairly successful at getting NSF funding. I've been funded probably more than 99.5% of historians by NSF in the history of science to do IT history research, much of it socially oriented.

Hanson: Good.

Yost: And a lot of it has come out of programs outside of the tiny history and social study of science program because there's not much money and there's too many historians of science and the sociology of science just grabbing at that for $100,000 projects. We've gotten some four and five hundred thousand-dollar projects from CISE within NSF to study computer security and issues, so—

Hanson: That's great – it's about time.

Yost: We've been pleased, and I think there is recognition among many academic computer scientists and even some in industry of a need for such research. I'm doing a project now for ACM-SIGCHI on the history of HCI and interviewing a lot of early pioneers in HCI - Don Norman and people like that. And there are many like-minded computer scientists that are very concerned about social issues and especially, I think issues of algorithmic bias are especially prominent. I think, well, the fairly recent documentary, *Coded Bias,* obviously garnered far more attention than our Just Code symposium (which was primarily academic), but it didn't get out to broader audiences as much but we hope the book will. But the Sloan Foundation was very supportive of this event and it has a long history of the social implications of science and technology being a focus. They fund research in science and technology, innovation and development, but they also give a substantial amount of money to social applications and policy implications - policy tools for kind of directing science and technology to improve society. So, we're pretty pleased with both private foundations like Sloan but also government funds, NEH, NSF and others. . Obviously NEH took a huge hit under the Trump administration, NSF less so.

Hanson: Yes.

Yost: So, you founded Amerinex Applied Imaging Corporation. Can you tell me about that?

Hanson: Oh, yes. One of the things we did at the University was we built a software system within which you could do research. It was a support system with a primary focus on developing vision-based systems. It had all the graphics, many of the commonly used algorithms, and a programming interface. The intent was to develop a system that would not require a student to start his or her research from scratch. The system was an infrastructure, a computing infrastructure, within which ideas could be rapidly developed and tried out. After using it in our lab, we realized "Gee, this could be used elsewhere." People who did any kind of research or wanted to build systems that involved vision could use this as a base within which they could build and test specific applications. It was a research and development tool and was the basic product of Amerinex along with libraries of specific algorithms.

Yost: And now it's Dataviews?

Hanson: No. Dataviews was a different company that developed a graphical display system somewhat along the same lines and for the same reasons as the Amerinex product. One of the other faculty members in the department (a graphics person) and our group spent a lot of time building graphical systems for specific problems. Not surprisingly we discovered that many people who wanted to display complex data were building similar systems over and over. So, one of the students there started to build a system that generic in a sense that you could plug in various graphic algorithms for displaying and looking at data in different ways. This turned into the Dataviews product. And both of them did fairly well for a while.

In the case of Amerinex, my colleague and I made a very bad mistake in building that company. We allowed financial control of the company to get out of our hands and we eventually got to the point where we couldn't control what the people who owned the company wanted to do. Eventually, they decided they wanted to get out of the business, so their solution was they walked away and left us hanging. And we didn't have time to build up any support. As a result, Amerinex was dismantled even though it was selling products and making money. So, we learned a lot from that, and we didn't let that happen with Dataviews. What happened with DataViews was that there was a very large US corporation with a competing product. We were consistently beating them in the marketplace. After a couple of years they apparently had had enough so they made us an offer we couldn't refuse so we sold the company to them. Each of the companies lasted four or five years and kept a lot of people employed (many were our ex-graduate students). If I were to think about doing it again under the same circumstances, I don't think I would. It's a lot of work. We had two companies going at the same time, we were trying to keep the research going at the university, and of course we had our University responsibilities that included teaching courses. It got to be really heavy load and I was not upset when Dataviews was sold.

Yost: So looking at your great number of publications, in more recent years, it seems like there's been a growing interest and focus with medicine. You've already said a bit about the systems and the projects research you've done in the medical field. I was wondering if you could expand upon that and also give your perspective on where you see kind of the future on visual systems and AI in medicine.

Hanson: That's a long question to answer. Or should I say that the question is going to take a long response. As you've probably guessed, I think AI can play a strong supportive role in a lot of medical applications. One of the projects that I enjoyed the most involved the School of Nursing at Umass, our lab, and a social scientist at Smith College in Northampton. The project focused on the application of computer vision and artificial intelligence to aging, as I mentioned earlier. The outcome was to be a prototype of a distributed, network-based support structure for independent-living environments. This included a small upright robot from the robotics lab at UMass for performing simple tasks around the house or apartment. The robots were immersed in a distributed camera system.

We worked closely with the social science folks on this due to the potential concern about surveillance and the like. Let me tell you about an interesting outcome of that. We were working with a local elderly group in Amherst and we were interested in determining what their attitude was towards what might have been considered as an intrusion of computers and technology into their private lives. Consequently, we obtained funding to do a survey regarding the surveillance issue with both the elders involved in the project and their children (if any). We explained (and showed them via a preliminary system implementation and a couple of small robots) some of the things that the system could do that might help them in their day-to-day life. The elderly people were ecstatic about that; they weren't the least bit concerned about loss of privacy. Their children, on the other hand, were absolutely appalled because the computer was interfering with the life of their parent(s) by collecting all kinds of information about them and making it public so that people were going to know everything that their parents were doing. Some of the things the system did was to use the robot to warn them if there was something laying on the floor that they were going to trip over, for example, and to remove it if possible. Or if they couldn't find their pills, it could keep track of where the pills were and how many they had taken. It was tasks like this that we were building into the system. So that was a very interesting outcome - it turned out that it was the children who were anti-technology not the recipient users. It was really surprising. I expected it to be totally the opposite.

Yost: And also, might in part be what some companies are doing with surveillance. You know people read articles by journalists and then think all robots, all technology, all devices are collecting data that goes to a central database that's being misused by either the government or a giant corporation, whereas there's a great amount of really important work and tremendous possibilities for applications of AI in homes in homes, production, in factories, important applications —people are suspicious I think because of what data they think Alexa might be collecting on them after reading some article.

Hanson: Yes. This was before the real uproar over privacy and invasion of privacy happened, which I think is fairly recent, maybe over the last ten to fifteen years but it has certainly gotten worse recently. But this is just as that was starting up and it was the kids that were watching this general development and reacting very negatively. But in our case the people who were actually going to be helped by such a system saw the positive aspects. Completely unexpected.

Yost: That's fascinating.

Hanson: Yes. It is.

Yost: Concerns with privacy have come in waves. I mean, there was a great public uproar about Lyndon B. Johnson's administration's datacenter that was proposed in 1964 and the use of social security numbers as broader identifiers. Willis Ware of the Rand Corporation and Alan Westin and some others then became involved with committees that resulted in the 1974 privacy act. But, yes, with a broadly networked world, and mobile and network devices with us at all times that ups the ante.

Hanson: Right. If someone's is complaining to you about Big Brother looking into everything and disseminating private data, ask them if they carry a cell phone. The answer is not surprising.

Yost: Yes!

Hanson: And then they say, "Sure." I say, "Well, there's a lot of information that can be obtained from cell phone." "What?" It just flabbergasts me. I don't get it.

Yost: On my computer security project for NSF, I did a bunch of interviews and I was interviewing a computer scientist at UC Davis and he told me about a study in which people were asked all these questions about how much they valued their privacy and their data, and everyone just said it's extremely important to protect consumer habits and information. But then they were asked if they were offered a grocery store card to save a small amount of money that would track their name and every purchase they made in the grocery store and the grocery store's pharmacy, they said, "Yes, I'll sign up for it."

Hanson: I can believe that.

Yost: The discrepancy is about how people think about privacy in broad terms but then take actions that really don't protect their privacy. Cell phones, of course are a prime example—because there are all these apps that, in addition to the cell phone locating you, ask it it's ok to collect data….

Hanson: And probably a lot of those people use Alexa or Siri—

Yost: Yes.

Hanson: —at home. Right. I was talking with an acquaintance the other day about Alexa and they commented that, "Well, Alexa doesn't listen in." I said, "Well, how does it know when you say, 'Alexa'? It's listening all the time." "Oh." So, people just don't think about it. They look at the positive side and they don't think about the other side that has to happen for them to get the results that they are actually looking for. So, there's a lot of education that needs to go into the use of these kinds of devices.

Yost: Yes. So, before we conclude, is there anything I haven't asked about or topics I haven't discussed that you'd like to mention?

Hanson: Well, I'm sure there are lots of things that we could talk about. In fact, I think we've covered a lot.

Yost: Well, thank you so much, Allen. I really appreciate this. It's been really interesting and very helpful to us to document some of the early experiences and perspectives on the University of Minnesota Computer Science department and also get the broader trajectory in the sense of your extremely impressive career I really appreciate it.

Hanson: I thank you for thinking of me. So, is all this material going to be online at some point?

Yost: Yes, what happens is, I believe with the video there aren't plans to put the video online. I turn it over to the Computer Science Department, but they will get your permission before they use any of the video. The public part is the edited transcript online.

Hanson: I was just thinking more in terms of the history of the department and what happened and, not particularly me in general, or—

Yost: Oh! Ok. So, what happens is this interview will get transcribed and then you'll get a month to make any changes you want to the transcript. Then that transcript becomes part of the Digital Conservancy at the University of Minnesota, so that's available online (on the web) for researchers to use. So, that's the transcript that you'll have a chance to edit. And in terms of does an article or book get developed out of the oral histories and some of the archival collections, I didn't talk much about CBI other than the Just Code event, but we are the largest archive in the world for computer history. We have 350 collections. We have the records of Control Data, Burroughs, a number of other companies, the records of IBM, SHARE, the records of ACM, a number of personal papers of computer scientists. And so there are papers for Marvin Stein, and it certainly is a possibility that a few years down the line that Computer Science and I or they working with someone else develop a project for a major article or a book to come out of this. But at this point, we're just trying to preserve the history by doing an oral history project and collecting peoples' perspective and remembrances of early years of the department. So, along with archives, oral history is a tool used by historians to write history and so we're kind of building that infrastructure first and there might be products down the line, but there aren't firm plans at this point.

Hanson: Ok. I was just wondering whether there were any plans for a book about the history or formation of the department and its development at some point.

Yost: Yes, and only a handful of schools really have kind of an extensive literature on the history of their department. MIT and Carnegie Mellon have more than most, but the history of computing literature has grown immense. But the institutional history at universities, there's only a handful of articles or books on particular computer science departments. I think it would be really interesting to CS, or not CS, it's CS and E, at the University of Minnesota to do such a project but we'll have to wait and see. So transcription generally takes about three weeks to a month, and so I'll be sending a Word document of the transcript and then you'll have a chance to edit it and at that time, I'll also send you the permission form that allows us to put it online and that permission form is just to permit free license. It doesn't restrict you in any way. So, we're not asking for copyright or anything.

Hanson: Ok. I was just curious on what the future held. This was enjoyable. Not as painful as I thought it was going to be.

Yost: Sure. Well, thanks again. This was fascinating. Take care.

Hanson: Ok. You too. Take care. Bye.