Knowledge Representation Techniques

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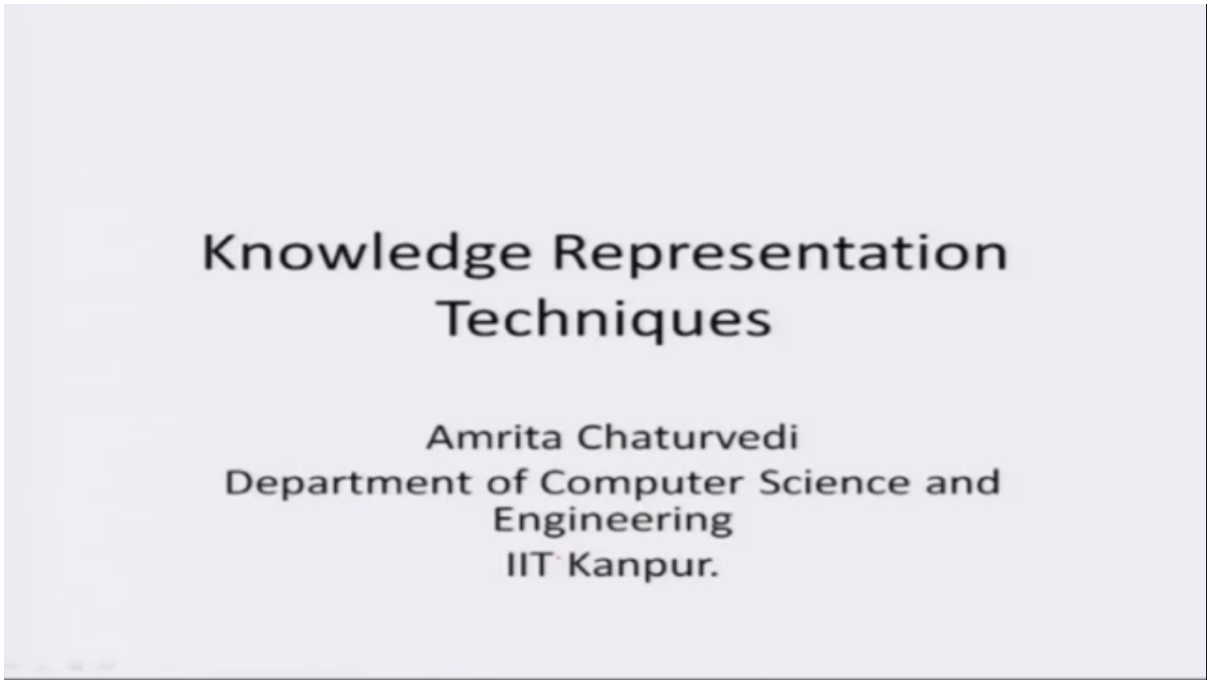

Hello everyone. Welcome to this video of knowledge representation techniques. I am Amrita Chaturvedi from the Department of Computer Science and Engineering at IIT Kanpur.

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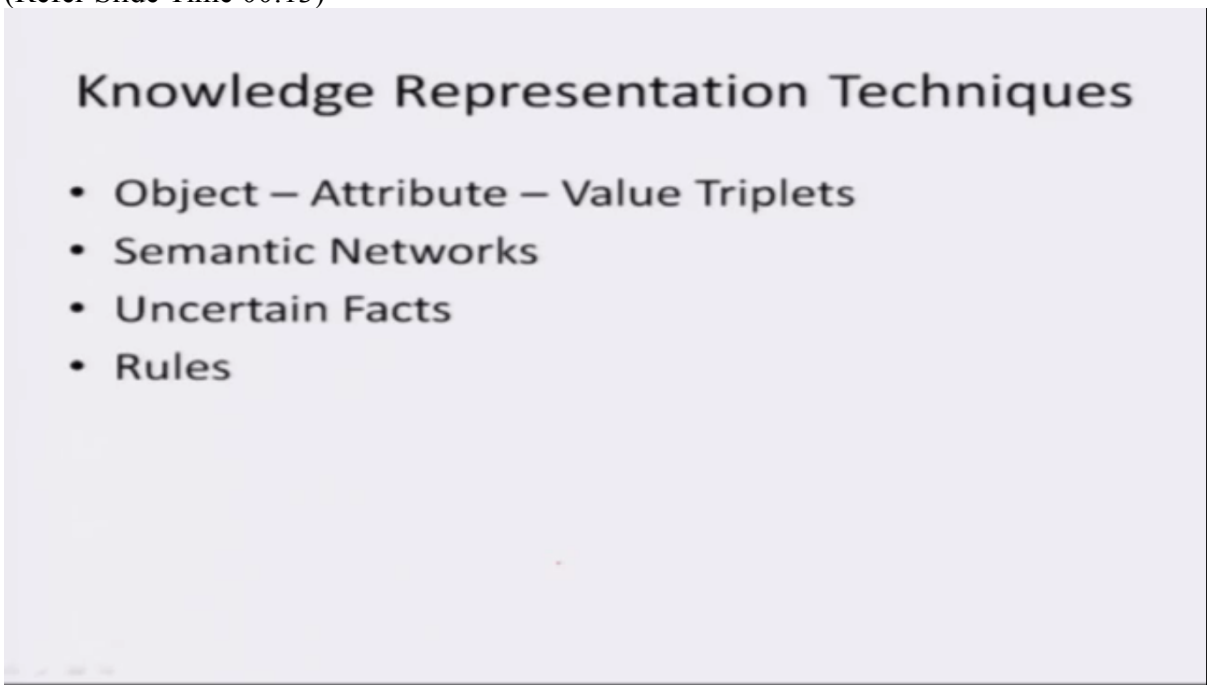

The knowledge representation techniques that will be described today are object - attribute - value triplets, semantic networks, uncertain facts and rules.

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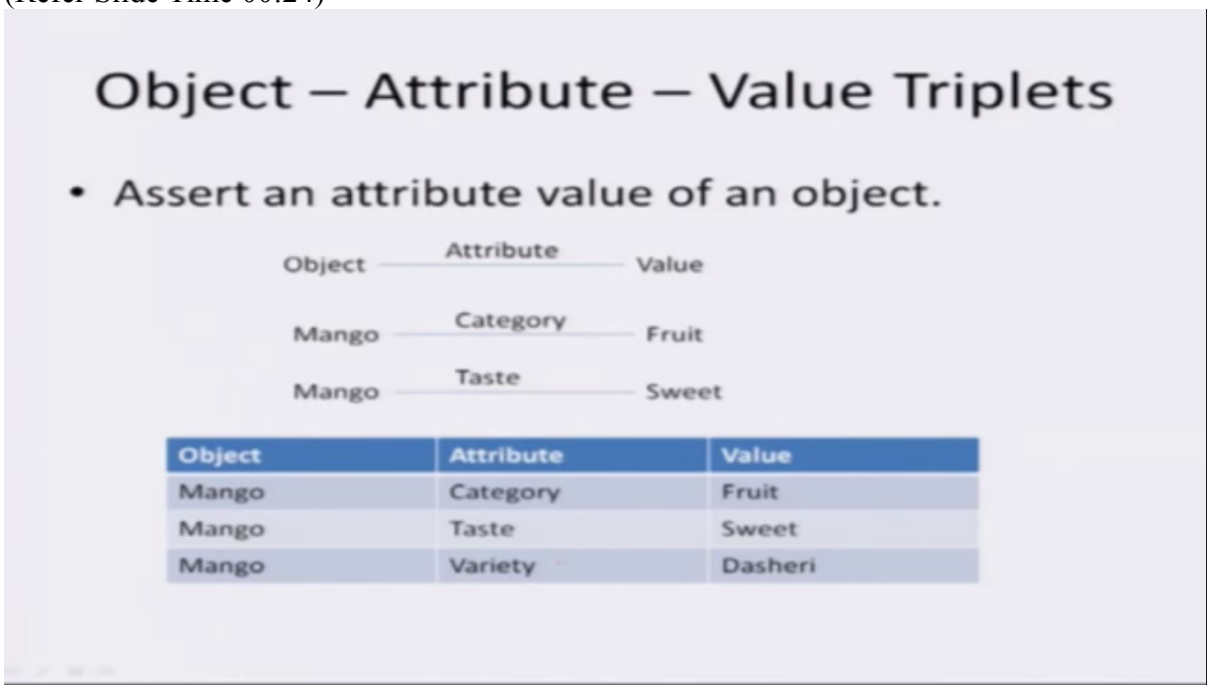

Object - attribute - value triplets are used to represent facts about objects and their attributes. They ascertain attribute value of an object. They can also be represented graphically in this way: Object Attribute Value.

For example, if I wish to say that the category of mango is fruit, I can write it as mango has attribute category that has value fruit. So mango category fruit. If I wish to say that the taste of a mango is sweet, I may write it as mango has attribute taste that has value sweet. So mango taste sweet.

It can also be represented in tabular form.

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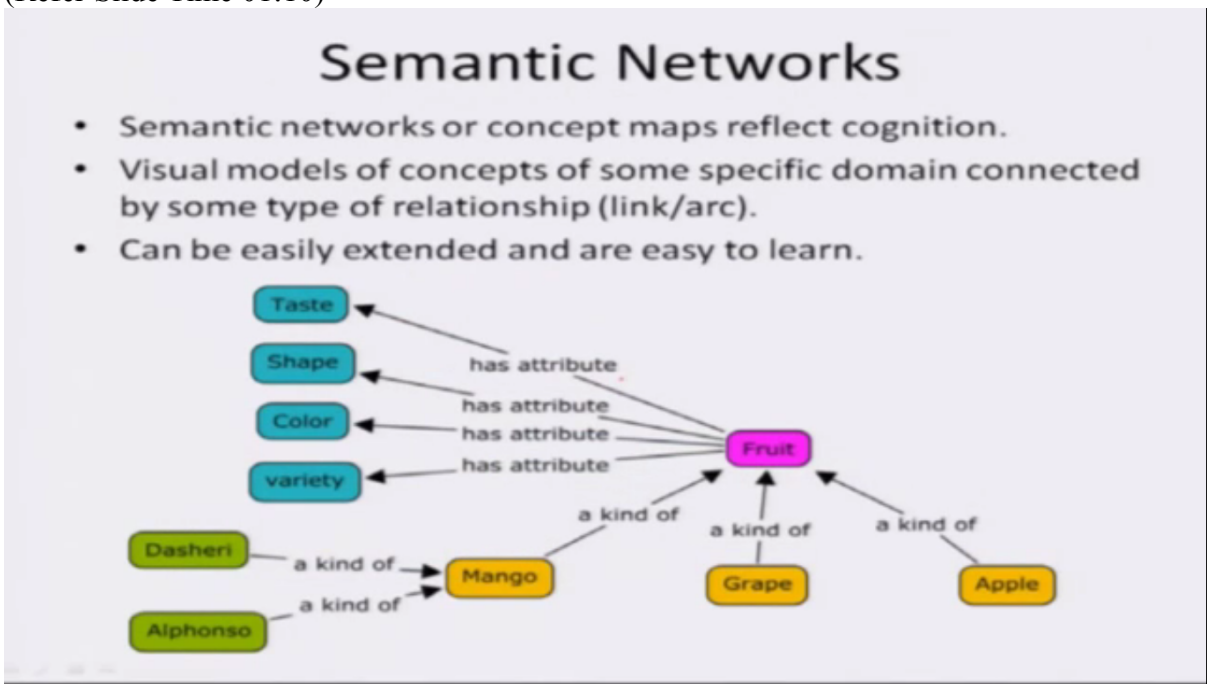

Semantic networks or concept maps reflect cognition. They model knowledge in the same way as human beings visualize it. The visual model of concept of some specific domain connected by some type of relationship in the form of link or arc. They can be easily extended by adding some more concepts and relationships and are also easy to learn.

This is an example of a semantic network or a concept map. The rectangles here denote the concepts and the arrows denote the relationships. For example, Dasheri is a kind of mango. Alphonso is a kind of mango. Mango is a kind of fruit. Grape is a kind of fruit. Apple is a kind of fruit. Fruit has attribute taste. Fruit has attributes shape. Fruit has attribute color and fruit has attribute variety.

Now it is easy to see that concept maps can be visualized as a collection of object - attribute -value triplets. For example, Dasheri has attribute “a kind of” that has value mango. Alphonso has attribute “a kind of” that has value mango. Mango has attribute “a kind of” that has value fruit. Grape has attribute “a kind of” that has value fruit. APPLE has attribute “a kind of” that has value fruit and same goes with other relationships as well.

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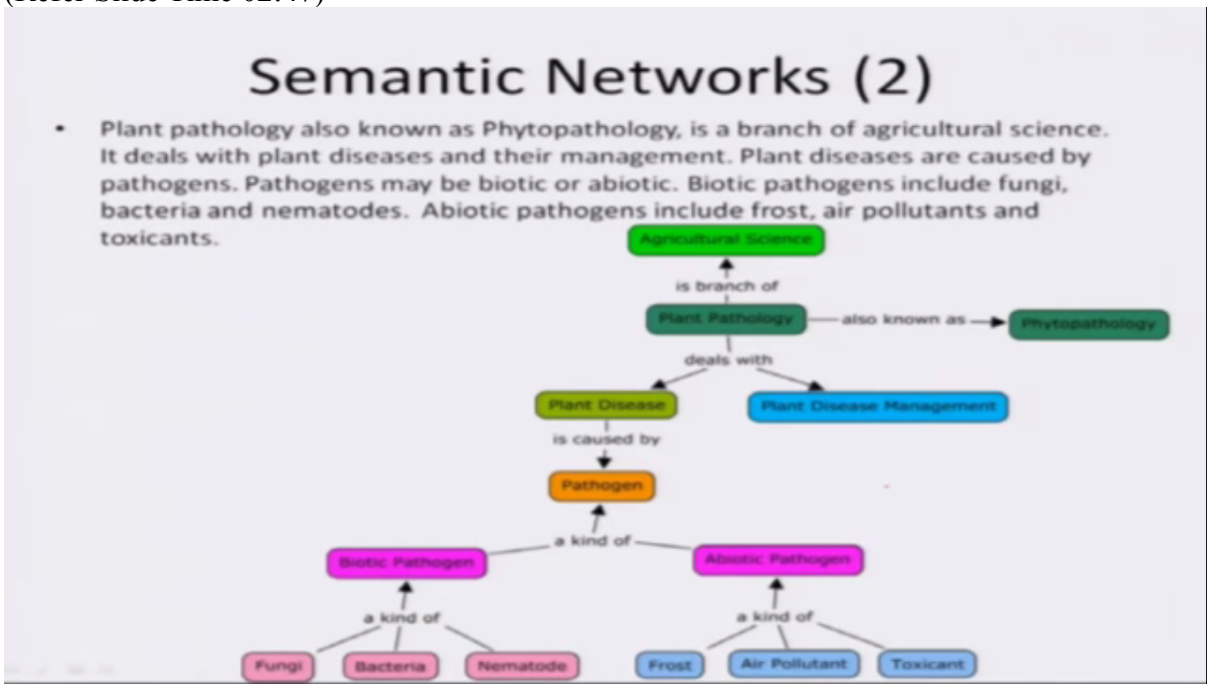

Now let us see how to draw a concept map knowledge that is represented in natural language. It is a three-step process. First of all, we need to identify the concepts, and then we identify the relationships between the concepts and then finally we plot the concepts and relationships into the concept map.

For example, Plant pathology is also known as Phytopathology is a branch of agricultural science. Now here the concepts are plant pathology, phytopathology and agricultural science. We draw these concepts in the form of rectangles in concept map and finally join them with the help of the relationships between them.

Plant pathology is connected to phytopathology by the “also known as” relationship. Similarly, plant pathology is connected to agricultural science concept by the “is branch of” relationship.

Then it deals with plant diseases and their management. The concepts here are plant diseases and plant disease management. So we plot them as concepts in the concept map and link them with the plant pathology concept by means of “deals with” relationship.

Plant diseases are caused by pathogens. Here the concepts are plant diseases and pathogens. So we plot the pathogen as concept and link it with the plant disease concept by means of “is caused by” relationship.

Pathogens may be biotic or abiotic. So here the concepts are biotic pathogen and abiotic pathogen. So we plot them as concepts in the concept map and link them with the pathogen concept by means of “a kind of” relationship.

Biotic pathogens include fungi, bacteria and nematodes. Here the concepts are fungi, bacteria and nematodes. So we plot them as concepts in the concept map and link them with the biotic pathogen by means of “a kind of” relationship.

Abiotic pathogens include frost, air pollutants and toxicants. Here the concepts--