Test. Great, you are about to start an assignment involving a simulation of co-evolutionary design processes. This is a method to iteratively optimize a building spatial design based on the structural performance of the design.

Therefore you will create a structural model and consequently change the building spatial design. You will in total complete two iterations of a simulation co-SADP. I don't know what that stands for.

Your assignment starts with the building spatial design with the villa depicted on the left. As part of the assignment we ask you to think aloud. This screen displays the current building spatial design.

Use the mouse to rotate the model. The counter at the top indicates your current iteration. When you're ready click continue to proceed.

The first step in this assignment is the creation of a structural model. You will assign one of three possible structural types to each rectangle of the spatial model. The available types are beam, truss, flat, shell.

In the next screen you have to assign a structural type to each rectangle by creating the corresponding option in the table. Choose the type you believe is best suited for each rectangle. All horizontal rectangles are assigned a flat shell by default and cannot be changed.

All horizontal rectangles floor and roof. Okay. Oh man.

Please think aloud while you choose certain types. You can only continue if you have selected a type for every rectangle. How do you select a type? Double click.

Oh. Aha. Number one.

Beam, truss, flat, shell. Obviously a beam so that you have more space. Beam.

That can be a truss. It's quite a weight-bearing component so it's a flat shell that helps. You can put a wall down there.

That can just be a truss, can't it? It's a load-bearing component. I mean, in principle the columns are the weight, right? So, ah, okay. So the column becomes a truss.

Wait a second. Where is she? I mean, in principle you can, if the columns are load-bearing, you can make a truss out of this, but they don't look load-bearing. So I think I want to make this a wall.

Oh my gosh. Where am I? Where is that? Okay. That clearly needs to be a beam so that we have maximal space, interior space.

Oh, that one. That is probably best a beam. Where are we now? Oh, there.

Load-bearing wall. Well, the load is already being borne by the two opposite walls so we don't necessarily need another wall. A beam does look a bit cleaner.

We probably want a window there so that's going to be a beam. Yeah, beam. No, this is not a load-bearing component.

We can make this a truss. Trusses are less expensive than beams. No, it is a load-bearing component.

So make that a wall. Where are we? This is upside down. It's load-bearing.

I'm going to use a wall. Where are we now? There. That's load-bearing.

Wall. That's not load-bearing. We do would like a window, so beams.

Yeah, beam. We can make it a wall, but beam is also good. Gets more space.

I just don't see why you would want to use a beam anywhere, use a truss anywhere. This needs to be braced, but I want a window, so we're gonna do that. Oops, I just messed something up.

It's distracting me, I thought. The subscription is very strict. Although the opposing walls are already bearing the structure.

What if I just make everything a beam and see what doesn't need to be a beam? Maybe that's easier. There are so many elements here. Okay, now everything is a beam, but it's not stable.

So that is not necessary. Yeah, that is necessary. And non-load-bearing, so I use a truss.

That is necessary, but I don't want to fill up that space. That is necessary and load-bearing, therefore I'll use a wall. Is it load-bearing? No, it's not.

Truss is fine. Good. Well, I need to put down a window.

I kind of want a window, so oh, this is getting a bit complicated. But it needs to be braced, so here. Yeah, it needs to be braced.

That needs to be braced. That needs to be braced. It does need to be braced, but it doesn't necessarily need to be braced there.

If there's a connection between that and a wall, let's just put nothing there. That's really inconvenient. No, not on the inside.

No, that's on the inside. No, no, not necessary. Not necessary.

Not necessary. That is necessary. That is also necessary.

That is indeed necessary. I need to brace that side. Yep, that is necessary.

That is not necessary because I already braced the one next to it. That is necessary. That is indeed necessary.

It needs to be braced, and it's not load-bearing, so a truss will do. Well, where did the beams go? Where did the column go? Truss, truss, truss. None of them are load-bearing, so that's fine, actually.

I made up my mind about that. Oh, I only need one brace on that side. Nope, that's unnecessary.

That may be necessary. I think that is necessary. Well, if it's not there, what happens? Can I have a mechanism? Yes.

Yes, a mechanism might occur, so I do need—oops, not that one. Don't need that one either. Yes, we need that, but it might be easier if I put it on the inside, although that's kind of inconvenient because then people can—we would be obstructing the space.

Oh, god, which truss was that? There. That is no longer necessary because the floor is already braced. That is not necessary.

That is not necessary. That is not necessary. Oh, that is not necessary either.

That is not necessary. That is not necessary. That is not necessary.

That is not necessary. Yeah, that is not necessary. That one is also not necessary.

Let me go back to number one just to—where is it even changing? Oh, no. Okay, so the floors and the ceilings are all flat shells already, so we only need to brace it on the outside. Shit, what did I do? That's redundant.

It's probably redundant. One of those is redundant. We only need one.

We need bracing in that direction in one case, though, so yeah, that seems good in the back. That's necessary. Where is that? Yeah, that's necessary.

They need to be aligned, and maybe I can remove the flat shell that was there earlier. I mean, I don't need any flat shells at all. The beams are carrying it.

Boom. Let's check the structure. No, this one needs to be here.

Oh, crap. That one. I need that one.

All the trusses that should actually be beams. Oh, we need that one. We need that one.

We need that one. We need that one. Do we need that one? Let me check later.

I'm focused on something else. How is this possible? The first one. Yeah, so that one.

Okay, good. We fixed it.

Okay, the exterior has been braced on the right side and the left side, for the front and the back, and the outstanding spaces have been braced individually. This truss is redundant. Finally, that was not the case.

What was it now? Not that one. It's not that one. It was that one.

Okay, that is not necessary, that's not necessary. Okay, confirm. Yeah, yeah, it stopped by itself.

What happened? Oh, fuck. Oh, you can see the structural model you must create besides this model. Three different structural models which are generated by IAI.

Underneath each model, the option and total strain energy are shown. Strain energy in structural design refers to the energy absorbed by a structure when it deforms under load, essentially representing the work done by the load in causing the deformation. Please select one of the models to proceed with.

This can be your own model or one of the AI generated options. As you make your choice, please verbalize your reasoning. Whoa, so my structure has the highest energy.

Is that right? No, it would be that one. It would be four. I used strain energy.

25 million, 3 million, 6 million, and 200,000. Enter the number of the model you wish to continue with below. Well, I don't think the beam model is stable, to be honest.

I don't think model three, I don't think, so option four has only beams, but I don't think it's stable. Option three has no space for windows, and many windows are blocked by walls. Option two obviously has no space for windows at all, so I'm going to go with option one.

Please press Y to submit. You were asked to remove a maximum of one space. The strain energy free space is displayed in the table below, which you can use as a basis for your decision.

However, you are also free to make your own choice. Think about your reasons for choosing a particular space to remove. Enter the space ID below and press enter.

Please think aloud as you decide which space to remove. Explain your reasoning for the choice you're making. Okay, so six, I'm looking mostly towards spaces that stick out.

They're harder to design. Seven is one whole space. Ten is one whole space.

Well, I don't know what, I don't understand strain energy. I learned about it today in class. I don't fully understand it.

I guess I should just pick one with the biggest—no, don't pick the—the one with the biggest energy is the one that takes the most load, so a redundancy would be indicated by a low strain energy. Well, the lowest one is ten. Where's ten? Ten is on the top.

No, I don't know. Just remove Y. Split a maximum of one space. Split a space.

I would split space seven so that it is more aligned with the internal—no, there's no structural bracing there. I would split space six so that the truss could continue up. I don't know, actually.

I have no idea. That was based on no reasoning. You can see the building spatial design you just created by the spatial modifications.

Besides your own design, three different building spatial designs are shown which are generated by AI. For each option, a different space is removed and split underneath each design. A diversity score is visualized.

Diversity score. Each design is compared to the initial building spatial design. Your own building spatial design serves as baseline, and therefore the other values indicated below indicate how diverse they are compared to your design.

A higher percentage indicates a greater deviation from your original design, whereas a lower percentage indicates a smaller deviation. Okay, so space number three seems very impractical because of the huge cancel lever of space seven on top of space two, so I don't want to choose option three. Option two has split space one, which makes it kind of small.

Option four, I like. I like option four. Oh, there's a bridge.

Yeah, that's interesting, but impractical, so I probably chose my own design so that people won't have to climb up the stairs and then climb down the stairs to get to spaces six, twelve, and eleven. So I'll just choose my own. Oh, that needs to be a truss.

I can make that a truss. Beams are fine. Beams are fine.

Beams are fine. Beams are fine. Beams.

I don't want to block the inside. Make—no, don't make that a truss. Beams are fine, but a truss is better.

I can start bracing. Where is that truss? It's there. No, I don't want to put the truss there.

I want to put it underneath the already existing truss. I want that to be a truss. Do we need this truss? Honestly, I'm not sure.

I don't think it's necessary, but that truss is necessary. That last—that one's not necessary. We do need a truss there.

Where is it? No, I don't want that one. Yeah, we need that truss. Well, actually, that's unnecessary.

That isn't necessary. That's not necessary. That's not necessary.

I want that truss. Where is it? Yeah, I want that truss. I don't want that truss.

I don't want that truss. I don't want that truss. I don't want that truss.

I don't want that truss. I do want that truss. I also want that truss.

I also want that truss. I want that truss. I don't want that truss.

Where did it appear? here. Yeah, I want that truss. I don't need that truss.

I do need that truss. I don't need that truss. I, oh wait a sec.

I do, oh, yeah, I do want that truss. Do I have any redundant trusses? I don't think so. I also want that truss.

I don't need that truss. I don't need that truss. I don't need that truss.

I do want that truss. Not sure if that's stable. The floor itself is stable.

The floor underneath is also stable. Coordination is not working. Is working.

Oh, where's that one appearing? I do want that one. Oh, there's an internal truss somewhere. I do want that truss.

I also want that truss. I also want that truss. I also want that truss.

I also want that truss. I want that truss. I don't want that truss.

Yeah, that's right. I don't want that truss either. I think we're good.

I want another truss right here, but I don't remember which one it is, unfortunately. No, that's not it. That's not it.

That's not it. That's not it. That's not it.

That's not it. That's not it. That's not it.

That's not it. That's not it. That's not it.

That's not it. That's not it either. That's not it.

That's not it. That's not it. That's not it.

That's not it. That's not it. That's not it.

That's not it. That's not it. That's not it.

I think I skinned over it again. This is very frustrating. I will continue anyway.

My option. Please enter the space below to remove. The design would be simpler if 12 was gone, I guess.

Split. I don't give a... I don't understand what the benefit is of splitting any of these spaces. Okay, option 4 is complicated.

It's doable, but it's impractical because you can't get from floor 1, space 3 to space 6. The same is true in space... the same law is in option 3 from if you want to get from 4 to 1. Option 2 looks nice, but it has a huge cantilever. And my option does not have a cantilever. It has a small cantilever.

So I'm gonna go with my option once again. How satisfied are you with the overall design process? Not very satisfied. Not... no clear sense of direction, objective.

How easy was it to use the design tools provided? Kind of difficult. Could not easily track which wall belonged to which switch on the side. How often did you find AI-provided models reliable enough to influence your designs? I could not.

I didn't find any. How do you think your design process would have differed if you had not had AI assistance? None. I mean, I would not have made any removals or splits because I was not... not understand what the benefit drawback may have been of such an action.

Would you choose to use the design process in future projects... this design process in future projects based on your current experience? Perhaps in architectural applications when I'm... holy crap... brainstorming, but not for structural designs. Please provide an additional... any additional comments on how you could improve the design process used in this experiment? Highlight the wall that is... highlight the relevant wall when one hovers over the switch for... to select beam truss wall. Thank you very much.