NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory - 1

Relation between walk and path

By
Prof. S.R.S Iyengar
Department of Computer Science
IIT Ropar

Look at this statement, if there is a walk from U to V, there is a path from U to V,
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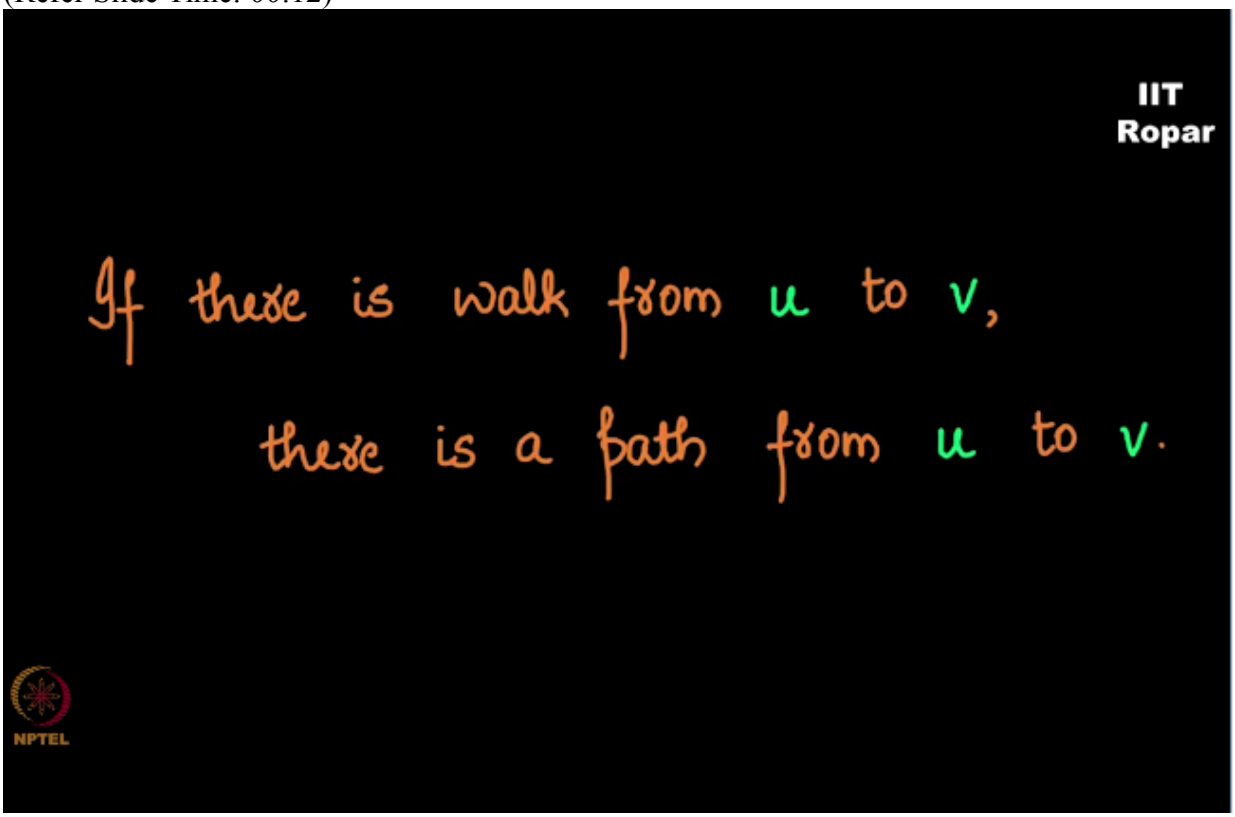

think about this question, you know what is a walk, a walk is simply I walk on the road from a point to another point, right, so let's say I start from my home, I reach my office by taking a long, long walk,
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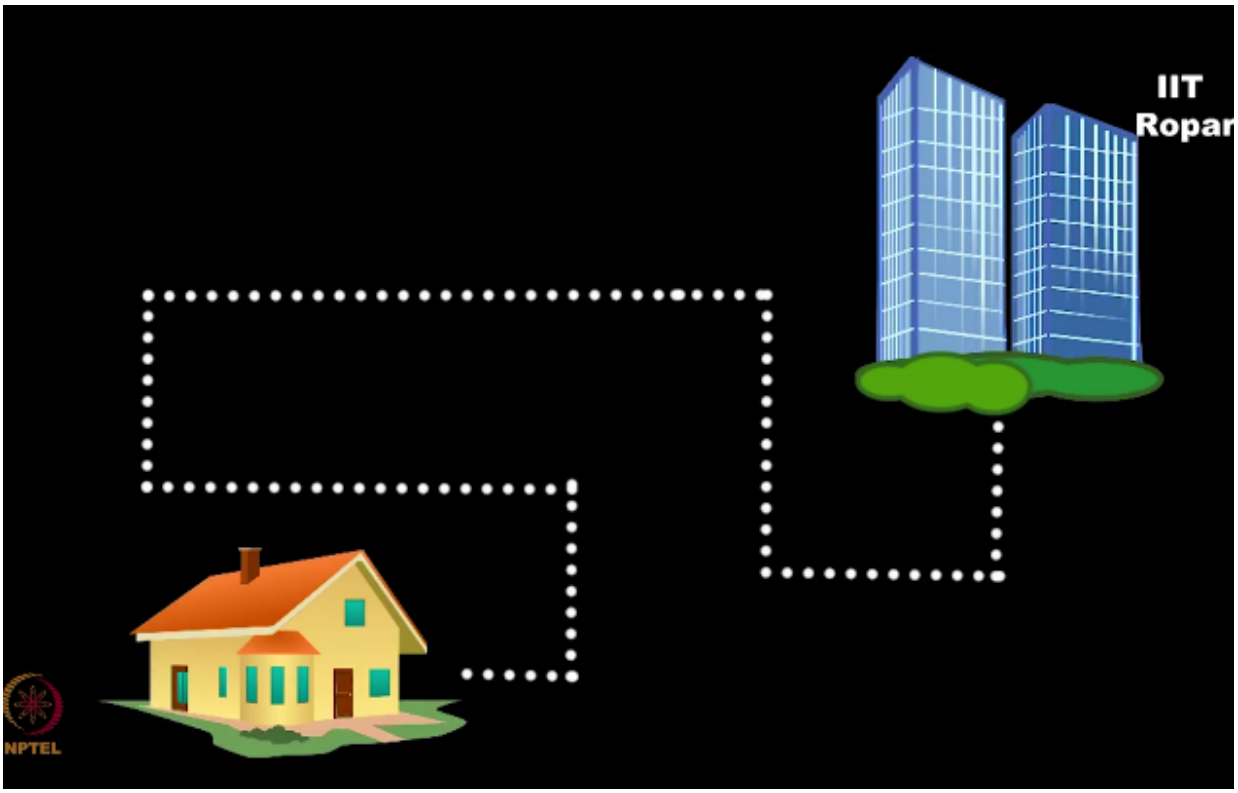

basically the idea is to take the walk not necessarily to go reach the office at the earliest, it's a early morning walk for me, that's how I reach my office.

Now when I take such a walk my office is actually just one kilometer away from my house, but I take 4 kilometers,
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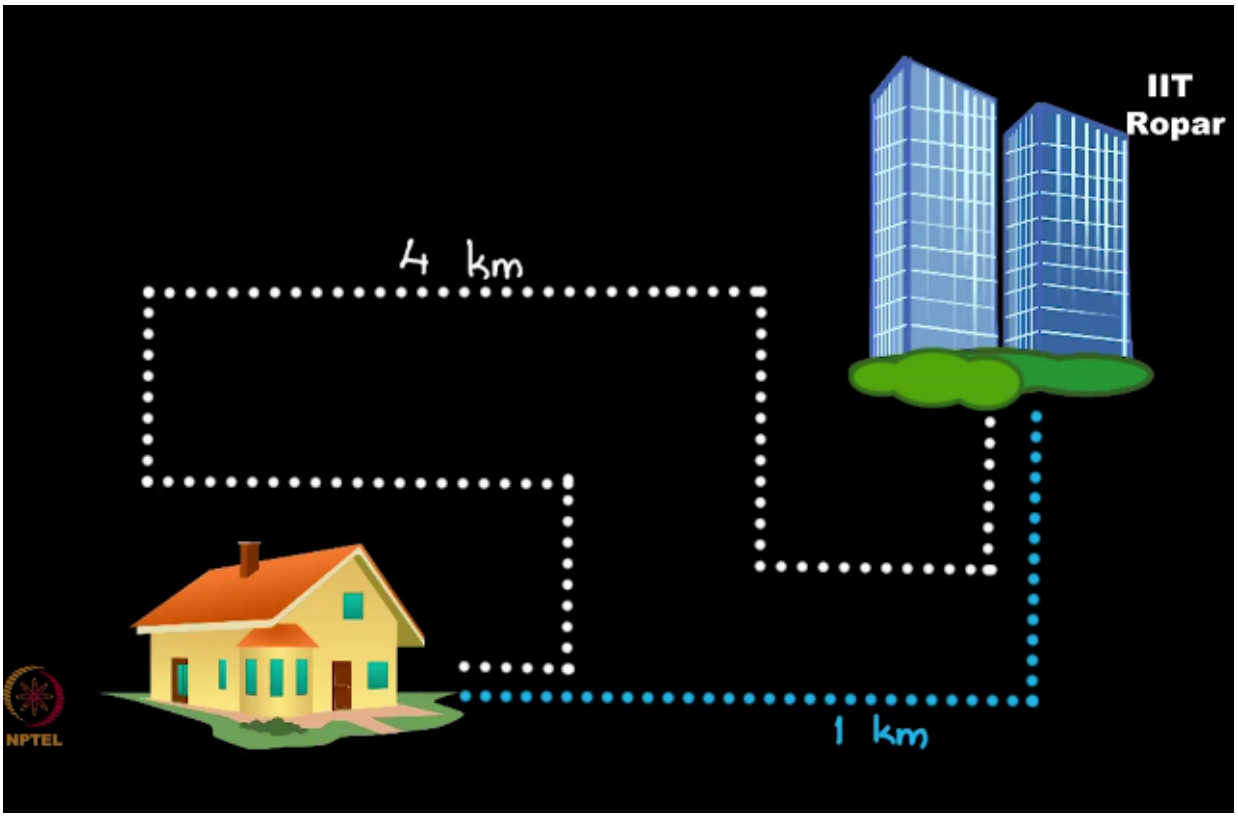

why? Not because I'm foolish, it's because I want a long walk early in the morning, on a good and nice, good and nice winter morning I need a very long walk, so when I take this walk, if I ask you this question based on this walk can you tell me what is the shortest path to my office, you will realize that they had possibly easier way in which you can reach your office quickly as well, but I choose not to reach quickly.

Similarly in a graph when you take a walk from let's say a starting node U to let say ending node V, if you take a walk, walk please note can repeat nodes and edges, correct,
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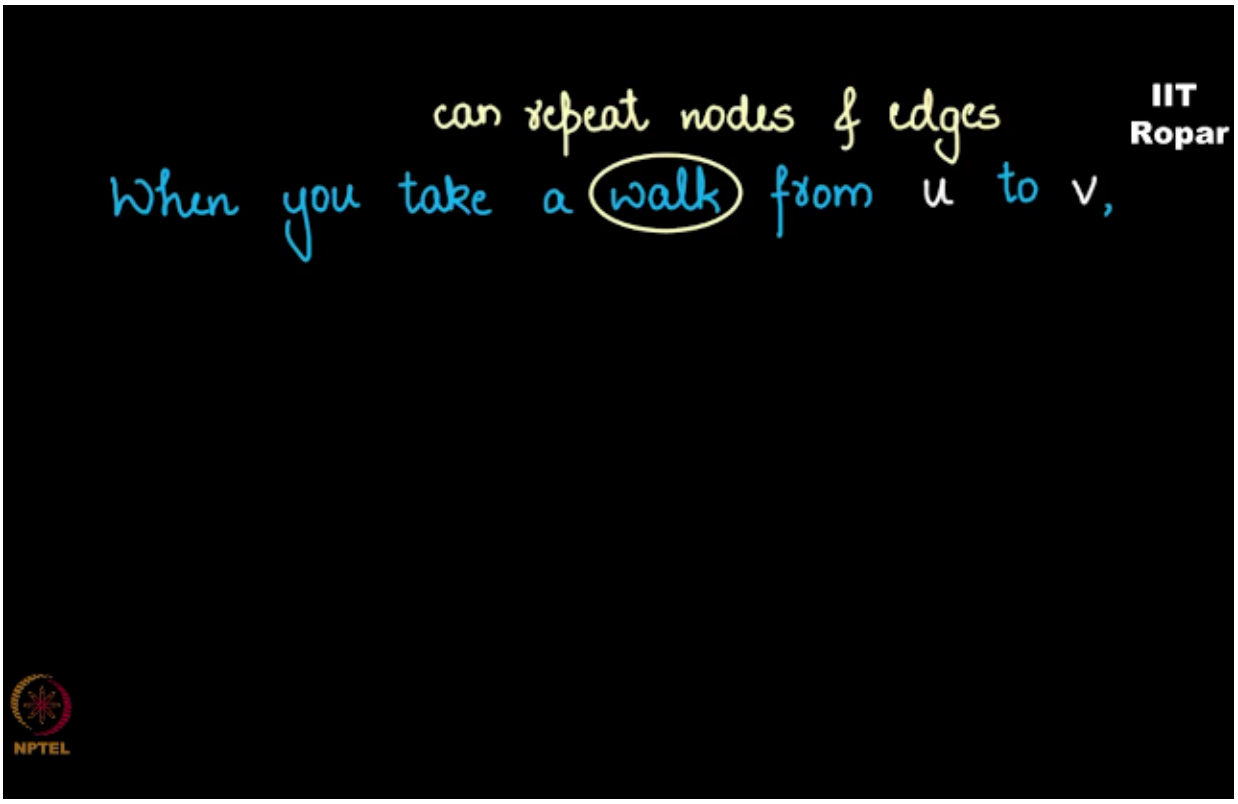

when you are doing this what I will do is I'll observe, as I'm going from U to let say another vertex X1 to some vertex X2 to some vertex X3 and so on as you know I can repeat vertices in my walk,

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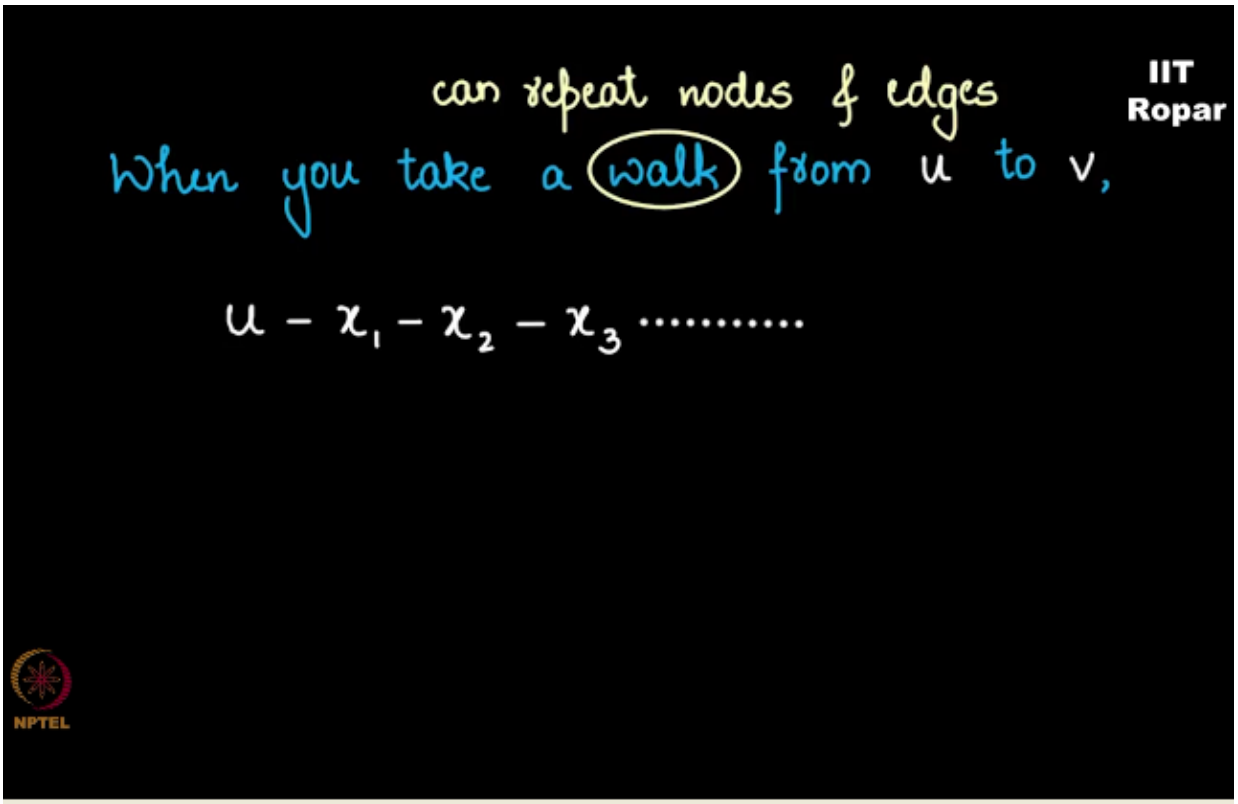

whenever I repeat a vertex in my walk it means I have seen a circuit, right, I start from X3, I go take a circuit as route, a detour, and I might end up in X3,

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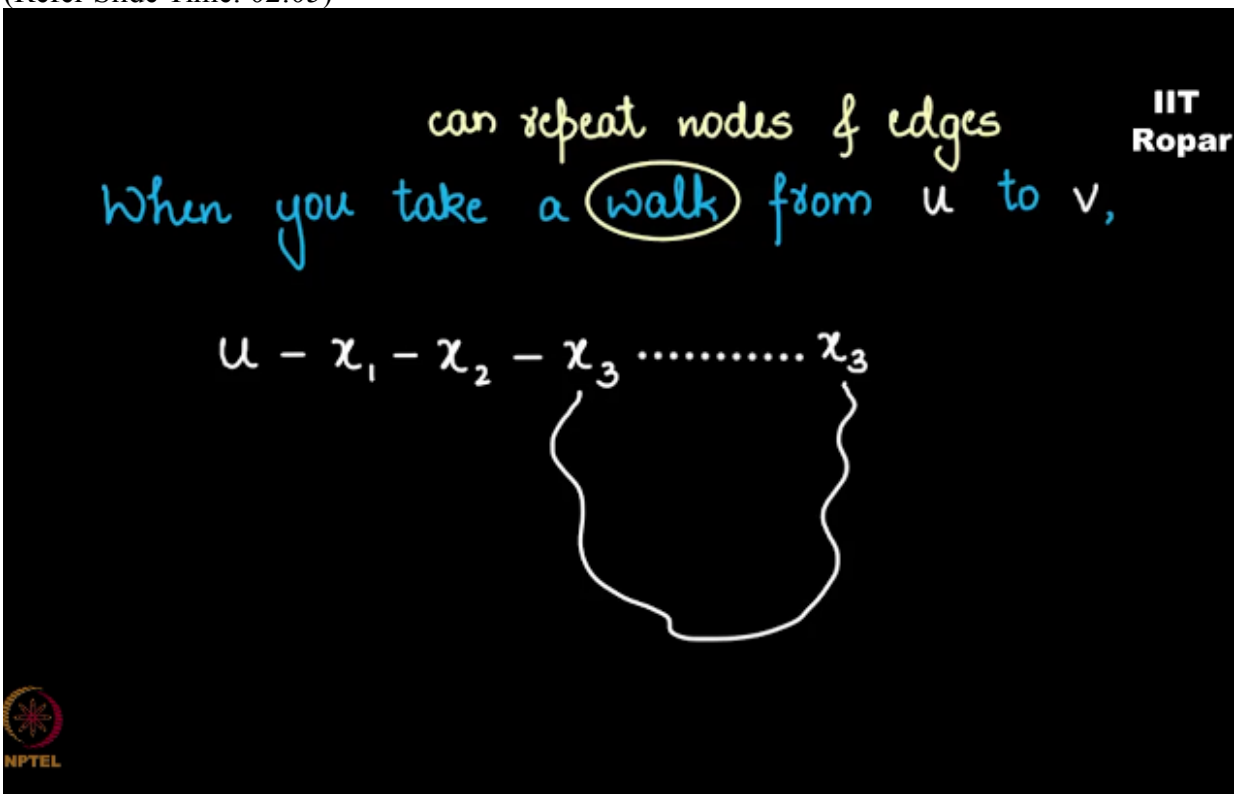

I remove such circuits, whenever I spot a circuit I remove it which means U, X1, X2, X3 and then if you see a circuit remove that circuit don't use that circuit, simply go to X4,
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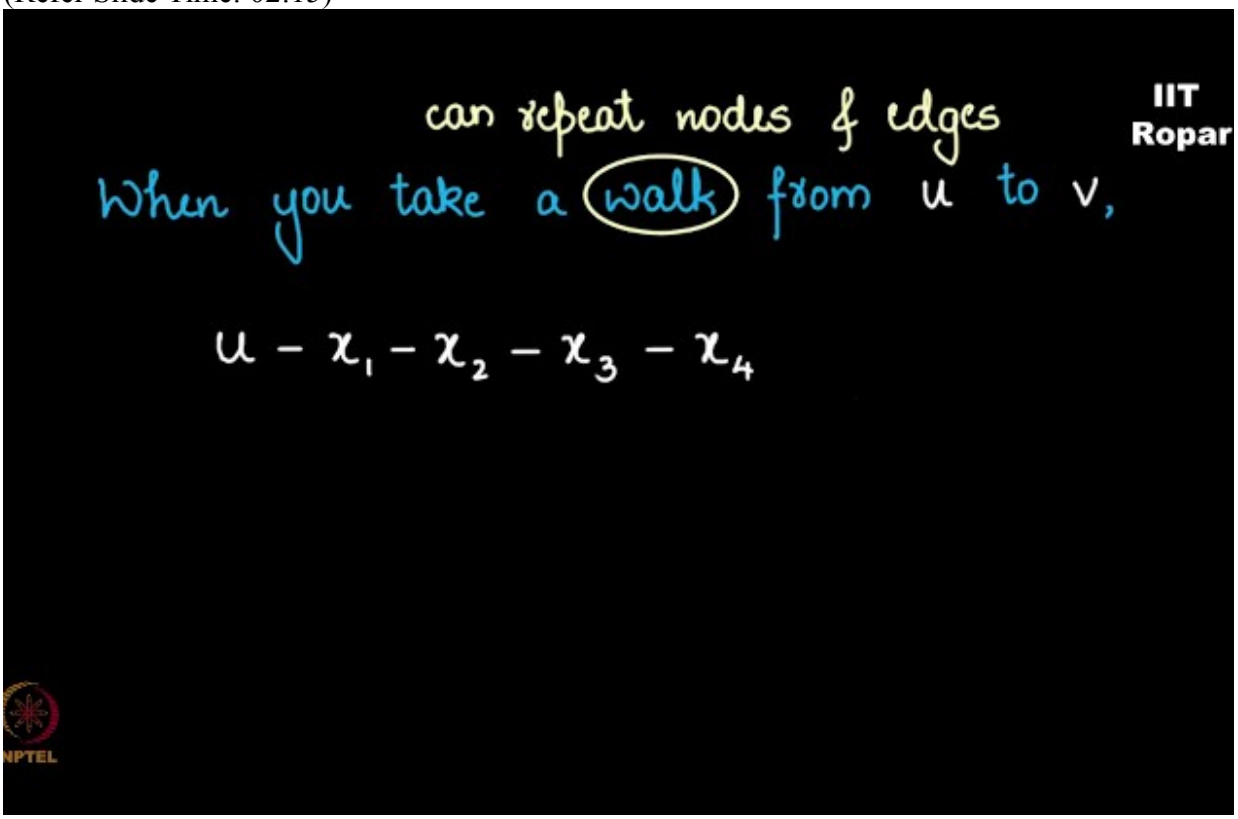

okay, if X4 was X2 then it means you have a circuit on X2, right, then don't go to X3, X4, and then back to X2, you go from X2 directly to X5,
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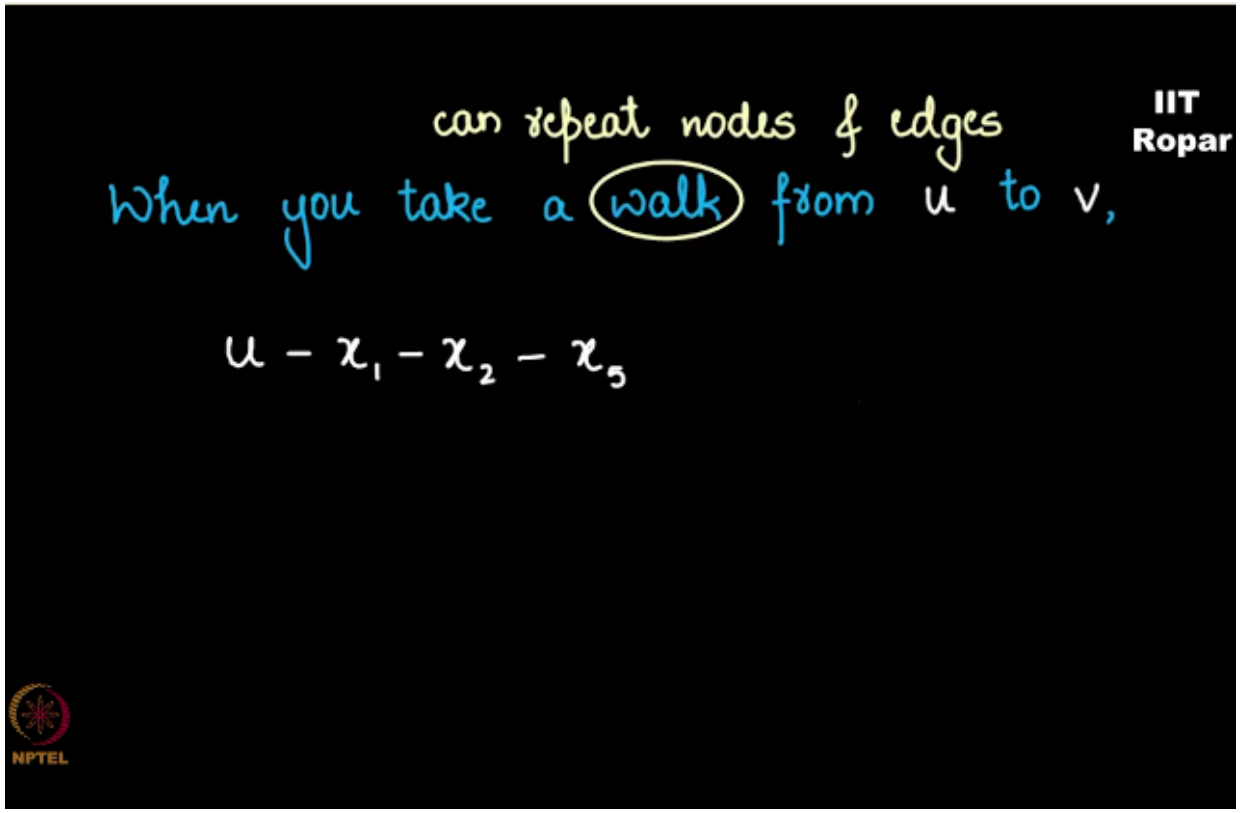

you see the point, what I am saying is extremely commonsensical you just have to see the point, that's it, so X5 and so on and finally you get V,

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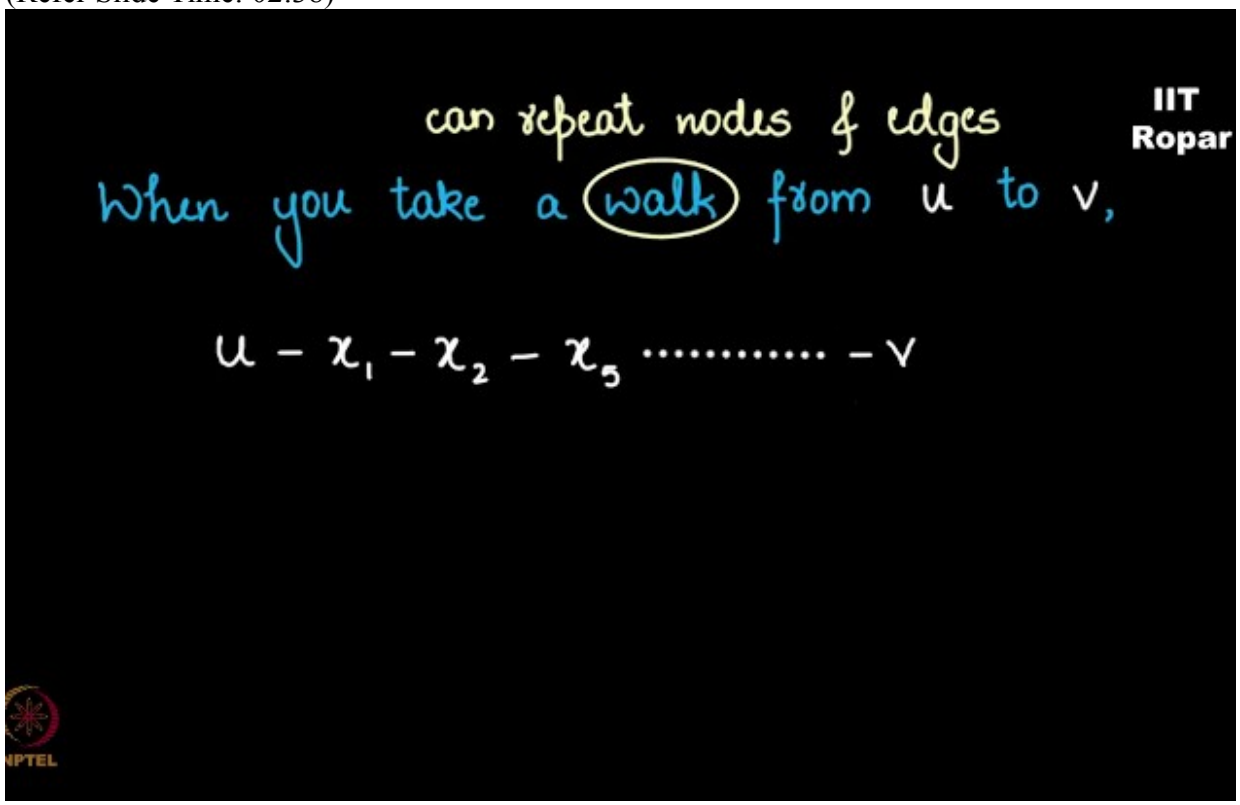

a walk from U to V might have circuits when you remove these circuits you will get a path from U to V, so what did we just now prove,
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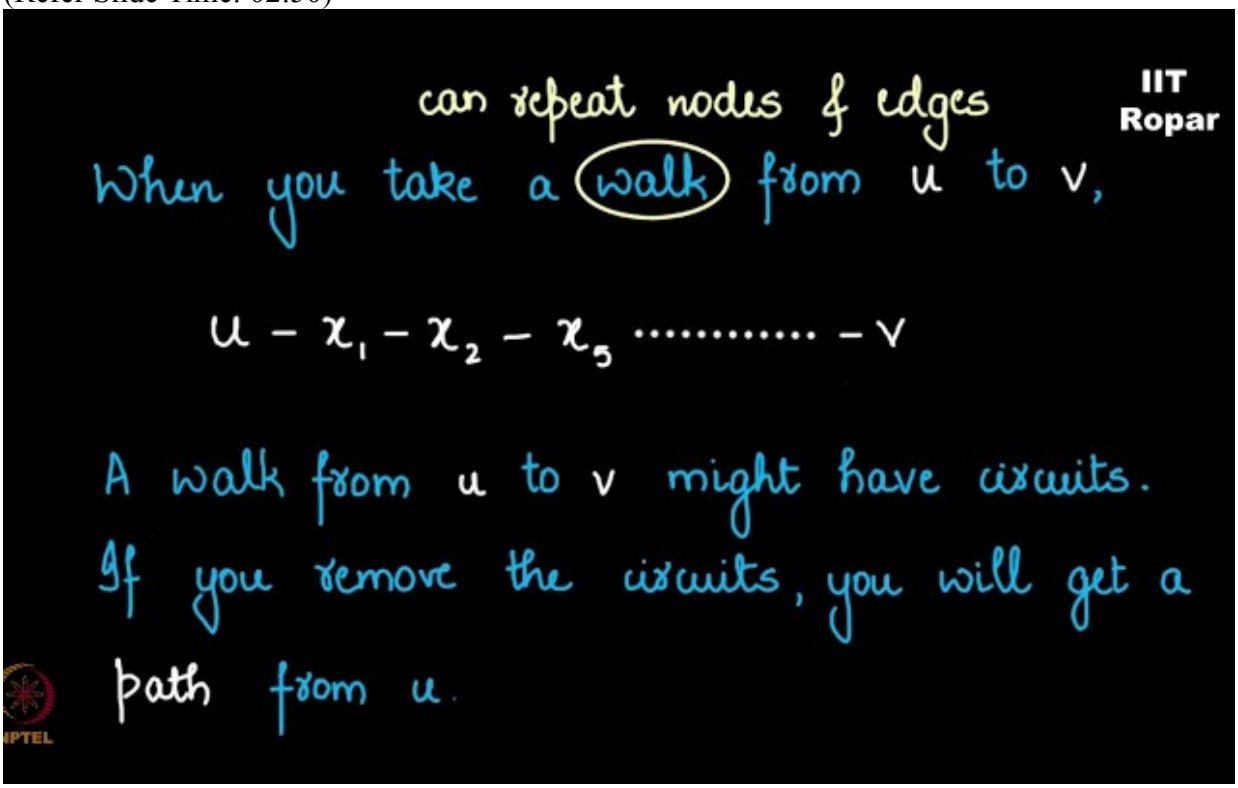

we proved that whenever there is a walk from U to V there is also a path from U to V always.