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DEFINE HARDWARE AND OTHER SPECIAL ALU, [illegible]

#2

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Video Conversation with Jon Burris, Woody and Steina Vasulka

JON: So what is it about computers that interests you, ~~th~~ though? You don't want to make images with them, do you?

WOODY: Images are the general verification of what's going on inside. But I know by observing let's say Grauer and Walter, that I'm not interested in structuralism as such. I was tempted ~~to~~ before because video tends to challenge you ~~toward~~ by saying there's a possibility of control. And then you have to struggle for specifying it. Here a priori the control is specified. The performance is arbitrary. That means, I don't believe that by variation of a program...that the full variation of the program is ~~a~~ the challenge...because it can be done. It's a large amount of finite possibilities.

JON: So what is there for the maker to specify?... in this framework?

WOODY: It really depends. I would say the first level is you can specify each frame. That is, you can sit down and quilt the film, as Kubelka would refer to as he tells. Tells his film by maybe splicing each frame. It's very much analogous. You sit down, and you say your film is going to have 1600 or 16000 frames. And you make a chart which will contain definition of each frame, as complex as your system wants or as simple as you want. Like the basic would be the black, either light or dark frame. And then you write it down. That's the first level of programming. And that gives you infinite creative approach. The second one ~~kind~~ is using algorithmical, let's say mathematical arithmetic or logical functions to create a priori a structure and you would control the structure by certain input parameters.

JON: This is the structure between frames or within the frame?

WOODY: That's an interesting question. Let's divorce that ... I would say the first level would be hardware level. Second level would be programming, which is a tool. Third would be control...data so to speak. So that means we are already talking about at least two hardware,...

JON: In a sense, sure...

WOODY:...in a sense, and ~~but~~ one control. But in a sense of a first level, when you _____ only with hardware and your program, which is let's say each frame specified, you will be talking only about two parameters, which is you... kind of controlling or commanding the system rather directly

JON: I don't understand what defines direct or indirect here, because they both seem to be the same type of control or modification.

WOODY: No. The program itself can become a structural basis for your control. And that will be applied to hardware. But in the first case, when you're not using a program itself to create a structure, when you use the programe only to facilitate direct parameters from you to the device...

JON: ...as a manual interface...

WOODY:...that;s right. It's almost manual, because if you ~~would~~ specify each element, there's not much difference as if you would turn the switches on. And whatever your capability of patience is, that's how your product will look like. But it will be a direct translation between your thought process, or decision, and ~~your~~ the tool. But the program itself contains then...it's very much like oscillators, when you hook up two or three oscillators, you can only control. You cannot specify because they become redundant. And in fact oscillators, wave-form generators

are carriers of program...they are programs. They are programming devices...

STEINA: Yes, they are programs.

WOODY: That's right, they are programming devices

JON: Except that you don't have control over their...You have control over the mode of their automatic functioning. You don't have a point by point control of oscillators. It's one difference between analog and digital, in that you have control over a process which is continuing.

STEINA: You can't freeze it, see if you have a ramp...

JON: It's a paradox to freeze it, of course, because...

WOODY: But Jon, don't get misled, In fact, creating a program is creating an analog tool, because the program itself is an analog tool. Because it behaves... Once you create a program, you can of course stop or freeze. That's the only difference between analog systems which have to perpetuate. There's no way that we can stop time in analog devices. But of course, since everything is sliced, or grouped into small elements here, time elements, each of the elements can be called, an example. That's the only difference. Because once you create a program, you have created an ambiguous kind of model... or ambiguous kind of redundant model.

JON: Sure, but this kind of divisibility puts it into a framework of itself. So that if you have, if we're dealing with analog terms, an analog framework that deals with wave forms, as all of these tools do, if in some way you alter it you're changing the wave-form-and-also-the frequency and also the shape of the wave form involved. You've changed it in kind. There's no divisibility here, because once you've stopped the ramp you've created a whole set of of sine waves.

WOODY: I think we should introduce two levels here. One is microprogramming and the other is macroprogramming. In a sense of composition, like in perceptual time, when you start

some performance and you end, in fact you can view that as a wave form.

narrative?

JON: In a narrow sense, sure.

WOODY: And that's what I would _____ to the ~~wave-form~~ program which is using algorithmical structure. But indeed there is a second level, which is the actual image forming process, which is not associated in that sense with kind of a real time analog performance like ~~here~~ feeling? _____. It may be.... ?

JON: apparent...

WOODY: ...apparent switching of function. But if you switch only function, let's say, in arithmetic logic unit, there's no wave form so to speak, except the display. ed one. It is in fact a step, it is a discreet step, switching, your choice could be precise, it's true. So we don't... (FUNCTIONS)

STEINA:

WOODY: In a way, yes. If you say you want to perform a logic operation, horizontal and verticle bars, it will be specified to the degree that ~~any-point~~ you can recall at any point always...

STEINA: I think you just open and close gates.

JON: But the gates aren't opening and closing that fast, are they? EXPLAIN HOW It's not operating as say a computer for music synthesis operates. Does it? This is a hardware question really. It has to do with the capabilities. You're not switching in the nanoseconds, I assume. You're not building components of amplitude and frequency as you would be....

WOODY: The switching rate, if ~~you~~ we deal with this system, on it's peripheral, in it's output stage it is a range of nanoseconds. It could be 50, 100 nanoseconds. The function of change is, once we prepare this digital structure, we have to apply that to an analog conversion. And in that conversion it may take certain longer time, but it is still a range of microseconds. I mean, it actually rests on one microsecond, because we can create an edge, and if you have a microsecond it's not really an edge, it's an area already. It's one sixtieth of a line. We can switch really in a range of nanoseconds, even when we convert a binary, or the digital

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information on the screen, which is the longest, in fact, conversion.

JON: All right. So precisely what is the computer doing ~~when it~~ at its lowest level when it puts out... the image?

WOODY: ...that's right. So what it does, it has to...two functions. One is, it operates through its program. That means, you set up parameters that it should perform, and it applies its own parameters towards output device. Let's say we have some unit which will be switched in particular command related to a machine language structure. Second one is to retrieve memory data... that you can create your...

JON: May I ask you a simple question, because you're asking it in it's application, not in its theory. If I wanted to create 256 vertical bars on the raster, how would the computer do this? Just between black and white.

WOODY: This computer cannot do that.

JON: Assuming that it could.

WOODY: Aha. There would have to be a clock. That means each line would have to be counted, from beginning to the end, and not only once, it would have to be multiplied ~~one~~ 525? times a second...

STEINA: Excuse me. Could I rephrase it, that you would only want to make three bars...

JON: ~~Certainly~~- By all means.

STEINA: Then it would be easier to explain.

WOODY: So there is something within an internal structure the computer called a cycle, in which it performs a set of operations that you perform...prepare...make certain menu?. And it goes to first operation and has to examine it and perform it. That is usually in this system, 16-microsecond long time. That means, in order to... if you have 63 microseconds on the line, then you see how much it can catch. Change that perform, like changing high value to low value can be performed only about three times. It's like a locked-in oscillator which has a capability of producing let's say

white, black and white on the screen.

JON: I see.

WOODY: But, indeed it can change each line. You have certain control over each line within those three parameters.

JON: All right. Let's say that I wanted in the first part of a line for it to be black and the second part of the line for it to be middle value and in the third part of it the line to be peak modulation. How would it do this?

WOODY: You would have to introduce something which would involve assembling a binary representation of each segment. That means your command would be to fetch or create three numbers, either within the memory or through the program itself, and apply these three numbers to digital/analog converter. So that the two parameters would have to be ready. One is the locational time code and the other the value code. Usually the locational, the positional code is done through a clock which ~~the~~ divides the horizontal or the vertical. The other value has to be fed to the computer. But there's a way out of it of course...

JON: NO, ~~I~~ but I'm curious then. This computer has to at each point within its resolution specify two sets of numbers, which ~~is~~ are, I assume, the value code which has to do with the brightness, leaving out color for now, and the positional code which has to do for when this change begins and when it ends. So that if indeed it had this capability of switching 256 times or whatever it can do, in the space of a line, it would specify, and this is a question, would it specify 252 sets of two numbers for each of those positions, or would it specify a change until...

WOODY: Indeed it has to specify both. It has to know where the change occurs and in what ~~brightness~~ code the brightness occurs...

JON: Of course,

WOODY: But in order to do such a large number, you would have to time-share it. You usually do it by allocating the fast memory outside of the computer and I would say fill the buffer

with different times on the scale and then we apply it to the screen at instants...

JON: I'm asking you a very simple question. And the very simple question is, for each point within the resolution of your computer, does it in fact calculate a set of numbers for the ~~value~~ voltage level and position? * It doesn't specify the a change and let it go until it reaches the next positional point. One would be a semi-analog system and it's an interesting duality. > P/4

WOODY: Any value change on the screen has to be indicated to a binary number which ~~has to be~~ is delivered to that particular location...through coordinates.

JON: So your computer calculates only changes. It doesn't calculate static conditions.

WOODY: That's right. It's this way in this case since our buffer is small it sweeps through all the locations, but there is no change, it simply doesn't change. But it does sweep through all locatinns. It can also be specified through a program that ~~only~~ only change will be dealt with.

JON: How does it deal with sync?

STEINA: See, this has to do with my question, because you keep talking about the computer, and the computer doing it, and that it is the computer. I think it is different. It is the decoder and encoder, the buffer. The computer itself doesn't generate anything. And it has all to come back to video -- so, could you make an analogy, because I couldn't really do it -- between the way the signal travels from camera, through camera-obscura, being decoded and then encoded back to the screen, to how we generate on the computer from the decoding to the endoding.

WOODY: Let me give you first a poetic analogy. That for me the image-making -- the actual video part of this is like floating structure. These are two boats that float side-by-

* ~~WOODY & STEINA. Yes.~~

sides. Each of them have their own time structure, they are not related directly, they are not synchronous, they are in fact two a-synchronous vessels. Each of them contain a certain amount of information and certain capability. Now, in order to communicate between these two vessels, at one point in time certain information has to be delivered from one to the other. That's the only time when they are roped together. It's every sixtieth of a second, there has to be rope given from one boat to the other and in that moment they provide certain synchronicity towards each other. But the rest of the time, during the field scan information they are free-floating again. So that would be the attitude between these two systems. They are already two systems, they are interlocked through this little time demand. They have something called a handshake which is a specific term, which indicates that the rope completed its communication. They handshake, both sides, and they disconnect this particular rope. And that's being done sixty times a second. But they are totally autonomous in their performance. It's like when you spoke about the creation of a line within a monitor. You only trigger the beginning. The whole process of forming the line is autonomous in time, and its destination is unknown. I don't know, did I answer the question?

STEINA: Yes, except you didn't clarify what is the role of the computer and what is the role of the devices.

WOODY: Okay, now let's talk about the devices. The video-making device, a field-forming, it's a field forming device, a set of clocks, it is in fact a sync generator. And this sync generator generates what video generates -- lines, it makes a field. The only difference here is that the lines are numerically specified. They are not accidental in the sense of length, they are clocked. Even lines are controlled by a clock. In video it's clock of a line. Here it's

is a clock of an element of a line. In this case its a nine megahurtz clock. That means when it clocks, when it jumps and creates a line, each element represents a binary number, and if we look at the whole screen we can view it as a binary-specified numerical structure, in this case 8-bits horizontal numbers and 8-bit vertical

STEINA: What does it mean in the sense of a line? How many elements of a line... can you control?

WOODY: 256. You can control 256 elements on horizontal and 256 elements on vertical which corresponds with half frame that means a field specification. Is it clear? or not?

JON: It's clear.

WOODY: It's a little bit tricky how the number is created. If you understand binary numbers, let's say on the top line is a very fast ~~clock~~ high-frequency clock, changing high and low. Below, it's changing every second. Below, again. If you sample in time the screen, this way (he indicates a verticle slice) there will be eight numbers which could be interpreted as an absolute vertical location, or horizontal location. But that may not be...

JON: I don't understand. Eight numbers...

WOODY: That means, I said every point on line is specified through an 8-bit number. That means when you start creating the line, the clock will have to output parallel ~~power~~...

JON:...sure, beginning at a specific point...

WOODY:... 8 information al sequences. If you display them on a screen, the highest one will be changing very fast. Lower one...

JON:...because of the nature of the numerical binary display...

WOODY: that's right. There would be like stripe of different time divisions.

JON: Because this is moving so fast that there is no illusion of simultaneity. I see.

WOODY: That's right. But you can actually sample it as parallel output, ~~but~~ because it does exist as a parallel output.

JON: So what does this allow you to do?

WOODY: That allows you to treat the screen as an absolute numbering...it's a location...it's a set of two numbers, horizontal and vertical. Where it helps you is to address, there's an addressing structure to the field. That means if you create a square indeed you can calculate a beginning to the square and an end of the square in a sense of numerical code and that's how the computer can in fact communicate with the screen.

JON: I see. So that is to say that every point, let's say that you're dividing a line in terms of these very short the first digit of the binary code, that the next line down, let's say the next even line down, the other next line down, will be specified by not the same number in a code, but an entirely different number. Is this correct? Because what I don't understand is the nature of this multiple division of the time code in terms of the vertical.

WOODY: Each line will be specified by the same sequence of 8 binary numbers, but at the same time the field will be decreased, because the field when it's at the highest point will have the most complete number and then slowly it will be counted down. It's a little bit abstract process.

JON: Very abstract.

WOODY: It is the basis of it. You don't have to grab it now. I kept it a long time in the back of my mind. Because I couldn't visualize it. But eventually it clicked, it's a fantastic idea. As each line has to count from the highest to the lowest, each field has to count from the highest to the lowest and they're coincidente. That means highest number of a line can still become very low number of a field. But on the contrary, when fields start regenerating, the buffer, I mean the counter is filled again with the highest number. So it is that kind of a process in which time, the clock divides and specifies

JON: Let's get back to the modes of control. That is to say the three aspects of the system. We're talking about ~~hard-~~ ~~WOODY: were, the~~ programming ~~and the control~~ and the hardware and the control.

WOODY: I would say that, ~~for example~~ again the hierarchy of how much for example the hardware carried, how intelligent hardware is, or how complex.

JON: How intelligent, or how flexible?

WOODY: ~~Let me put it this way.~~ By now I also can forsee how hardware is replaceable by software. Or what is kind of a proportionally possible in sense of software and hardware. Let's say if you look at that matrix, for example. That George Brown. That's very exact locations. There are lights on it, there is a keyboard. This matrix can be made on a screen as a graphic display, and lights can be indicated let's say ~~say~~ by cross and empties by O's, and there's a cursor -- which is electronically created cursor -- which services them. In a very, identical way, it's product is in fact the same as very elaborate hardware. Drilling the holes, putting in LED's, and operating the display. All that you need is a point specification and you sit down with a graph paper and in fact divide the screen into absolute location of time, in this case a two-dimensional space, and in instant, this hardware structure is replaced by a software structure. But that's the first level. That's the physicality of the hardware. The same applies to a device. Some devices have for example many clocks. And they are almost independent, so the computer only can only access them very briefly and just guide them to perform these elaborate actions. Some systems have none of the specified hardware and all the hardware is assembled within the computer as a structure. But they serve a very identical purpose. And it was in fact a surprise to me, because people always mention "You shouldn't do that, you should do it through software" But at that time it was totally abstract to me -- how can you replace

how that is,
a structure as hardware, since I come from video where hardware is the basis ~~for~~ of production, of any product. But suddenly the possibility of replacing totally the hardware strudture through software is possible.

JON: But this is because you quantize qualities. That you have taken these aspects which are...That the machines of analog control -- analog synthesis -- operate on essentially different principles, different processes. And each of those processes is specified by the particular machine you're using. Here you've divided these various qualities that are necessary to the specific types of analog hardware that we use in video or audio and you've replaced them with a quantization of values (quantadization?) which can then be substituted completely. Information theory tells us this. So it's the exact equivalent. So what you've given yourself is the flexibility to cross properties while maintaining the single system. So this seems to be the principle you're talking about now.

WOODY: What I was describing was the first level which is hardware. You already went into a formal kind of manifestation. That is a second step, that you can in fact specify the behavior, or performance of the hardware in a particular way, as you linked it to the performance of an analog. But indeed, analog performance is already a program which is inherited within analog tools. But it can, surprisingly enough, be simulated, or performed through particular mathematical functions...

JON:...of the digital equipment...

WOODY:...but they rather belong to the programming, or mathematical equipment. It is not the first level... I mean, digital equipment as hardware is entirely different from the analog. Their relationship in performance can only be specified through a program. But ~~super~~ surprisingly indeed, the mathematical specification of program looks very

much like what's experienced through inherited properties of analog systems. That's ~~what links them~~ how I would link them. But what's interesting is ~~how~~ that the digital computer is a totally ambiguous tool, and anything that should for example manifest either pictorially or acoustically, ~~or I don't know...~~

~~JON: as a wave form...~~

WOODY:...or even numerically, as a table, whatever... All these things, all these models have to be built into the computer. The computer is for me a large room, or it's a large warehouse in which inside you can build stage to shoot movies, you can build a model of the universe with all the stars rotating around, you can also put a dying patient there, monitor the death of a human being.

JON: So tell me, ~~how~~ what do you build in to the computer to give it these capabilities?

WOODY: An interesting question. First of all, we have not built anything since we built the hardware to do video. We avoided this question. First of all, I didn't know that it was possible, and secondly, the computer itself does not accomodate -- this computer has no capability of dealing with screen directly. But in theory and in practice with larger systems, even the sync can be generated directly, numerically through a program. That means there is no need for video as a hardware setup. All video is only conceived through a set of instructions. And the computer can serve five minutes before assimulation of third world war and right after it can serve as a broadcast studio.

JON: So what I'm curious about then, is when you speak of building, what did you call them, not capabilities, properties? I forget. Call them capabilities of the system, you're not building a capability as such you're building as parameters in terms of speed and storage, is this correct?

That would enable you to perform these various mathematical computations that you need to do the third world war and so forth; that there is no inherent difference in the structure of a computer for video or for warfare simulation, it's only in terms of speed and computational ability. Is this correct or not correct?

WOODY: It is correct.

JON: So that a computer is fairly much a blank check. You call it ambiguous. It can do anything if you can specify it in the software as long as it has the hardware capabilities to operate at that speed and complexity.

WOODY: Right. But there is something, I would say. There is a building of a system within a computer. You have to bring let's say your data structure, let's say you bring your camera obscura with you on a piece of paper-punched tape. And then you have to enter that and create what's called object -- object ~~module~~ module which is a binary specified program within a core. By doing that you've built, sort of pseudo-physical or... you have built in a way physical, physicality of a camera obscura into the system, so you've converted this warehouse into a special purpose tool. Indeed, many special-purpose tools can reside side-by-side. The closest analogy would be speech synthesis. All you'd do, ~~in~~ with the same computer in which you'd produced pictures, you allocate certain part of the warehouse for the machine, which is now a soft machine, software machine, to let's say assemble certain codes into what's called speech. And it has a program which assembles those things and puts them out in between the picture out, put because unfortunately ~~you can't~~ usually a computer has a single output -- a port -- and through that single port it has to push through all the information that should go out, ~~because~~ normally it's done by time-sharing. Certain things are held back while other things are... But that's about the capability. Generically, it's the same system _____, same storage. And suddenly there are two different products. Which is unheard of in let's say

analog systems, unless, as ~~you~~ we know, we take sound-making devices and apply them to control of video systems, or direct regeneration.

JON: But that's a question of display, more than function.

WOODY: Right, it is not making a distinction between generic differences. You don't build special-purpose machines within a computer... JUMP TO #3 PG 19 BOTTOM: *

STEINA: How many functions do you consider a computer has in image-making? Like a control function. We use two: we use a control function and we use a generating function but indirect generating, and then what you're talking about now is direct generating. So, how many categories, or how many sub-groups?

WOODY: I see. So, I'll put it another way. The time scale, or time accomodation of what's called perception continuity of image and sound -- that perceptual continuity depends upon the speed of ~~the~~ performance. That means if you want to repeat a field of information, perceive it as ~~kind of~~ a continuous let's say dynamic interpretation, you have to do it let's say 60 times a second. If you want to do it directly from the computer without allocating this function outside like in our case, you would probably...it's impossible in this case. What is the question?

STEINA: What, are those kind of the three groups that an all-purpose computer can do in generating ~~an~~ or controlling images...

WOODY: There's only one question. Is the computer capable of performing them in time. Or does it have to use intermediary within it's time, performance. You have to use intermediary called the image-making bus in order to even deal with the function modes, or control modes. But they are indeed not the primary, they are built since the system is ~~small~~ economic or small, or prohibitive. So we have to bring the social factors into this...social economics.

STEINA: But it's also a matter of knowledge. Because in generation there is still an awful lot to be done. There is very little that has been done yet, as we see with John

Whitney. He brought ~~nearly~~ probably everything they had done, which is two or three years of very extensive work. I think he brought every last image.

JON: Sure. So let's get back to concepts.

WOODY: All right, all right, if you can steer it somehow.

JON: All right. So in terms of this division, which you have, these three aspects which are; number one, the hardware, which is the IC's inside the thing, basically, the software, which is how you can manipulate these IC's and ~~certainly~~ thirdly the manual control,. You speak of a kind of equivalence between the software and the hardware. That is to say that you have this machine ~~that can~~ which will do virtually anything that's within its parameters and that you can program it to perform the tasks and specialized devices that you would have an analog.....that in some sense hardware and software are equivalent, interchangeable. So, can you continue on this.

WOODY: It poses basically, a question of materiality of a tool, and understanding a tool as ~~in a way~~ immaterial. ~~Because if you describe anything,~~ Like we deal through integrated circuits, for example. It is a set of pragmatic commands to do that. Because if our ambition, or if our ability would be to see the computer as pure tool within itself, you would not have urge of dealing with the components, as you describe it. So in a way, first of all, it is our knowledge deficiency that we seek this material~~ity~~ understanding of image, or component, or tool - specialized tool ~~part~~ path. We have taken this ~~part~~ path because it ~~is~~ was traditional to us from very long. This indeed generated from a box. There is a physicality called a sync generator. There is a camera. These things are absolutely unrelated to the puristic understanding of a computer. Because these things, as I said, ~~a~~ have been ~~created~~ CONNECTED TO A COMMAND.

JON: So you can create ~~things~~ images through these ~~completely~~ absolutely non-material things called wave forms, in analog video. The box is again, only a mode of control and a programming implement that's used to do this, In a computer again you're again using a different type of device which produces these wave

forms that are again immaterial to create an image. So it seems to me that the difference lies somewhere else. Not in terms of the materiality of analog video and ~~the~~ immateriality ~~of~~, but instead, perhaps because you've abstracted them, in a digital system you've abstracted ~~them~~ that material one other level. Which is that you've taken the quality out of it, you've taken the size. You've instead substituted elements that are so small, that you can use them to construct almost any other larger component, which is the nature of digital.

WOODY: I would say it is the capability of presentation of a code in time. That means, everything... Let's speak about the resolution. If We want to speak about densities, or locations of elements of image, these all in abstract way can be represented through a code. You have to either accept it or not accept it, but it is like that. If We have a long, binary number we can specify_____.

JON: Sure, but it's falling apart. What intrigues me the most, is that you've eliminated that which is most tangible to us, which is that you've eliminated quality. You've eliminated...on that level.

WOODY: No, I'll tell you, I'm just trying to destroy the perceptual mechanism as the only possibility ~~means~~ of perceiving let's say reality. You see, but let me just give you an example...

JON: But we're talking about two different things, I think.

STEINA: ~~Now~~ Jon, what do you mean by quality?

JON: So when I touch something, or when I look at something, when I envision something ~~when I~~ imagine something, what I imagine ~~is~~ are a set of qualities like color, shape and so forth. I'm imagining all these aspects. That which is real to me in the world is a system of qualities. Which is like I don't hear the sine waves that are making up the complex wave forms ~~the~~ from Steina's violin, for instance. What I'm

~~hear is~~

hearing is that analog wave form which is Steina's violin.

WOODY: You're bringing it back to the basic ____ the question. That is, are you ~~hear~~ here to decode the beauty of....Are you here to judge the existence of the universe? Or was the universe here before you, to be more beautiful than ever.

STEINA: What's fascinating to me, also, when you say a violin and things like that -- all a violinist strives for all his life is control. And in analog systems, all we were striving for, all the time was control and is control. And you long for a machine that has the absolute, total control. Once you get it, there have been many years spent on computers to find a true random generator and they haven't found it. What they've come closest to is something called pseudo-random...

JON: Which is...

STEINA: It will eventually repeat. And computer people spent an awful lot of time in losing the control, because the ~~computer~~ machine is so absolutely controlled that it becomes inhuman. So we always have to strive for what's not there. We ~~are~~ always want a tool that does the opposite. And I think that what we will always have to end with is hybrid. Because everything is hybrid, is this yin and yang, back and forth. Because you both want to talk about absolutes: the absolute analog ~~and~~ or the absolute digital... go ahead.

WOODY: No, I want to ask you a question. Do you think that beauty, ~~do you think~~ we are seeking beauty, or that beauty is? You see, what you are asking is that you would be seeking, seeking the possibility of...

JON: You're very European and I'm very American.

STEINA: I think the opposite.

JON: What I am saying though is that you are subdividing to a degree ~~that~~ where you can generate from these absolute abstractions, which are these little binary levels that exist at a speed that is virtually unimaginable, to us, and invisible to us except ~~in~~ through certain kinds of displays such as video -- that you have

eliminated all kinds of distinguishing marks except in the building from these digital aspects.

WOODY: Let me explain in two ways,. First of all, that scale is a state of mind. You only ...

JON: Can we stop this? This is incomprehensible and...

WOODY: No, It's mechanistic. If you say that video is fast, I must laugh, by now. Not because I am a smart person, but because I've seen, someone let me see this. I have seen things that are impossible, in fact, because they are too slow, they cannot appear as pictures. Or the obstacles. I've seen the difficulties in which time like you speak about video which is a manageable medium for a middle aged ...technician. But there are problems that cannot be approached because they are too fast, and they cannot be managed through components, for example. But they exist, and we know it. The second part...What was the second part you said? Secondly, I think it is possible to make total understanding of reality through the elements. There's no need for large narrative or other structures. And I think the poetic principle of today is not truly the interpretive, or as you brought in, camera appreciative. In fact, poetic principles of today are the analytic ones; I'm absolutely more satisfied with what we call generally a poetic principle of fantasy...the need for fantasizing is definitely within the scale of elements that we can access.

JON: So then I think we completely agree.

WOODY: I don't know. You seem to always bring this appreciation of art, somehow. Always sneaks into your attitudes as if you would be longing for it, you see.

JON: No, but I think that...that this tool is devised. I mean, you can look into the innards of your computer and you can see these things. But yet it's devised to bring things to us on a level that we're able to perceive. It's a building thing and so it's still a perceptual mechanism. It still presents us with these qualities that are for our eyes or for our ears - whatever context you may put them in esthetically - so it's a different framework. I mean we

don't disagree on this.

WOODY: It is a symbolic proof, it is not an absolute proof any more...You cannot take any system... Because any time you present this possibility the answer is, or the reaction is "But why cannot do this?" because in our minds we have trouble there. We have to see the end of it, we have seen totally synthesized images, but it always is the deficiency that we have to deal with. Because the human mind cannot be matched. It has been explored to the utmost.

STEINA: The deficiency is really that there are no new images there are only new tools.

JON: And this is in a way the terror of digital.

STEINA: It is not a terror, it's like... There are those different video systems like there is a Hern (?) system, there is a Dave Jones system that Ralph uses, there is our system - George Brown - The images are spitting alike. There is no difference, there is keying, colorizing, but they are exactly the same. But everybody has been talking about those tools, this revolutionary approach say that Hern (?) has with his voltage controls that is supposed to make new images: it doesn't, it makes exactly the same images because there's only those images. Now we get to computer it's the same images because, I didn't know it until actually quite recently, it is all built on loops. And that was long before a computer became a controlled system like this thing used for us when they were using it just to count salaries and things. It is all in count-downs or count-ups and what is a count-down or a count-up? And then it goes, and then starts again, it's a sawtooth. And then there are sine waves or there are square waves, it is all cyclic. And so there is nothing really new except that those can be made absolutely 100 percent precise whereas analog waves are not. And you can take...

WOODY:... It can't be made completely precise. Also the computer program has a lot of ambiguities...

STEINA: But it is called loop, and ~~the program~~ in Fortran it is called DO LOOP and everybody ~~lives~~ believes in the do loop and what is it, it's a wave form, that's all it is.

WOODY: It's an organized principle, it is. If you look at it from a distance as a _____ oscillator, oscilloscope and you see ~~there was~~ it as a sine wave. But of course it's a process through which things are organized. We're talking continuously...You brought up last time -- We are talking of organizing principles of certain images...it's a structural kind of effort. We are trying to communicate some structures. tures that indeed look like any other structure. But except ~~that~~ there is access to the element and elements now can be treated as they could have never been treated before. In some other areas they could, like in speech maybe...

JON: Slower processes, sure...

WOODY: ~~I~~ In...mathematics always,. But this is a whole different idea about what media represent because suddenly we can specify media in a certain set of absolute codes. So that I would say is the essence.

STEINA: ~~There are~~ But also ~~other~~ analog has been ~~greatly~~ very deeply influenced by digital _____, ~~but is~~ that say oscillators have become now so precise. And you can phase lock oscillators, and we... Both the technological achievement and also the demand for it I think come from digital.

WOODY: Because a new scale of precision is possible, because the digital systems are a new set of clocks which are controllable clocks. So the time scale has shifted somewhere else, that's why it ~~was~~ will influenced definitely always the tools of the present system. There's a built-in future of time definition.

JON: So why is it you're working with computers?

WOODY: It's a sworn duty by now.

JON: Could you be more specific?

WOODY: It's a very interesting question. Not really interesting but... I think that...first of all I can give up any attempts of making structural work in_____ image. Because it gives me possibility of dealing with large behavioral models. I can say my computer has to accommodate every cultural aspect.

JON: ...has the capability of doing this?

WOODY: No, in a _____ sense, indeed it does. You can put a few words into it, it can speak up, it could make certain symbols on the screen and can compose them. So that in a way again gives me again a territory which I can have for myself in some way, so I don't have to deal with specialization. The second is the fascination, of course, because it is interesting. And third, I can do it. I don't know why, we kind of have the conditions of doing it so we do it. So these are the pragmatic solutions. Thirdly I do believe it is my duty to do it.

STEINA: It's a very hard question for me...very hard question.

JON: I think we have to come to grips with how we want to... what kinds of concepts and frameworks we want to talk about. Because I think we're having a real problem.

WOODY: So, Jon, you have to be the thinker here.

(here a break was taken)

JAN: My question is, is the goal of programming a digital computer...to generate an image... is the goal a program that will run of its own, from beginning to end, whether or not it's being constantly fed external data as input. Or is the goal to devise a program that allows an human interface, constant interaction between the operator and the program itself. The second seems to me much more interesting in generating a program.

WOODY: Unfortunately I have a lengthy answer. First of all, I was interested in video because ~~video~~ it was a phenomena that in a way did not ask these questions. It was a phenomenon that could have been done in a group; because there's no personalization of control yet. It could have been done in team; ~~because~~ everybody was in a way perceiving with equal respect. The triviality of it was very important because that's sent through a feedback, which is a system performance. Suddenly these relationships were minimized. Of course you could also say that it was a certain degree personalized by certain set of choices. But as a phenomenon, to observe this was beyond what's called... aesthetic appreciation. It was simply as much stronger urge. In a sense of a computer it's about the same. But what I'm trying to find out are the inner- ~~most~~ modes, which, again in a way ~~the in~~ a feedback. In which the system would perform or ~~I would~~ in which I could observe these inner modes of ~~some performance~~ sub-performing. That's why again...from this personal... after video phenomena we went into specification ~~of~~ video ~~in~~ kind of a more personal basis, in that moment we ceased a teamwork. She cannot work in a team once it becomes a controllable tool. And this stage again, this is a team work. In fact I haven't produced a one piece of video except a few test programming. Most of the other people they do actual work because they find some reason for working with it, ~~see~~. I have none. All I'm doing, I'm trying to find this particular mode, feedback loop in which I could observe and indeed_____ control it. But in the next stage it will probably become a personal tool of mine, as other people's when suddenly the confrontation of these questions will come. But I have always managed to avoid these questions which seem to be rather moral, or ~~rather~~ moralistic, or of a nature of a struggle between the creation and material and...so I don't know.

STEINA: See, it is like image and sound has always been very distant through ~~our~~ out history, they have been very distant, different mediums,

and with moving image it started ~~getting a little~~ being closer because it was an image in time and there have been alot of attempts made to make moving image into film. Video came already a lot closer to it by being instant like music is. That whatever you make you instantly hear back, you can feed back to it. And ~~here~~ video brought with it the same things as music has: the group performance, the improvisation; But also there was a ~~yen~~ yearn for a score-making -- because that's where music always is at its highest -- as a composition, as a score. And video couldn't do that. Now, that's where computer comes in and I don't know...

WOODY: It's too clear, it's too clear a model...

STEINA: ...it's clear...but...

WOODY: What you are describing is indeed an evolutionary process of the _____ tool, you know?

STEINA: Yes, but in that way visual ~~idea~~ has always been so envious of sound, of music, and has always yearned to join that media.

WOODY: ..to disclose. Because the music is much, maybe structurally manageable, of course. So that might have brought the emergence of score in music in such a masterly. But I'm interested ~~ing~~ in observing the phenomenon much more than any creative process which would be in fact culturally defined materials. That means your question is the same as Jon's. What is in fact the cultural placement of this activity or image within the whole culture. I cannot refuse to deal with these things. I don't have to in a way be... I know other people who do it like Grauer, all his life he is trying to define ~~the~~ structure as a definition of a cultural product but when you ask him "hey what is the result, what is the composition, what idea does it carry?" he cannot answer. I guess it's not up to us to define the cultural content... we can try, but...

JON: You know, the thing that intrigues me about these tools is the fact that in a sense they're objective and they're not cultural. That they exist outside of culture, to a degree they're automatic in that they will operate on their own. That they will carry out a process that you can to a degree specify or set up the parameters of it, and that these things exist outside of culture. Within that cultural intervention that exists ~~when~~ in the construction of the particular machine...

(side one ends)

JON:...esthetic creation, content viewing, they're all the thing same in a way. That there seems to be an implied and to a large degree fairly well-stated attempt to...to relate these modes of esthetic to these things ~~that~~ that are real, which are illustrated and specified to a degree by this equipment. And this has to do with the range of possibilities for looking at, process or phenomenon or whatever is, you did and some other people are doing ~~did in video.~~ this kind of So there's a cohesion that's there but it's only sparked by the fact that we have this hardware. And now we have this machine, the computer which will do almost anything if it lies within its parameters. And the hardware is no longer a problem, the problem becomes the software, which means that in a way you're in the position of having almost to define the phenomenon under investigation. at the same time as trying to observe it and that puts you in maybe a ~~critical~~ fruitful position, maybe not. But it's certainly a difficult one. ~~And it's potentially a very creative situation.~~

WOODY: But let me go back to what Grauer said which was -- maybe we should be formalists, because it's really the most difficult position to take. Because if you say that the tools around us provide naturally structures ~~inside~~ fact, and the computer is the tool which is the most open or least defined and then the structure you build in becomes

the relevant one, then I think it's the perfect tool to exercise formalism. But at the same time it is part of the evolution which is natural and any product being assembled through this tool...

JON: ...can be seen as natural...

WOODY: ..can be seen as natural, or naturalistic. And I think this is a dilemma in which there is a total violation of these natural, or naturalistic processes towards the intellectual one in which formalism is supreme, in a way . It Maybe more ridiculous, maybe not misunderstood, it may be unrewarding, it may be unsellable, it may be asynchronous to the rest of the art, but I guess it is the highest exercise of any duties of us. Yet so many of us, including myself, I wouldn't be able to take a stand as a formalist. I would not be able to explain myself...that I do not believe in form. because form of course indeed is a content and it presents an idea which I would have to defend, and I don't have those ideas to be defended. So I guess it is the most difficult position to take. I think some people do it, like Tony is trying to in a way define a particular formalism as a school of thought and activity.

STEINA: So what is the formal today? in arts? Is it formalism or naturalism or hybrid? How is the world oriented toward art right now?

WOODY: It depends what we all understand by formalism.

STEINA: Victor was saying that he thought the world was coming back to formalism, away from naturalism. And I think it is formalism that reigns now. I find people very much down on totally emotional expressionism... in art.

WOODY: Why do you think emotional expressionism has anything to do with formalism?

STEINA: Okay, good. Define formalism.

WOODY: We have to create this term, or interpret that term of formalism in our own minds. I think formalism is always to me anyways, the least natural to my own mind. Or somethink that I cannot reach. And I guess formalism must be

defined in other people's minds somehow similarly. Because you have to make a special effort to violate your naturalism to create a formalistic work and defend it as the most artificial. Because what's natural...the anti-pole to natural is artificial. So the least natural is the most formal.

JON: It is a specifically constructed framework that is, comes, it's a system ~~that comes~~ of ideas that is constructed by the mind of the maker, unlike in some sense naturalism which is investigating some properties that are outside of the maker.

WOODY: Construct it ~~a~~ and defend it. Or put as the content. You can never fall back on anything.

STEINA: All right, so ~~there~~ it has nothing ~~do~~ to do with rationalism versus emotionalism or any state of mind or anything. It has to do with artificiality versus naturalism.

WOODY: As I say, if we divorce ourselves from what we are as part of the nature, as living beings or as societies or colonies, if we say we are deep individuals, or individualistic beings which have their own synthesizers in their own heads then we are entitled indeed indeed to perform formalization of such a process. I don't know. It depends How ~~would~~ you define it? That's what I understand by it. And also if you take people like Grauer has, taken like Mondrian. Of course you can apply his theory because Mondrian's work ~~way it~~ was in a way formally defined as least naturalistic.

JON: Except that Mondrian was always representational in a way. He always kept that. And he went back to it ~~in~~ at the end of his life. But he always used those squares as a kind of direct representation of some kind of essence or whatever... rhythm or whatever that he saw.

WOODY: ...space, which is almost object-like treatment of squares

JON: So Mondrian's a bad choice. But...

(break)

we cannot deal with this ~~si~~ problem on even simple level of understanding. We should... in fact I'm inclined to regret that I have involved other people in it because it is maybe very important to do step-by-step rationalization - it may take a longer time, but I ~~need~~ used too much outside help already. Because now I'm trying to rationalize the tool, it's easier because you can ask. And asking is a fantastic way of learning. But in fact the physical work, I think/should be accomplished by a single individual as ~~a unit~~, as valid ~~(illegible)~~ experience as the product, in fact more. I don't know how to communicate that mode of experience which is probably very important. But these are the questions that I would answer. But maybe I should prepare some questions for you, I don't know, how do you feel?

JON: We should probably have a graph, a graph of levels of questions. We would have a graph of questions of hardware, questions of motivation, questions of culture, questions of construct, it then might be too limiting.

WOODY: What we should do, we should maybe do a couple more, whatever, sessions. Then stop it, do some~~thing~~- kind of little editing, and after Christmas, next year...

END OF TAPE