IIT Madras

ONLINE DEGREE

Computational Thinking
Professor Madhavan Mukund
Department of Computer Science
Chennai Mathematical Institute
Professor G. Venkatesh
Indian Institute of Technology, Madras
Decomposition of the study group problem to incorporate encapsulation and abstraction

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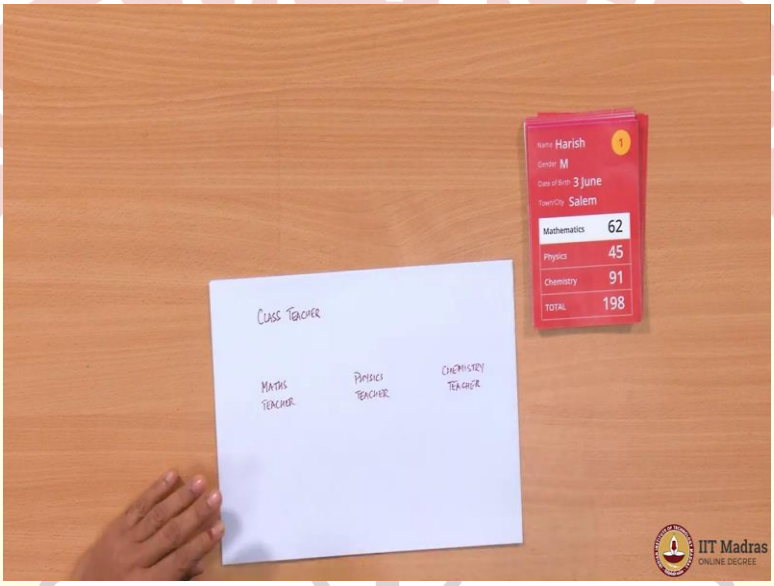

Professor Madhavan Mukund: So, let us take another look at these scorecards. So, we said earlier that there are different types of information so there is this personal information about the name, date of birth and all that and then you have the subject wise information and normally there is a separate teacher who does this so this is a maths teacher

Professor G. Venkatesh: That is a maths teacher.

Professor Madhavan Mukund: There will be a physics teacher, there will be a chemistry teacher and all…

Professor G. Venkatesh: That is correct, they give the maths marks.

Professor Madhavan Mukund: And there probably be a class teacher or somebody who knows this information, how to…

Professor G. Venkatesh: The student.

Professor Madhavan Mukund: So…

Professor G. Venkatesh: There are 4 teachers.

Professor Madhavan Mukund: Yeah, so you can assume that there are actually 4 teachers so maybe…

Professor G. Venkatesh: Teacher should be the object.

Professor Madhavan Mukund: So, each of them…

Professor G. Venkatesh: So that is how we will ask, what would I do if I were to find out how somebody is doing physics I am not going to ask some person I will ask the physics teacher.

Professor Madhavan Mukund: So, you will, because this report card is finally assembled, this scorecard card is assembled by collecting this information from everybody…

Professor G. Venkatesh: From the, I see.

Professor Madhavan Mukund: So, you can kind of the decompose it, let us say the class teacher, class teacher on the day when…

Professor G. Venkatesh: So, what we have, we have 4 so you are saying there are 4 objects, so there is a class teacher.

Professor Madhavan Mukund: So, we have a class teacher.

Professor G. Venkatesh: So that is a very different we are now not organizing by one card, we are not organizing something else, nothing related to cards.

Professor Madhavan Mukund: Correct, so we are…

Professor G. Venkatesh: It is natural actually much more natural class teacher, physics teacher.

Professor Madhavan Mukund: So, we have a maths teacher.

Professor G. Venkatesh: Maths teacher.

Professor Madhavan Mukund: A Physics teacher and…

Professor G. Venkatesh: A chemistry teacher and these are the 4 objects, and if you want to ask some questions who would you ask? Depends on the question.

Professor Madhavan Mukund: Depend on the question or we could always ask a class the teacher and class teacher will…

Professor G. Venkatesh: Can find out…

Professor Madhavan Mukund: Will refer it to the professor. So, we do not know for instance, maybe the maths teacher is also the physics teacher, I mean we have no idea, so the same person maybe teaching 2 subjects.

Professor G. Venkatesh: So, let us say I want to find out the top 3 physics marks.

Professor Madhavan Mukund: So, I will ask the class teacher the top 3 physics marks.

Professor G. Venkatesh: Hey class teacher tell me the top 3 physics marks in your class.

Professor Madhavan Mukund: So, the class teacher will say ignore the other two you just ask the physics teacher.

Professor G. Venkatesh: Why do I need anything.

Professor Madhavan Mukund: Tell me the top 3 marks in your class in your subject, teacher will go through…

Professor G. Venkatesh: And that physics teacher will only student name and the physics, student roll number or something and the marks in physics.

Professor Madhavan Mukund: Do the standard max 1 2 3 max and…

Professor G. Venkatesh: Return.

Professor Madhavan Mukund: And then class teacher will relay that back to us.

Professor G. Venkatesh: I see. I can ask the class teacher find me the 3 best maths marks and what you will do then.

Professor Madhavan Mukund: Same thing.

Professor G. Venkatesh: Same thing.

Professor Madhavan Mukund: Except that you ask the maths, ask the maths teacher.

Professor G. Venkatesh: So, this parametrization we said earlier max parametric pass now it became something which you ask different object.

Professor Madhavan Mukund: Correct. So, you are actually decomposing this report card itself into 3 different…

Professor G. Venkatesh: Groups you segregate…

Professor Madhavan Mukund: 4 actually one is the personal data.

Professor G. Venkatesh: Keep this personal data, one keeps this, one keeps this, one keeps this keeps the total, total is computed.

Professor Madhavan Mukund: Total that teacher will compute when they need it.

Professor G. Venkatesh: When they need it.

Professor Madhavan Mukund: So, we can always ask each of them for the marks of that particular. So, if you want the total for Harish then the class teacher will ask the maths teacher what is the maths marks of card number 1, we tell the physics teacher what is the. So, these teacher do not even know the names of the students, that is good. They are not prejudiced that this person behaves in class.

Professor G. Venkatesh: So, if the class, we want to find out who is the top 3 overall, the only person who can answer is class teacher.

Professor Madhavan Mukund: Class teacher will have to collect this information from all these 3 and then…

Professor G. Venkatesh: Cannot collect the top 3 subject marks that is not…

Professor Madhavan Mukund: No, that we have already seen does not give you the right one.

Professor G. Venkatesh: So, he has to collect, he will say give me all the marks, give me physics for this student, maths marks for this student, chemistry marks for this student, add it up get the total marks…

Professor Madhavan Mukund: And then…

Professor G. Venkatesh: May store it also for future use.

Professor Madhavan Mukund: Correct.

Professor G. Venkatesh: And then do whatever is necessary to find the top marks total, like that. So, let us take some complicated question we ask, create the study group, we said study group basically means…

Professor Madhavan Mukund: Some mentoring.

Professor G. Venkatesh: Mentoring.

Professor Madhavan Mukund: So, you want the student who is better than by a certain amount but not too much away, so we said 10 to 20 marks.

Professor G. Venkatesh: 10 to 20 marks in maths let us say, then maths somebody can mentor somebody else in maths, but that somebody else could mentor this person in physics, we have to find that, kind of combination, whom do you ask that question here?

Professor Madhavan Mukund: So, I suppose each teacher knows the mentoring relationship for that subject, so maths teacher knows within maths who can mentor another person, we had drawn this graph.

Professor G. Venkatesh: Graph.

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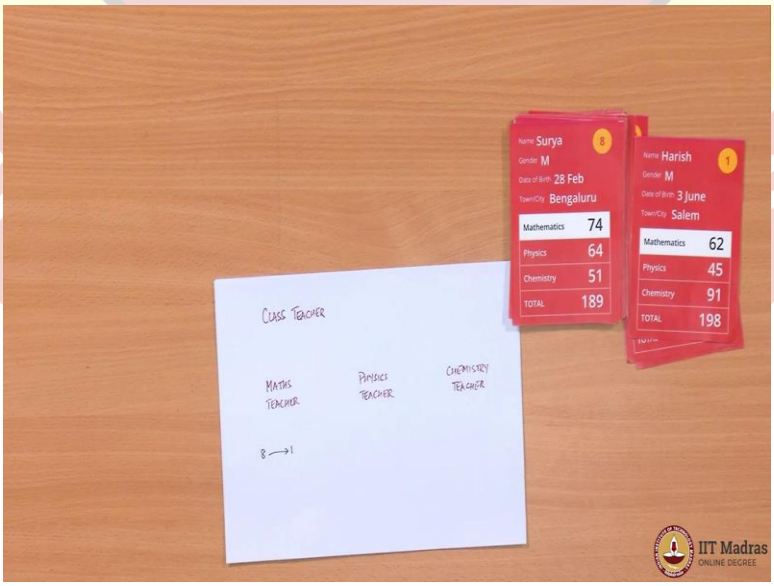

Professor Madhavan Mukund: They will create the graph, so for instance let us see if we can find, so for instance 74 and 62 is more than 10 and less than 20, so the maths teacher would have a graph which says that say 8 can mentor 1 in maths.

Professor G. Venkatesh: We will have that.

Professor Madhavan Mukund: And has only maths, because the maths teacher does not know anything about everything else.

Professor G. Venkatesh: So, there is no label required.

Professor Madhavan Mukund: No label required.

Professor G. Venkatesh: So, we are asking maths teachers so obviously is maths. So, you can tell so you will ask this question to the class teacher, hey class teacher prepare these students into study groups. So, the class teacher will say I cannot do it without knowing subject, so we will tell the maths teacher…

Professor Madhavan Mukund: Give me the…

Professor G. Venkatesh: Give me the…

Professor Madhavan Mukund: Mentoring graph for your subject.

Professor G. Venkatesh: I see, graphs, entire graph will ask. So, the maths teacher will prepare the graph and return it back to the class.

Professor Madhavan Mukund: Saying that this is the relationship of all the students in my group.

Professor G. Venkatesh: And then you will ask the physics teacher give me your mentoring graph.

Professor Madhavan Mukund: Because once you have the mentoring graph you do not really care what the marks are, we just need to know that 8 can mentor 1, you do not need to know how many marks…

Professor G. Venkatesh: All the marks information. So, in fact for this problem class teacher does not even need no marks. So, then it will ask the physics teacher give me the graph, so you get a graph.

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Professor Madhavan Mukund: So, physics teacher might give you some other graph for instance by say that, say 24 can mentor 24 cannot but…

Professor G. Venkatesh: 88 this guy can.

Professor Madhavan Mukund: So, 9 can mentor 24, so this be a typical edge here.

Professor G. Venkatesh: He will return edges.

Professor Madhavan Mukund: Yeah.

Professor G. Venkatesh: Basically, all such edges he has to return.

Professor Madhavan Mukund: Correct.

Professor G. Venkatesh: A list of such edges he has to written.

Professor Madhavan Mukund: And this one can be chemistry person will say 1 can mentor 9.

Professor G. Venkatesh: So, he will return a list of edges. So this girl return list of edges so we get 3 lists.

Professor Madhavan Mukund: We get 3 list and now the class teacher can now…

Professor G. Venkatesh: That is strange we got.

Professor Madhavan Mukund: Correct. But here is like now the class teacher if you remember the graph that we drew, it had 3 kinds of edges, so we had….

Professor G. Venkatesh: M, P and O.

Professor Madhavan Mukund: So, we had labeled them with M and you know some P and C and all that so this is what class teacher does, the class teacher takes these 30 students and now the maths teacher provides all the messages we will draw all the messages.

Professor G. Venkatesh: Label them.

Professor Madhavan Mukund: Label it with M, then the physics teacher gives you all the physics edges, label with P, chemistry teacher gives you all the chemistry edges label with C…

Professor G. Venkatesh: Now, you have the whole graph.

Professor Madhavan Mukund: So now, you have assembled the graph by layering three layers of edges with different and we have kept track of labels who gave us the edge, so we have got the graph which we earlier collected.

Professor G. Venkatesh: And then we can do the same thing…

Professor Madhavan Mukund: And now once we have the graph, we look for this cycle.

Professor G. Venkatesh: Cycles, cycles of M, P and C, or MP or whatever.

Professor Madhavan Mukund: But the important thing is that this graph is now given piece of each teacher has only got focus on 1 marks, so they just give back a graph of their subject and it is a class teacher job to keep these 3 edges a 3 sets of edges labeled correctly so that these study groups can be identified through these different edge cycles.

Professor G. Venkatesh: More elegant.

Professor Madhavan Mukund: So, it is how to decomposes…

Professor G. Venkatesh: Decomposes the problem nicely neatly.