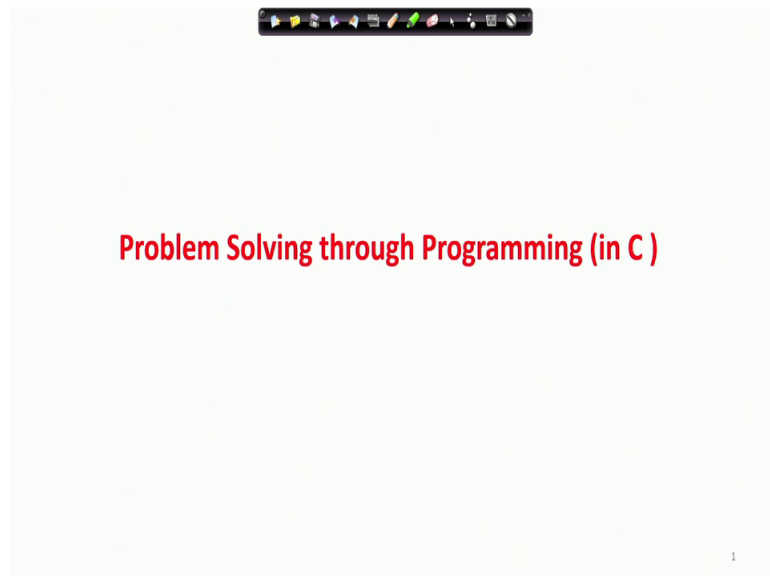**Problem Solving through Programming In C**
Prof. Anupam Basu
Department of Computer Science & Engineering
Indian Institute of Technology, Kharagpur

Lecture - 02
Idea of Algorithms

So we move to the next module of this course.

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In the earlier module we have seen some example problems, and the problems which can be some example problems which can be solved through programming using computers. And also we said that all problems cannot be solved by computers. So, what are the problems that can be solved using computers? That is a natural question that can be asked. The answer to that is that, if it is known what are the steps that we must execute or perform in order to arrive at the desired result then we can solve it by programming.

Now, those steps may be directly known for example, in the case of finding the average marks in the class for n students, we know the steps right. So, let us see if we write down the steps following which we can solve this problem, how would it look like?

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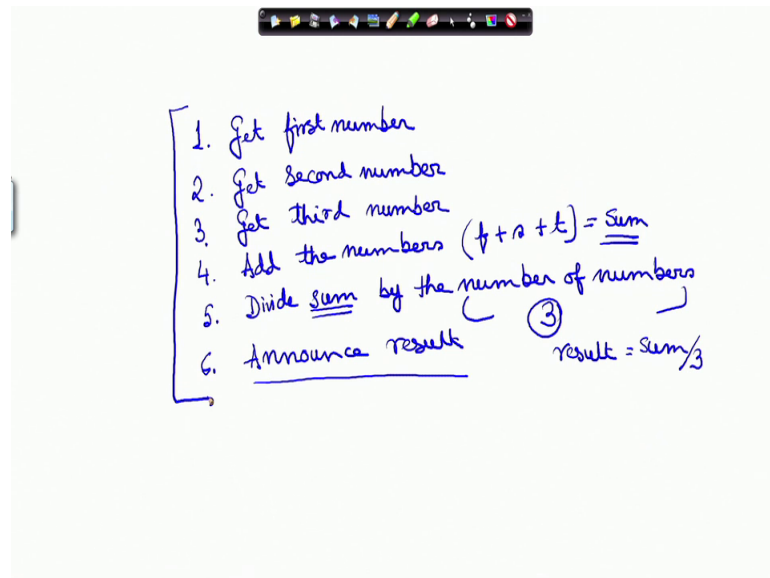
I want to read one number, suppose I am reading phone numbers, I want to find out the average of phone numbers, I want to find out the average of phone numbers read. Read means I just know get I can also say get first number, 2 get second number suppose you want to find for 3 numbers; get third number add the numbers; that means, first number plus second number plus third number and let that be the sum and then I say divide sum is this sum by the number of numbers and what is the number of numbers? Number of numbers here is 3, because there are 3 numbers and then say announce result.

So, this one divide the sum by numbers. So, that is something like say something like this that result is equal to sum divided by 3 in this case right and announce result. So, these 3 these steps are very well known, very clear and since these are very clear. So, I can solve them by programming. Why because programming what is programming? Programming is informing a computer as how to solve a particular problem. So, I can say let me just do it a fresh.

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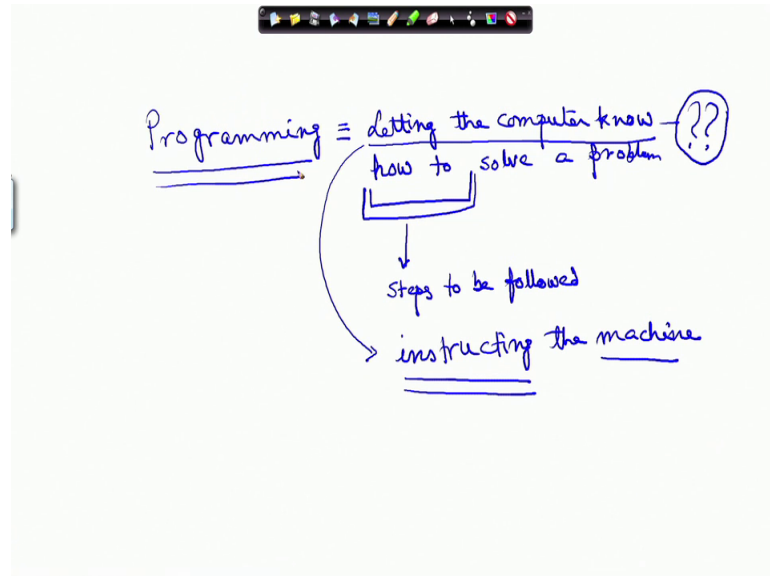
Programming is nothing but, letting the computer know how to solve a problem.

Now, there are some important aspects to this sentence this phrase. Letting the computer know is one important thing, but what do you let the computer know? How to solve a problem? So, how to means I have to tell the computer, that what are the steps to be followed to solve a problem. I have to be very clear about it and I have to let the computer know. So, there is a big problem here how I let the computer know I will come to that later.

The steps to be followed are what we have to tell the computer. So, in the earlier example we just saw that the steps for finding the mean of 3 numbers are very clearly stated, and I can inform the computer often this is informing the computer is also known as instructing the machine. The machine is nothing but the computer itself and these are the computer instructions. A programme therefore, consists of a number of instructions to be executed. Now the example that we saw was for adding there numbers now we will soon see that the thing becomes a little more complex if I wrote get first number, get second number, get third number suppose there are 20 numbers, then I will have to write them 20 times get first number, get second number, get third number like that upto get twentieth number that is boring is not it.

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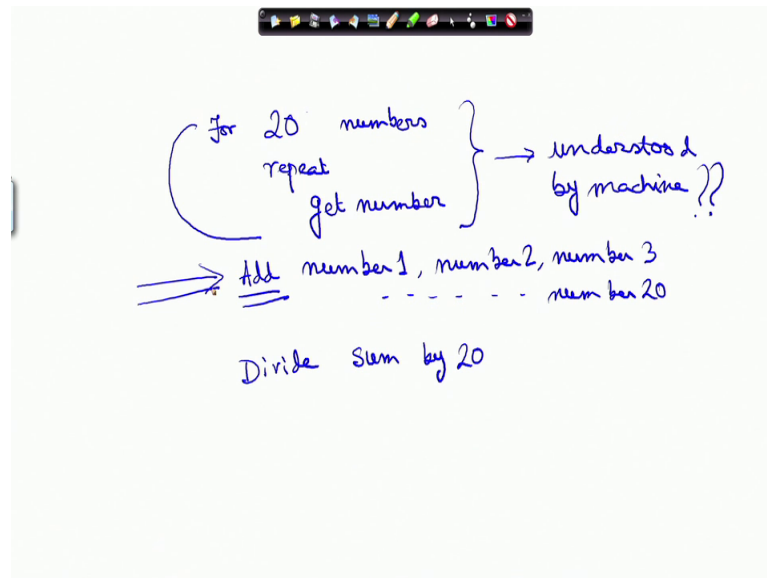
So, instead I can possibly write that for 20 numbers let me do it in a let me do a number here for 20 numbers repeatedly get number, aright that is possible.

So, for 20 numbers I will be getting the numbers. So, I do not need to write down one get first number 2 get second number 3 get third number not like that, I can straight away with one instruction I can express myself, but whether this will be understood by the computer or not is a different question. So, I am keeping that question open. Understood by machine and whenever I talk about machine, I mean a computer. So, for 20 numbers get number, in that way I can say that or say I could have written that in a little more smatter form let us let me try to do that.

Now, if I do that then what would be the next one? I have not I have to add those 20 numbers. So, one thing is that again I can write here add number 1 number 2 number 3 upto number 20, then divide sum by 20 this is one way of saying that, but this is again boring right this is very boring, I mean it is not interesting to look at this why should I write this in this dot dot dot dot form instead say I can write it in a smatter form say I write it in this way and you.
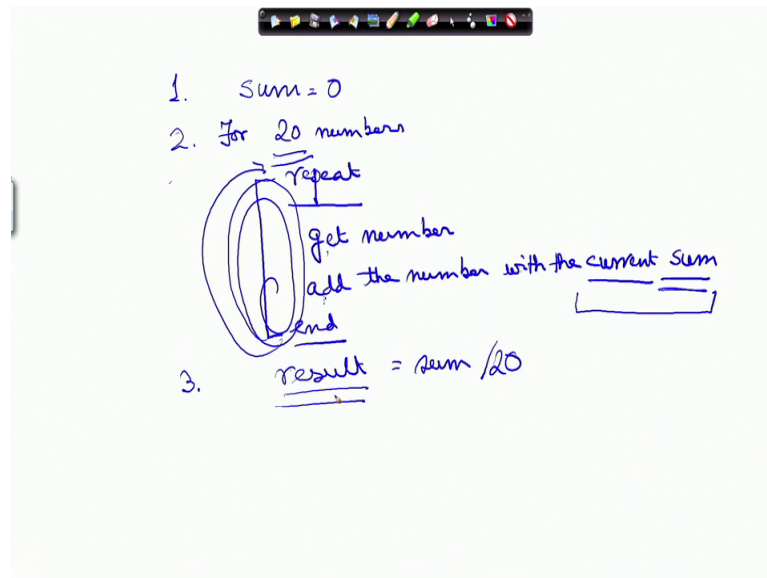
Just see whether you can understand what I am writing for 20 numbers, I am using my own language, it is not a computers language, it is an English and it is a version my version of English. I just need to express it to you and then whether that will be understood by the computer or not is a different question and we will address it separately ok.

For 20 numbers get number sorry I say repeat get number or let me add the number with the current sum; that means, presently whatever is the value of sum, I add that number that I read with that. Now initially therefore, what should be the current sum? Initially when I am starting the current the sum is 0. So, I can say let us sum be 0 initially. Now I get a number at the number to the current sum and this repeat I am just using my.

So, just showing as if it is a bracket, that this part I am repeating I am repeating this part how many times I am repeating this part? This part I am repeating, how many times I am repeating? 20 times because for 20 numbers I am getting the number adding the number getting the number, adding the number and I am going on doing this and adding the number and I am keeping that number in sum. So, ultimately I do it 20 times and then this part is finished then what I have to do. So, this was step 1, this was step 2 this was step 3. So, this step 3 was repeated 20 times I am sorry let us make it sorry actually this is the second step, which I did 20 times and after that I have got the all those numbers added.

So, next I come and I say result is sum divided by 20. So, that will be my result and then I can announce the result frame the result whatever. So, here you see in the earlier example what I did is, read first number, read second number, read third number read forth number like that here I just expect do it in a smatter way that for 20 numbers do this activity repeatedly 20 times. So, that is another way I can express it. And that shows that I can specify very clear steps by which the problem can be solved and since I can specify the steps clear steps through which the problem can be solved, this problem can be solved by programming. I can programme a machine to solve this problem.

So, similarly say how many times the second problem that we had looked at, how many times a particular word human occurs in a particular text. So, I have to do something like this, I have to open the texts I have to see look at the text and read a word and see is it human? No, is it human; no is it human yes. So, I will have to have some sort of counter or a count, which I will increase every time I am sorry every time, I encounter the word human.

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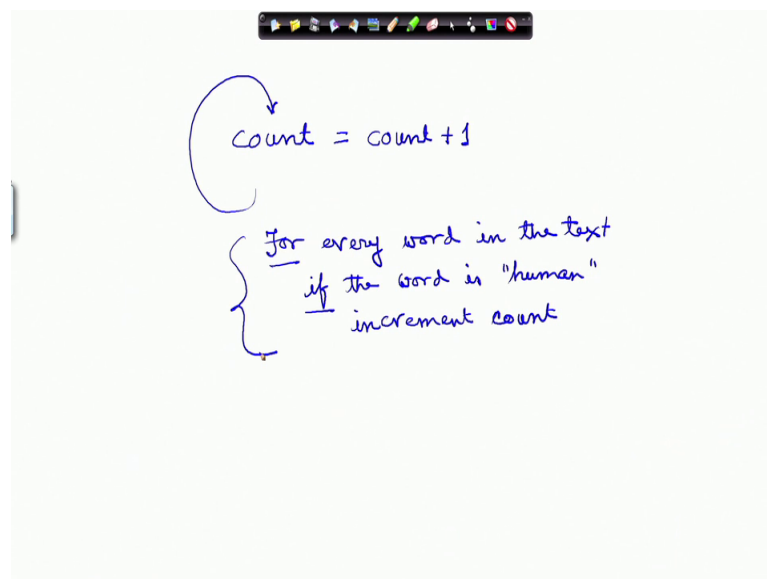
And this will go on as many times for every word in the text. So, I can write that down as for every word in the text if the word is human increment count. So, this will go on only if the word is human I will increment the count otherwise I will go on reading the words. So, this is the very clear step which I can express to the computer in its own way. So, that it can find out how many times the word human has occurred.

Now, there are other different variants of this that I have told you that, whether its a human being or whether it is an equivalent man, a woman boy girl whether it refers to a human being or not then; obviously, the instruction will be a little more complicated than this in these way. So, I once again come back to my state when that, what are the problems that I can solve using a computer? I can solve the problems where I can enunciate, I can express the clear steps set of steps one after another by which I can solve the problem correctly.

So, that is now for example, now if we take the example of that searching in a maze, where I was trying to use the diagonal up down whichever, there also I can express some intelligent ways by which I can instruct the computer to approach the problem. But everything as I said do not render themselves, to such enunciation of very clear steps I do not really know. I really do not know exactly that may be either the problem is not well understood, I mean a student of friend of yours is feeling depressed is not feeling well now there may be you really do not know exactly what is the reason for that. If you know the reason then you can try to solve it help him out.

Now, when the problem is not well understood then of course, we cannot solve it in such clear through such clear steps. If the information that you have you are getting all are not very reliable then also there are ways and means by which we can think of how we can get a good enough solution. Another thing is that there are some things which we do not know. So, we cannot solve that using programming or may be some cases where. So, the problem is so complicated for example, solving the problem of hunger all. Right now obviously, if you say buy food give food by that hunger will be solved, now that is too simplistic solution and that is not a realistic solution there are many angles many interacting variables, which are working towards that. So, that is not directly amenable to solving using programming.

So; however, we are been able to give an idea of the category of problems, which can be attempted to be solved by programming. And I have also said what is programming once again programming is the set of instructions.
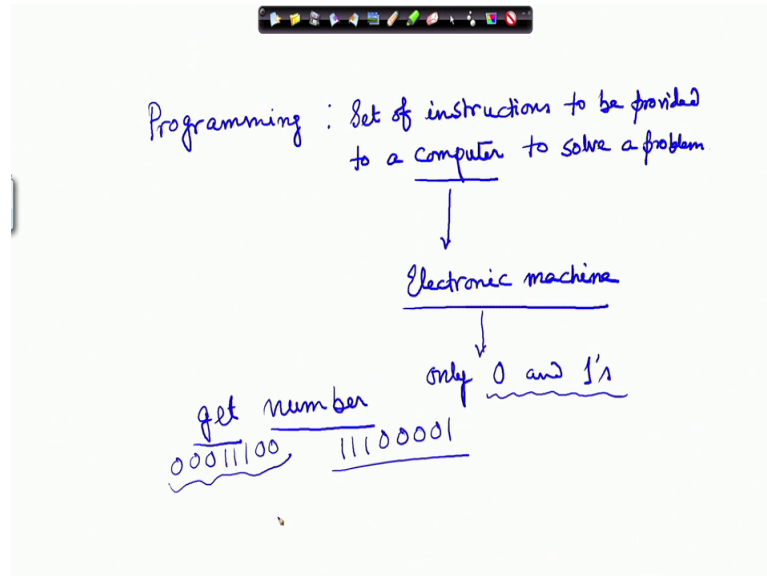
I am rewriting it in different way, set of instructions to be provided to a computer to solve a problem. Now a computer is an electronic machine, till now what I was doing I was writing the set of the statements in the form of somehow like English. So, you could understand that, but the computer being an electronic machine will not be able to understand that. An electronic machine is made of switches. So, since it is made of switches it will understand only it understands only zeros and ones.

So, whatever I say get number, now each of these get a number is one simple instruction or you can always understand this you can all of you can understand this, but for a computer I will have to somehow write it in the form of some zeros and ones. So, may be something like this 000 111 00 suppose this is representing get. A number can be this anyway be are that number can be say 111 000 101 something of that. So, that is the completely different type of expressions alphabets. So, the way we are writing it here cannot be directly understood by the computer. I think in the last lecture I had mentioned that how to let the computer know the steps.

Now, if I want to let somebody know of I want to express myself to somebody, I must do it in the form of a language that he or she understands for example, whenever I am talking to French person, I will have to talk in French otherwise he will not understand if he does not know other languages right. Similarly if I encounter an alien for example, I will have to talk in his language or I will not understand his language. Therefore, but

how do you do that if I meet a person who does not understand my language, some the natural solution is that will have somebody who will be acting as an interpreter, who understands both my language and the other parties language. So, we can understand my language and convert it to the other language.

So, what is the other parties language. So, what are the parties here let us see.

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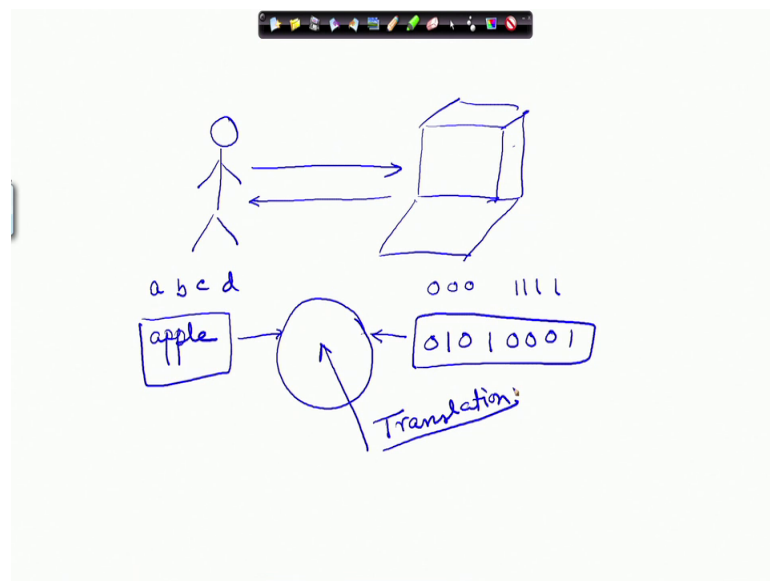
On one side it is we who want to do something, on the other side we have got this machine called computer, alright this machine which is lying in front of you.

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Now, I have to communicate with this machine and this machine will have to communicate to me. And this communication, but this understands its word consists of zeros and ones and my word consists of a b c d's, and with that I can say apple, but this apple to this machine is 0 1 0 1 0 0 0 1 something like that. So, I will not understand this to be apple and he will not understand this to be apple. So, there we need some sort of mechanism that is this is that translator some sort of translation is required to. So, we will be talking about this translation process in the next class, but before that let us summarize what we you have learnt till now. We have seen that there are problems which can be solved by computers and there are problems which cannot be solved by computers.

The problems which can be solved by computers have we have to in order to solve them; we have to express the specific steps to be followed for solving that particular problem. We have to express that to the machine we have to express that to the machine in its own language somehow we have to express it in its own language and this specific steps.

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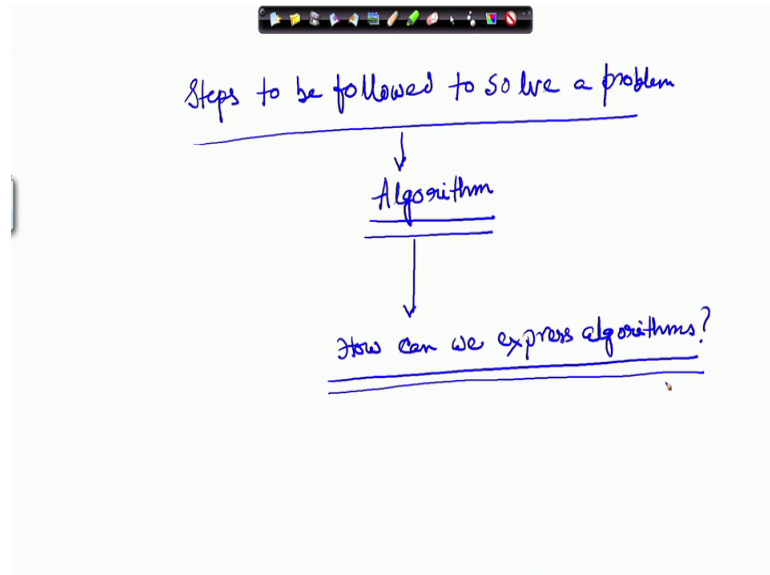
The steps that to be followed to solve a problem, this is also known as algorithm: algorithm consists of the specific steps or the methods that have to be followed in order to solve a problem. In the next lecture will see how we can express these algorithms.

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How can we express the algorithms, that is what will do in the next mo next module next lecture; how can we express algorithms there are different ways, even I mean when I say how can we express algorithms not to the computer, but maybe I want to communicate an algorithm to you or you want to communicate an algorithm to me, I was showing some examples in which I was writing in English. So, there are different ways of doing that we will discuss that in the next class.

Thank you.