Artificial Intelligence: Search Methods for Problem Solving

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Lecture – 06
Introduction (2013)
Language and Thought

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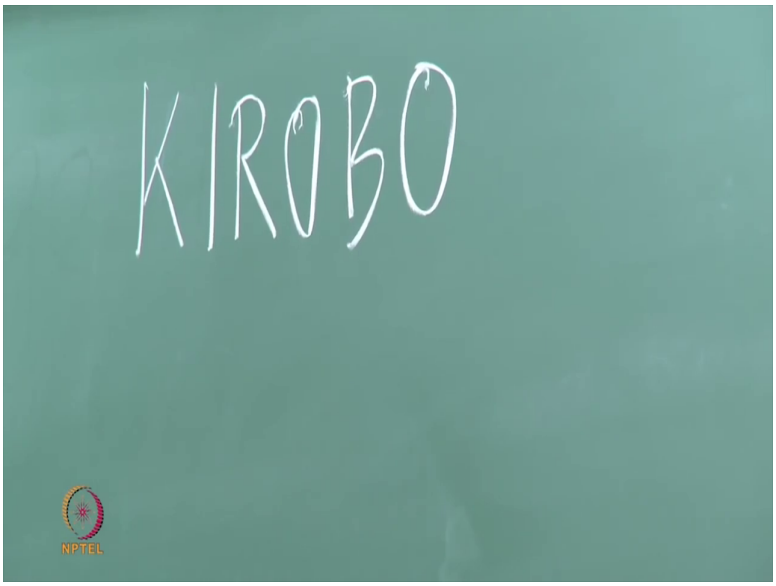

You heard about this creature? Kirobo is a small robot 34 centimetre comes to about your knee or something. Built by Japan needless to say it is Japan is ways ahead of the rest of the world in robotics and this robo has been sent to space on Sunday that is how it came into the news. If you are watching some news channel well maybe BBC or something else.

Japanese space agency has sent this robot into space. It is a small robot which can recognize speech, understand what you are saying, talk back and recognize faces and so on essentially.

And the idea is that, this robot will be a companion for a Japanese astronaut who is likely to who is scheduled to go in November something and that is an interesting idea robots as companions of people.

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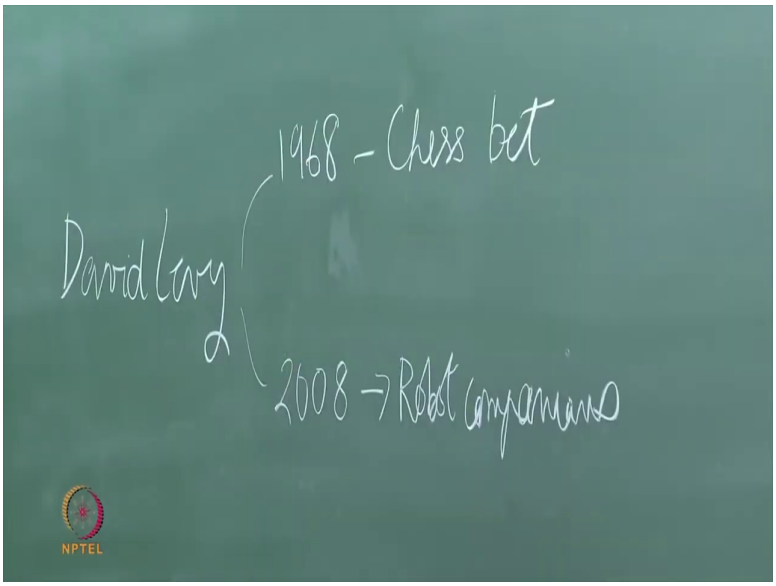

So, if you remember, we had talked about I had mentioned about this chess grandmaster David Levy. In 1968, he had a chess bet ok. So, we had talked about it in the last class and he had said that no program can beat him for the next 10 years which he luckily survived the bet because now as we know chess playing programs are much better.

But in 2008, he is talking about robot companions. So, he has swung from one end of the pendulum in which he believed that a chess, a program a computer program could not do anything interesting. To the other end where he believes that robots can be companions to human beings essentially.

So, he wrote this book it is called it was published in 2008 and the title of the book is Love and Sex with Robots and the idea behind the book is something which many parts of the world are looking at. Specially those parts of the world which have aging populations where they do not have enough young to take care of the old. But of course, he is not talking of the old here. But where robots could take care of people essentially. So, robots can be companions essentially ok.

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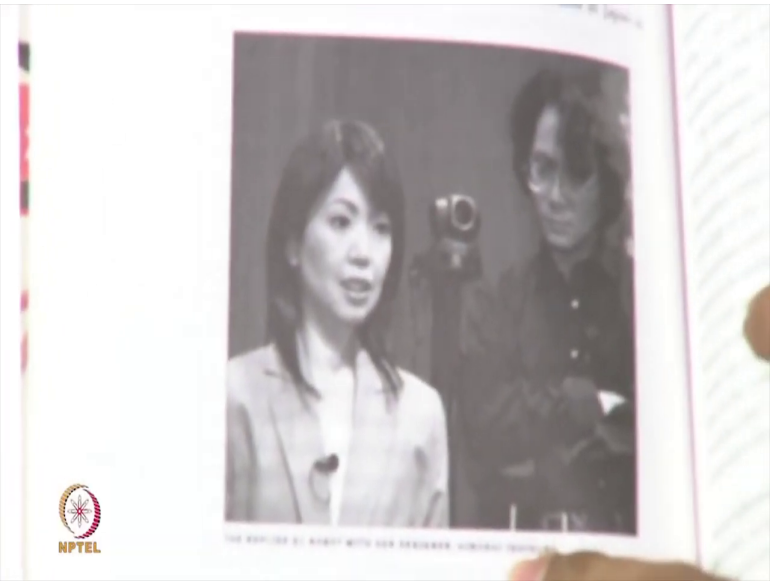

So, that is a book he wrote in 2008 and for example, what looks like a young lady whereas, in fact, it is a robot the thing here. So, this idea of look creating robots in the image of us has been around for a long time and we will look at some of this history today and robotic companions could well be there in the future essentially.

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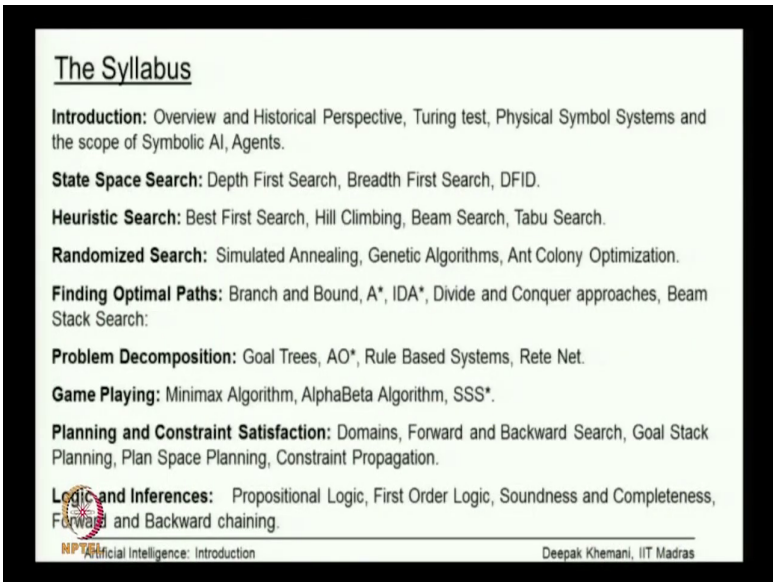

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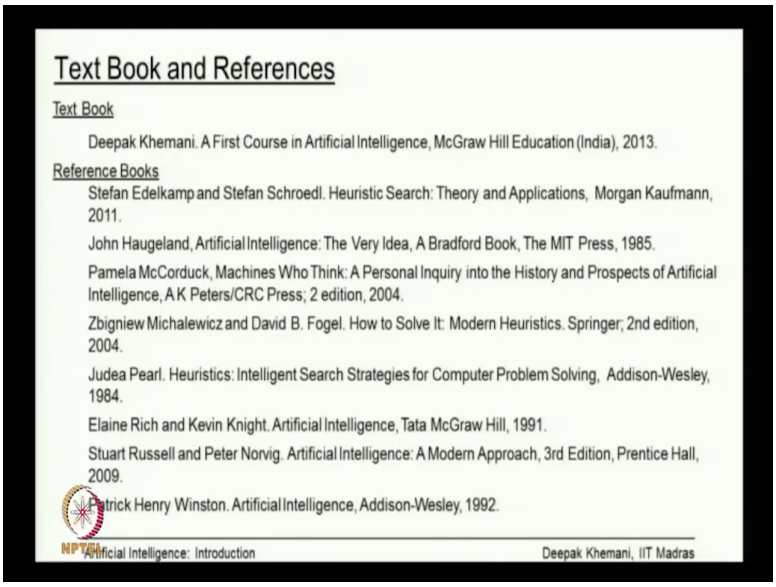

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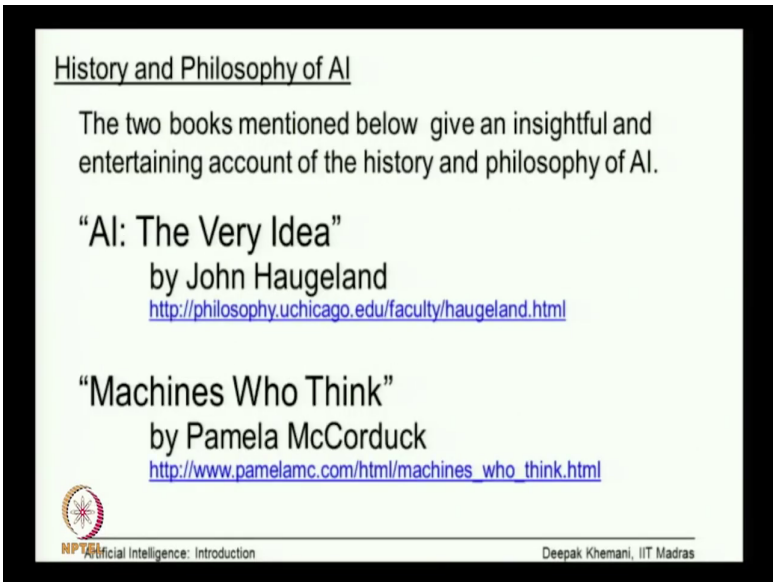

So, we saw in the last class, so I will just quickly go over this. We saw the syllabus which will be available in some place in the textbooks and these are two books that we will be following in the next couple of lectures AI: The Very Idea by Haugeland and Machines Who Think by Pamela McCorduck.

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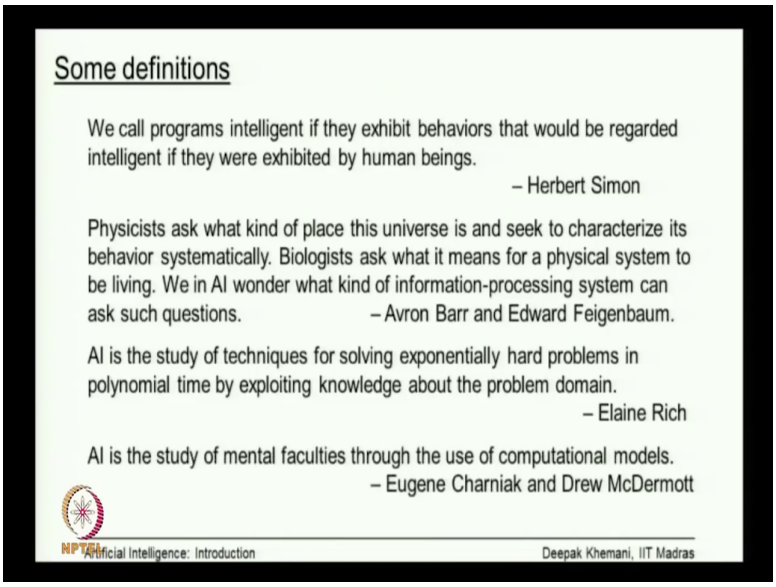

We saw some definitions of AI. So, there are four things here: one is that, if they do machines are intelligent, if they do things which human beings are considered to be intelligent for another definition is that AI is the enterprise of solving hard problems and finding polynomial time solutions and we must of course, qualify that by saying that these are approximate solutions or they are not necessarily optimal solutions and then, the AI is a study of mental faculties by creating computational models that is the idea given by Charniak and Mcdermott.

But the definition that we like most is given by Haugeland and definition says that AI is interested in the idea of machines.

Student: Minds.

With minds of their own essentially and this is a idea that we will pursue in the next couple of lectures essentially.

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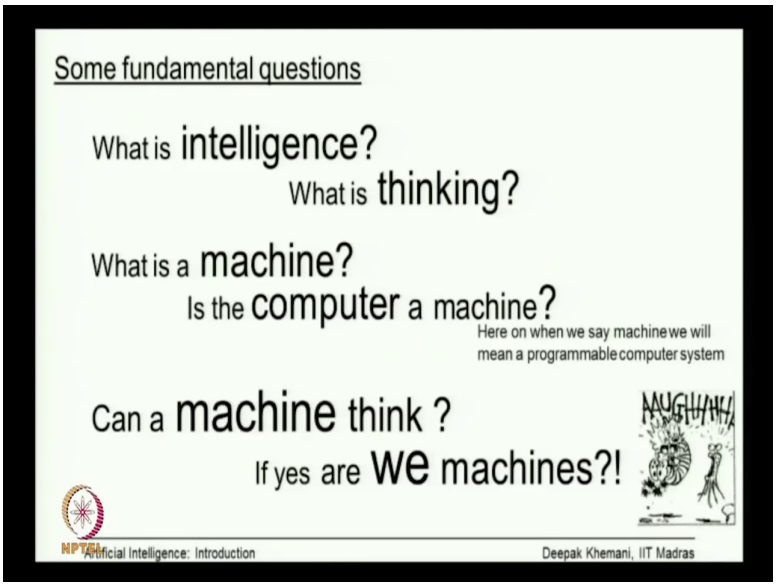

We asked some fundamental questions in the last class. What is intelligence, what is thinking? And we got several responses here about what we think is intelligent behaviour. So, problem solving, reasoning, learning, perception and language, language was mentioned in the last class (Refer time: 06:03).

So, let me ask a question here language is something which is unique to human beings and many people believe that it is instrumental in intelligent behaviour, but the question that I want to ask is if you look at language and thought what came first?

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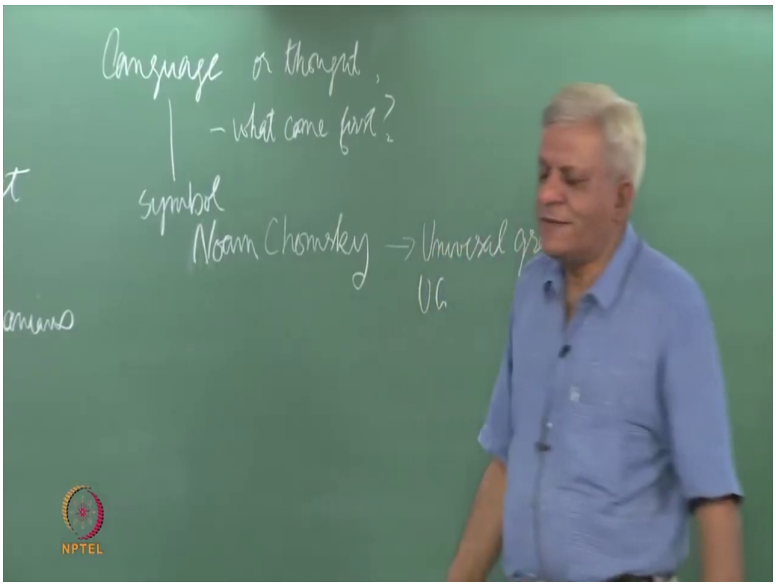

So, he was thinking a precursor to language or was language a precursor to thinking. In the sense, our is our ability to think dependent upon the scale of language that we have or did language come because we are able to think.

So, let me see what people think here and again I will emphasize that there is no correct answer to this question in the sense that it is like the chicken and egg problem, but what does students think?

Student: (Refer time: 07:23).

And I hope our students from Monday will also join in with their opinions.

Student: (Refer time: 07:35).

Can we think without language? Ok, let me ask it this way or is.

Student: Yes.

Is thinking closely tied to language?

Student: No.

You are saying no, we can think without language. So, can you sort of justify or support your answer.

Student: Graphical images do not necessarily have a language.

Sorry.

Student: Abstract graphical images or something.

Graphical images do not necessarily have a language.

Student: Abstract thoughts we have so, those are not language do not a language dependent or something.

Yeah. So, abstract thoughts are not language dependent. Now that is a somewhat debatable claim essentially I. So, the question I am asking really is that are thoughts made up of language or are thoughts do thoughts imply language? Can we think without taking recourse to language?

So, when we say language, we really mean symbol because language is just one kind of a symbol system essentially.

Student: (Refer time: 08:37).

Is it possible to think? Now you said graphics or visual images yeah that is a thing which comes to mind that that if you recall visual images, then you are not really talking about words or things like that.

Interestingly, you have heard of Chomsky right yeah. So, is anyone who has not heard of Noam Chomsky? What is he doing nowadays? He visited India a few years ago as well essentially. So, he is actually become a political activist, but many years ago, when he was active in linguistics, he put forward the idea of universal grammar ok.

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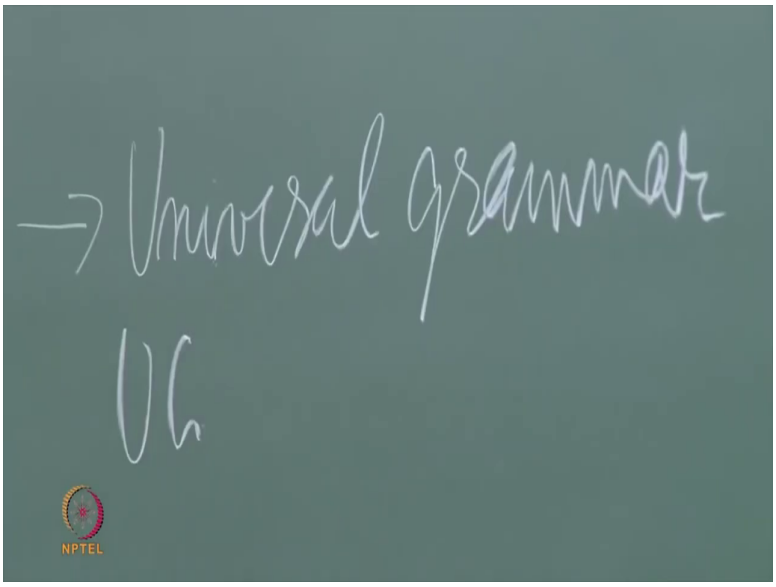

So, UG as it is called and he said that human beings are born with a grammar in their heads whatever; that means, in the heads we will not explore that question, but essentially our brains come pre wired with the faculty of linguistic ability which is sort of some kind of a grammar and what he says is that depending upon which place, which society you grew up in you tune that grammar to that particular language that exists in that society essentially.

So, Chomsky of course, so, he is saying that language came first that we are born with the ability to use language and maybe that helped us because he is not saying that, but maybe that helped us in our ability to think essentially. But anyway that is an open question, maybe at some later point we will come back to it.

So, we also ask some questions as to what is a machine? Is a computer a machine? And we said that yes we will assume that whenever we talk of machines thinking, we will be talking

about computer programs running and of course, we ask the question that are we machines that is something you can ponder over and some reactions to that ok.

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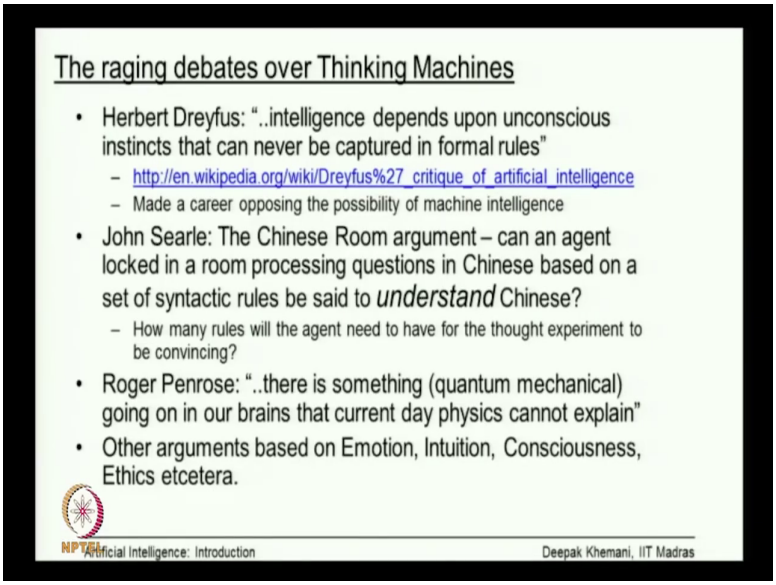

So, historically there have been arguments against thinking. So, we had discussed three arguments by Dreyfus which says that there is something intuitionistic going on in our heads, something which is kind of intuition which we cannot define in terms of rules. So, when Dreyfus was talking about all these people who were talking about rules as a mechanism for reasoning and he said that there is certain kind of unconscious instincts that we have which cannot be captured in rules essentially.

John Searle, a philosopher used the Chinese room argument and the insertion of the argument was that just because you can manipulate symbols and convince somebody that you are doing something. You know like for example, children doing long division. Do they understand

whether what is really what are they really doing or when even younger children do addition so, they add two numbers by looking up a table do a carryover then add and so on and so forth.

You are doing simple manipulation are you understanding what is behind that activity essentially or older students should I say when they are dealing with things like Fourier transforms and so on and so forth. Are you doing it mechanically or have you mugged up a formula of how to integrate something or do you understand what is happening behind that essentially.

So, what Searle says is that, symbol manipulation the ability to manipulate symbols is not necessarily a guarantee that you are intelligent. Maybe you are following some rules which somebody has taught you this is how you add numbers and so on and so forth and Penrose, the celebrated scientist (Refer time: 13:05) says that there is something quantum mechanical going on in our brains essentially.

So, there are other arguments based on emotion, intuition, consciousness, ethics and so on which we will ignore.

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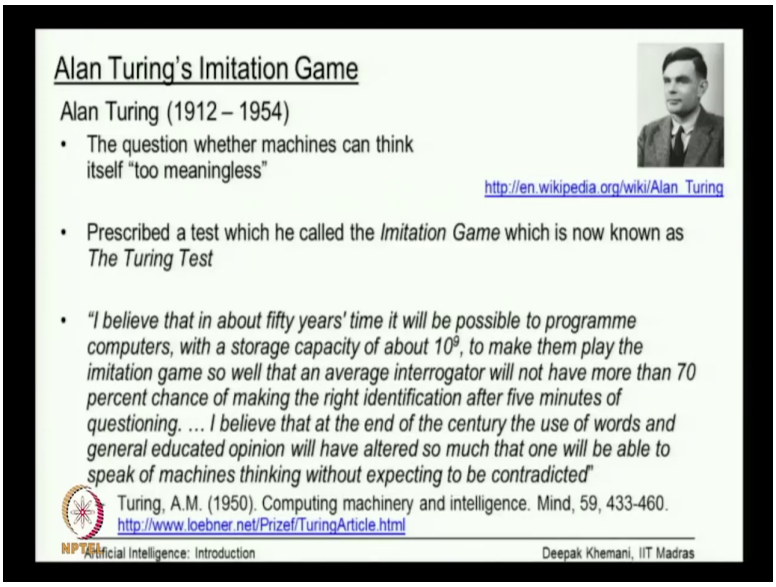

Then along came Turing, Alan Turing and he said that the question whether machines can think is meaningless let us not try an answer because first you have to answer what is thinking and only then you can say whether machines can think essentially or not essentially.

He said that let me prescribe a test which is called as the imitation game and which we now call the Turing test and at that time when he prescribe it in this book that is mentioned in this slide here sorry in the paper that is mentioned here Computing machinery and intelligence appeared in 1950. It is available on the link that is given in the page.

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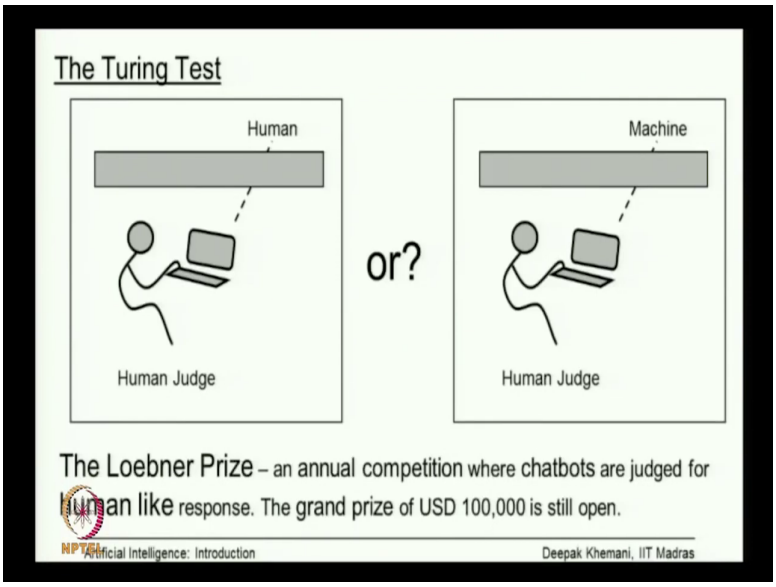

He believed that in 50 years from then which is in 2000; machines would be able to pass his so, called Turing test essentially. And what is the test? This is where we stopped in the last class. The test is that there is a human judge sitting out there. Interacting over some medium it could be nowadays a mobile phone where you are chatting with someone or in those days, it was a teletype which was connected through another room in which the other person was responding.

And what Turing said was that if the human judge can confidently discriminate whether the other side is man or a computer then, the computer has failed the test. But if the computer can most of the times, convince the judge that the judge is talking to a human, then the computer has passed the Turing test.

So, this is what is known as a Turing test of intelligence you might say. To test whether a system is intelligent, you will pass it through the Turing test and then decide whether it is. You do not ask what do you mean by thinking, what is intelligence and you know that do not go into fundamentals. And as I said, there is a Loebner Prize which is currently available still not 100,000 US dollars for anybody who can pass the test so, to speak essentially.

So, the question which I left the class with was what do you think of the Turing test as a test of intelligence? Do you have any views on this? Is it a good test is it a bad test? Do you agree that if a computer passes a test it will be considered to be intelligent will it qualify to be called intelligent? Any thoughts on this?

Ok while you are thinking meanwhile let me address the Monday students. So, welcome again and the basic idea of the first few lectures is that they are going to be a study of history and philosophy behind AI what has happened in the last few 100 years which has led to the development of AI currently and after those 2 or 3 lectures, we will have a qualitative shift and we will spend most of the time using algorithms using the syllabus which I will convey to you essentially. So, is it a good test or a bad test? Surely you can have some opinion.

Student: I mean I cannot judge the intelligence because like any programmer can see the past behaviour of like what type of questions are there in the conversation and based on that data.

Yes, in fact, that is precisely what happens is Loebner Prize is a contest which takes place every year and as we said, this year it is going to be the final is going to take place on September 14 and this one of the leading programs is called Izar and this is a conversation transcript from the earlier competition round. So, you have seen it and you can look at it again.

So obviously, people who write such programs look at the history. Just like students who write exams, they look at the history of past questions even such people this thing. So, that is all allowed, everything is allowed.

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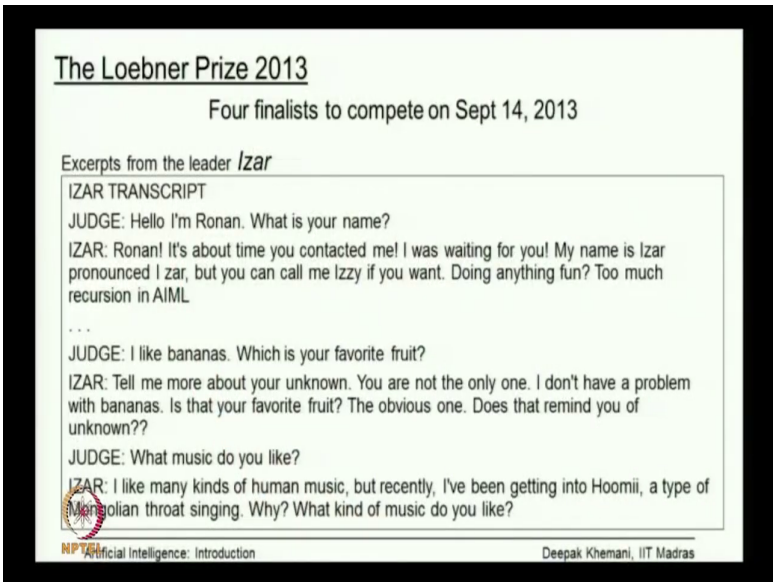

Can you write a computer program which will fool the judge if you want to use the term to thinking that the judge is talking to a human being and this was the conversation that we saw this Izar had and he is making statements like I am getting into when he is talking about music, he is making statements about in the last couple of lines you will see I am getting into Hoomii, a type of Mongolian throat singing. What kind of music do you like?

So obviously, such a program will have to be equipped with general knowledge at least which everybody knows essentially ok. So, I mean no human would be would not knowing it essentially. So, you have to have that kind of a knowledge. Of course, you also have to have some kind of rhetorical skills and ways of getting a round questions and things like that all that is part of it.

What if I were to give it two 12 digit numbers to multiply say what is the product of 2 billion, 29 million whatever, whatever, whatever some 12-13 digit number I say I give two 12 digit numbers and ask it what is the product of that and the computer poor thing being a computer, gives me the answer before I even finish the question almost finish the question. Would not I be able to say no you are not a human being ok.

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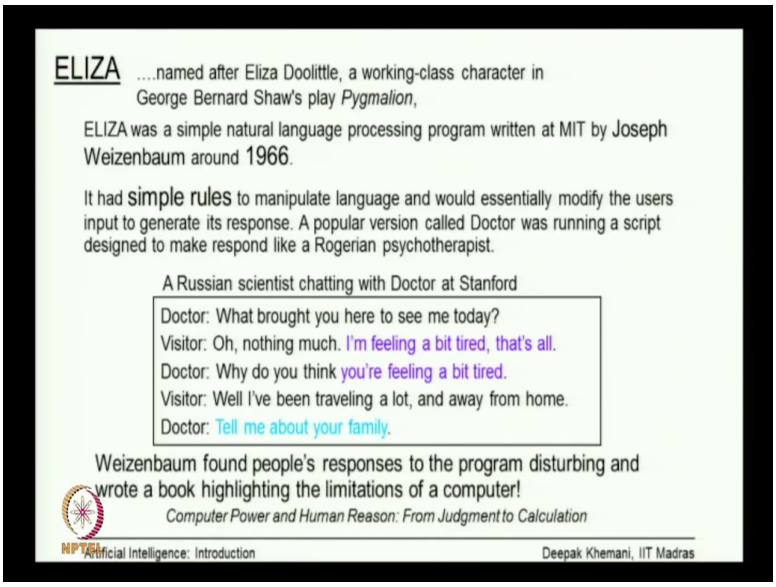

So, I will again leave it to you to think about this. Is it a good test or a bad test ah, but we have did mention Elisa or Eliza program written in 1966 when computers had just come into place by some Weizenbaum and it is a program for simple manipulation of rules. It would take the users input do a little bit of twisting, turn it around a bit and put it back to the user and to some people it is one version of it called doctor sounded like a psychotherapist and they would start talking to the program as if they were talking to a therapist and this was the Russian

scientist, who was visiting Stanford who actually went through this conversation and we saw that in the last class.

And what you see in purple is the fact that how this program is manipulating your input into generating its own output essentially. So, something like I am feeling a bit tired and it says why do you think you are feeling a bit tired is standard and you know new questions like tell me about your family and so on.

Weizenbaum did not like the way people responded to Eliza. It is a very simple program it is nothing deep, sophisticated about it. But people used to interact with it as if they were interacting with somebody who understood the complexities of their problems and things like that essentially.

So, he wrote this book Computer Power and Human Reason from Judgment to Calculation. He wanted to say in a sense that AI is not possible that you know computers can never be as deep thinkers as a therapist can be essentially. So, there is this difference between what can be and what appears to be essentially and human beings have a tendency, we have we are willing to suspend our disbelief essentially, we are willing to watch a James Bond movie and believe that all that is happening is possible and all kinds of things essentially.

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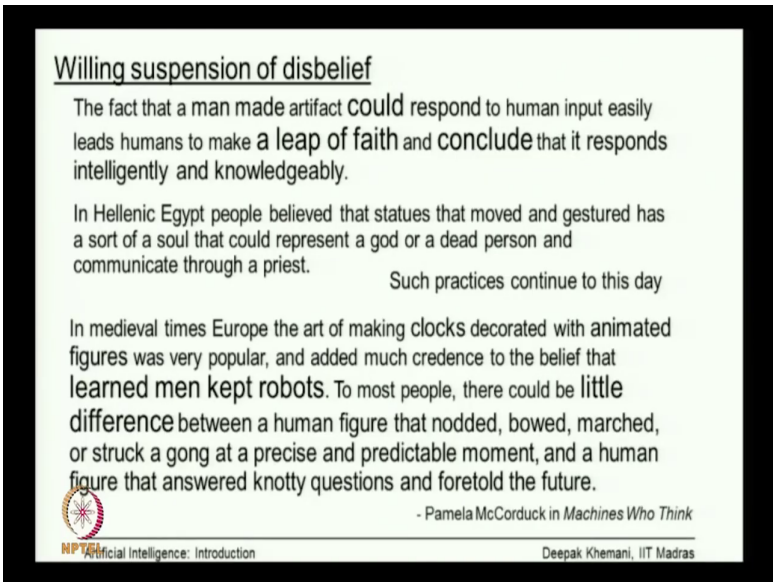

So, the fact that a man-made artifact could respond to human input easily leads humans to take a leap of faith and conclude that it responds intelligently and knowledgeably. Throughout centuries we have been doing that essentially.

So, in olden times in Egypt, people believed that statues which moved and gestured had a sort of a soul and they could represent a God or a dead person and communicate through a priest essentially.

So, I said olden times Egypt, but even today you can find in our country this sort of a thing happening know you have people who eat tea leaves or people who communicate with your ancestors or people who go and get their fortunes foretold by a parrot who pulls a card out of

a bunch of cards. So, we do it all the time and we believe not everybody, but we mostly believe that this is possible essentially. Such practices continue to this day essentially.

And in Europe, there was a great fascination for such moving figures, moving automata; automata or you know statues which could move around and shake their heads and so on. So, Pamela Mccorduck writes in her book Machines Who Think that in medieval times, the art of making clocks decorated and animate figures are very popular essentially. So, if you go to Germany, you can still find them for example, in clock towers, when its 12 noon suddenly there is a lot of music and some statues come out and do something and go back in that kind of stuff.

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Next

The Willing Suspension of Disbelief