May 2020

OfficeHours_IS31_20160414_Seg04.pdf

Setting: mild classroom
Participants: I1 (glasses, female), IS31 (male, vest)

0:00
XXX I1: alright
XXX so is there anything↑ (.) specific
XXX you guys are: like studying↑ the fluidity of water for?
XXX like (.) you said how:
XXX you're studying how like
XXX say water was going through a farm and
XXX the trees would affect the way the water
XXX the [w- the path of the water
XXX IS31: [m:
XXX I1: like is there a specific reason you guys just like
XXX need this for?
XXX IS31: a reason↑ (.1) I think the reason might be that uh (.1)
XXX it (.)
XXX oh
XXX ok
XXX I- i want to first uh (.)
XXX give a: introduction about the professor
XXX ((incomprehensible))
XXX I1: ok [go ahead go ahead
XXX IS31: [I mean the (.) the (.2)
XXX the main difficulty now (.) is that
XXX uh for: fluid dynamics
XXX I1: mhm
XXX IS31: now we have (.) the: partial differential equations
XXX I1: [ok
XXX [they are established
XXX but you know:
EXC such questions are: (.) different from the uh
EXC uh al(.)gebra questions
XXX like x equal to something like this
XXX f-for this like x plus (.) one equal to two↑
XXX (for some questions)
XXX I1: mhm
XXX IS31: we can easily get the:
XXX accurate solution
XXX I1: ((nods))
XXX ok
XXX IS31: but for partial differential equations
XXX (.1) uh: (.) a-at least for some practical (.) PDs

XXX uh
XXX it’s impossible to get (.1) the: (.)
XXX at least the up to now
XXX it’s impossible to get (.) accurate solution
XXX so that’s why we use computer to do:
XXX numerical calculations
XXX so we just want to: approximate
XXX get a approximation (.) of the: solution°
XXX so now the main question i-
XXX uh you say why we just want to: (.) learn how fluids-
XXX I1: yea
XXX IS31: behave
XXX uh in th- that case
XXX that is (.) uh that is
XXX m:
XXX the: condition is very:, (.1) uh sophisticated
XXX for that question°
EXC because (.) if we:
EXC for example if uh uh
EXC like
XXX water’s just fluid in a very big lake
XXX I1: [mhm ((nodding))
XXX IS31: [then (.)
XXX it seems that there is no- nothing (.) to (start) it
XXX it’s just uh (.) fluid with uh
XXX constant velocity
XXX right? ((I1 nods))
XXX like so on
XXX or you know w-with river and so on
XXX I1: mhm
XXX IS31: so that- that’s mostly (worthless)
XXX ((I1 tilts head, confused))
XXX because we al- already know how it behaves
XXX I1: oh ok
XXX IS31: yea
XXX i-if-if you need some simple case
XXX l- like in a (.) wide river
XXX and uh
XXX no wind,
XXX no no (.) no stone,
XXX no anything
XXX it’s just fluid (.) with uh constant (.1)
XXX uh
XXX velocity
XXX so: in that case we don’t need to (.) study it

XXX so:
XXX we just uh use (.)
XXX uh:
XXX and uh because (.1) now we can get accurate solutions
XXX I1: mhm=
XXX IS31: =so
XXX actually
XXX we can't verify whether our numerical results
XXX (.) are- is right or not
XXX so: we just uh (.) want to set very: uh some different
XXX conditions
3:00
EXC and uh (.)
EXC test uh (.) and uh get the: numerical results
XXX and then compare them with experiments
EXC if they (.) are: they-if they are (.) similar (.1)
EXC then: we can say that our (.) matter (.) may be right
XXX I'm not- w- we are not sure whether that right
XXX but
XXX uh a- at least there is ((incomprehensible))
XXX for this case right
XXX and after we: test for many many cases
XXX then we can say that
XXX um
XXX almost our (.) numerical measures are right
XXX yea that's why we (.) want to study it in many
XXX uh: cases
XXX and though that case is (.) maybe very strange ((chuckle))
XXX not very: practical
XXX yea
XXX ((I1 about to start speaking, IS31 continues))
XXX because we: don't know (.1)
XXX accurate solution
XXX we just guess
XXX and then we want to verify (.)
XXX whether our guess is (.) reasonable
XXX I1: ((mouths oh ok))
XXX so
XXX what happens once you guys like
XXX so say you're like
XXX guessing and you're approximating the:
XXX IS31: [uh
XXX I1: [the solutions or whatever
XXX IS31: a-a-actually it's not totally guessing because
XXX I1: yea I know you guys [are approximating,

XXX IS31: [i-
XXX yea yea yea
XXX because,
XXX you know
XXX the (.) partial differential equations are (.)depend on
XXX continuous variables
XXX right,
XXX ((I1 nods slowly))
XXX for example
XXX the temperature
XXX I1: mhm=
XXX IS31: =it depends on the: (.) time dependant
XXX uh- uh continuously
XXX I mean the time is continuous
XXX maybe
XXX I1: yea [ok
XXX IS31: [from one second to another↑ (.1)
XXX to another°
XXX I1: mhm
XXX IS31: but you know computer: can only (.)
XXX uh processing (.) (discrete) numbers
XXX it can't processing (.) continuous
XXX so we
XXX for example
XXX i-the: numbers (.) in (.) computers can only be like
XXX one two three four
XXX I1: [mhm
XXX IS1: [like so on
XXX it can't be one point (.) two,
XXX but this is a- an example
XXX it can be one point two but it can be-
XXX cannot be very very accurate
XXX maybe only:
XXX uh like sixteen (.) digits
XXX I1: ok
XXX IS31: yea so
XXX so this is uh (.) a region of the errors
XXX and we want to make sure that
EXC this error doesn't (.) affect
EXC uh
EXC doesn't have very (.2) uh huge affect on the final results
XXX because if (.) this affects the results a lot then the
XXX re(.)sults are not (.) useful at all
XXX it (.) is totally different from (.) the actual results
XXX so

XXX so- yea that's the origin of (.) why:
EXA apr- the approx(.)im-
XXX uh we can only get approximate (.) with that
XXX because
XXX uh our real world is continuous
XXX but
XXX I1: mhm ((nods))
XXX IS31: a computer can only (.) process (.) discrete
XXX I1: ok=
XXX IS31: =numbers
XXX I1: ok
XXX IS31: yea
XXX so
XXX we need to verify (.) that though we (.) there are some
XXX running errors but
XXX but the results are (.) good enough
XXX yea=
XXX I1: =so
XXX once you guys get like (.)
XXX approximations from the computer programs↑
XXX about the solutions to your (.) partial differential
XXX equations
XXX IS31: m:
6:00
XXX I1: ok
XXX so say (.) you get a: solution,
XXX and it's very- it seems very (.) I guess good,
XXX IS31: yea
XXX I1: ((incomprehensible)) it seems good or whatever,
XXX what do you do like
XXX next
XXX is there something you guys like apply that to?
XXX IS31: ok
XXX uh:
XXX if we have verified this: (.) method is useful
XXX then we can (.) use it to (.) do many practical (.)
XXX things
XXX uh
XXX for example
XXX uh: (.)
XXX like uh
XXX um
XXX give a mo:re easy example
XXX ((not a confidence issue, thinking))
XXX like a car

XXX I1: [mhm ((nodding))
XXX IS31: [uh
XXX before that (.1) um: (.1)
XXX we
XXX if we want to test↓ whether a car or:
XXX actually this is a test for the (.1) uh fliers
XXX I1: mhm
XXX IS31: but
XXX I mean
XXX whether it's (.) safe
XXX when like uh
XXX the air around it and there are wind or some else
XXX conditions
XXX I1: mhm=
XXX IS31: =very um (.) (unusual) conditions around hi-
XXX around it
XXX uh in the uh before we must uh
XXX make a real flier or car
XXX and do a test (.1)
EXC and maybe sometimes it will (.) be:-
EXC it will (.1) be damaged
XXX I1: mhm=
EXC IS31: =uh because
EXC it's not safe- safe
XXX but now if we can simulate
XXX I1: ((nods))
EXC IS31: the
EXC uh:
XXX simulate it on computer
XXX then we don't need to: (.) make a real flier or car and
(.1)
EXC have someone:
EXC uh (.) uh
EXC drive it
XXX I1: mhm
XXX IS31: and do a real experiment
XXX we can just do that in computer
XXX it's more cheap and uh(.)
XXX more: effective
XXX I1: o[:h
XXX IS31: [yea
XXX I1: ok
XXX ok
XXX that makes sense
XXX IS31: yea ((chuckles))

XXX I1: that's useful
XXX alright=
XXX IS31: =but we want to- but we: should make sure that (.) the
XXX simulation results should be the same with the real result
XXX so we need to test our method↓
XXX to make sure that they are correct
XXX if- if the:
XXX i-u-because if (.) the simulation results (.1)
XXX are different from (.) practical (.) results
XXX then it doesn't (.) make any sense
XXX yea
XXX I1: ok
XXX ok
XXX so
XXX say you guys like
XXX came up with your (.) your your pr- prediction
XXX oh what's the word
XXX IS31: yea pd you can just call it ((chuckle))
XXX I1: oh (.) oh
XXX what's the word no what's the word?
XXX IS31: partial differential equations?
XXX I1: um:
XXX >no no no<
XXX your (.) approximation
XXX so [say you
XXX IS31: [m
XXX I1: you came up with your approximation↑
XXX as to what the values for the:
XXX for the: (.1) variables should be
XXX and then you make like a simulation of like
XXX say with the airplanes and the wind or whatever
XXX and what would happen if
XXX I don't know°
XXX IS31: [m
XXX I1: [the wind was going sixty miles per hour↑
XXX and the airplane was going that way ((motions with hand))
XXX so say:
XXX like the (.) the ending result of that situation
XXX is not what you guys predicted before,
XXX would you guys
XXX like
XXX (.1) uh
XXX think that there was some other variable (.) happening↑
XXX in this situation and like try to: factor in what's
XXX happening there?

XXX IS31: m: you [mea:n
XXX I1: [like does that make sense?=
XXX IS31: =do some improvement?
XXX I1: yea yea
XXX IS31: uh: (.1)
XXX yea:, we can do some improvement
XXX but
XXX you know (.1) we:
9:00
XXX uh: understand the: principle behind th-this
XXX is the best thing
XXX because
XXX only I- only: based on that we can (.) try some (.)
XXX new: (.) designs and uh test whether it's useful.
XXX because now:
XXX um almost all tests (.) process
XXX are done by computer
XXX while (.) u:m
XXX maybe maybe fifty years ago?
XXX they are done in practical
XXX so now:
XXX because in the: do some improvement (.1)
XXX if you do some change
XXX uh
XXX in computer
XXX you can-you just need to (.)
XXX uh:
XXX change some (.) numbers (.)
XXX but
XXX and run the program again
XXX so you can get new results
EXC but if you want to: change (.) in: practice
EXC you need to make a new:
EXC uh object
EXC so yea
EXC this is more (.) a more effective way
EXC so th- that's
EXC uh
XXX that's the meaning of computational: science
XXX I1: ok
XXX IS31: yea
XXX you don't need to do experiment (.)
XXX and uh
XXX if (.) and you can get the
XXX theoretical (.) results

XXX so you can-y-you-
XXX the only way is to use
XXX in order to (.) simulate
XXX (.1) ah
XXX I1: ok
XXX IS31: [yea
XXX I1: [ok
XXX wow
XXX theoretical science
XXX it's- it's good stuff going on here
XXX ((laughs))
XXX IS31: oh ((nods))
XXX I1: ok
XXX so:
XXX since you guys↑ or the team
XXX or the class you're in↑ deals with more like with water (.)
XXX and stuff right?
XXX with water?
XXX IS31: uh: [yea a- actually
XXX I1: [you guys don't do stuff with air
XXX IS31: f- uh water and fair- and uh air they are (.) similar
XXX though not very (.) not totally the same
XXX but
XXX the basic equations (.1) are the same
XXX uh:
XXX I1: the equations are the same?
XXX IS31: yea
XXX because=
XXX I1: =what wait wait
XXX wait
XXX so
XXX what equation?
XXX IS31: uh:=
XXX I1: =is there like a name (.) for this equation?
XXX IS31: it's
XXX uh
XXX Stoke's:↑ (.)
XXX Stoke's something equation
XXX uh after two:
XXX after two names of two scientist
EXC I-I don't remember the: the the
EXC uh(.)
EXC [whole name
XXX I1: [it's ok [((incomprehensible))
XXX IS31: [yea I- I remember the first (.) is (Stoke's)

XXX s t o k
XXX [or something
XXX I1: [s t o k ((to self))
XXX ok
XXX so what's-
XXX wait
XXX you said that they have like the same equation
XXX what's the equation like uh:
XXX like what's the equation for?
XXX ((pause))
XXX IS31: huh?
XXX I1: cause you said like water and air
XXX you said like
XXX they're different↑ but similar↑
XXX they have the same equation,
XXX IS31: yea
XXX I1: like
XXX what do you mean they have the same equation?
XXX IS31: I mean:
XXX their movement are governed by the same (.) rules
XXX I1: ((mouthes O)) ok
XXX ok=
XXX IS31: =for example:
XXX uh
XXX you know
EXC every:, (.2) uh
EXC I mea-
EXC I think you have (.) you have learned it like (.)
XXX Newton's (.) gravity (.) rules=
XXX I1: =yea
XXX IS31: yea so
XXX uh
XXX though: many objects they have different shapes↑
XXX they have different color but they are governed by the
XXX (.) same rules
12:00
XXX I1: ((mouths ah))
XXX IS31: yea
XXX I1: ((mouthes O)) ok
XXX IS31: yea
XXX I1: oh ok
XXX IS31: wow