Language, Culture and Cognition

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Module 4
Part 2
Lecture - 10
Image Schema

Hello and welcome to the 2nd part of this module. We are discussing Image Schema in this module and so far we have seen what image schema is, what have been the historical background of this particular field.

As to how the theories have come together, how various disciplines have converged upon the primary idea that certain experiences of our, bodily experiences, physical experiences with respect to space and objects in space, and how we experience various perceptual interactions with the environment and so on, can be actually represented in a schematic way, probably is represented in a schematic way in the human mind.

And this is not only an idea from the languages, linguistics or but also from philosophy, from psychology and from other disciplines also, the same ideas have been you know converged together. And they are largely there is an agreement upon that there is some amount of an of a schematic representation, schematic understanding, that underlies all these, many of these recurring patterns. Because human life is ultimately a recurrence of various patterns. So, many of the patterns can be grouped together as part of being one schema.

So, for example, one of the most important and most productive image schema is that of a 'container' image schema and then there is source-path-goal. So, various kinds of movements of objects in space can be understood in terms of a path schema, source path and goal schema and so on.

And similarly, that same idea can also go on to help us understand the abstract domains of experiences as well. So, starting from the physical, embodied experiences of physical relationship with the objects to the complex understanding of abstract domains so and so on and so forth. So, we have already looked at the definitional aspects, the historical

aspects and of course, we have discussed some of the most commonly utilized image schema so far.

Now, let us move on to the second part of our understanding on image schema. So, this part where we will discuss about, this is the kind of a road map, where we will discuss the language understanding. What is the role of image schema? We have arrived at image schema of course, that is a kind of a schematic understanding that has been you know distilled out of, in fact, it has been called a ‘distiller of experiences’. So, image schema is the distillers of experiences.

So, once we have distilled our experiences into getting the schematic representation, now how does it help us? How does it help us in various domains of human understanding? So, we will just try to briefly go over a few of these domains, where image schema has been utilized to make, to understand certain domains of human experience. Like language understanding and then creating and comprehending metaphor, image schema and its relationship with the brain and of course, the computational modeling.

This is by no means an exhaustive list, but this gives you a basic idea about the various domains, the variety of enterprises, variety of academic enquiries that benefit from the use of image schema. And how this theoretical position can help us add to our existing knowledge in these domains.

So, the first and foremost, since we are this is a language course let us look at how image schema help us understand language. So, the claim that image schema underlie meaning in language means, a listener understands a sentence by simulating the scenario. So, let us take a very simple example here, when we talk to each other, we understand each other and the there are positions where there are situations, when we fail to understand each other.

Now, what happens is that we sometimes say that the meaning did not get across, the meaning that is generated out of the fundamental understanding on which the entire whole thing is based on, is probably lost in translation somewhere. So, one aspect of that understanding is dependent upon the image schematic notions of the speaker and the hearer. And if the speaker and hearer both share the same image schematic notion of the object being talked about, the understanding is simple and straightforward.

So, talking about ‘I have a long journey ahead’ is very simple and almost universal, near universal way of looking at life, you have to talk about life, we have already seen in metaphor that life is often talked about in terms of a journey. So, what is happening here is I am looking, at I am creating my sentential output, the linguistic output, to talk about my life by using the image schema of a journey.

So, there is a source-path-and goal image schema. So, this is the schema that we are using and the other person, the hearer also has the same schematic understanding to map the sentence on.

So, basically if you have the same image schema, if you are able to fathom the image schema, then you were able to simulate that scenario as in what is exactly happening. The simulation is a very very interesting aspect of language processing, which we will see in greater detail towards the end of the course, we have a module on simulation.

So, basically what we are looking at in this segment is, that the simulation is dependent on the schematic understanding. So, we are able to create, we are able to abstract out the schema of the sentence and then think about it in embodied terms and that is where comprehension really starts.

So, a lot of studies have actually taken place, and as I have said we will discuss it in greater detail, but a lot of lot of data from to underlying this, underlining the use of image schema in creating simulation while understanding language, this comes from the domain of what we call psycholinguistics. So, psycholinguistics typically looks at processing of language, not simply speaking and hearing, but processing; processing as in what happens when we either comprehend or produce a sentence or a word or any aspect of language.

So, what happens simultaneously? What are the psychological reality of understanding language, of processing language as well as the neuronal reality? So, a large chunk of studies actually used sentences like this “he hammered a nail the nail into the wall” and then you can also have a comparative sentence “he hammered the nail on to the floor”.

Now, both of these the both of these sentences basically mean almost the same thing except that the orientation of the nail is different. So, what the speaker and the hearer are simulating in this particular case, if they match then there is a smooth understanding of the scenario. But if there is the schema is not does not match, then there will be a problem.

So, the results from a large number of studies using this kind of language pair, this kind of sentence pairs, have shown that people actually create an image schematic nature of the event. So, we create an image schematic nature of the event in our brain, basically we activate the image schema, so to say. Because the schema is already there because again because of the embodied experiences throughout our life, which has seen this recurring pattern already.

So, we are basically activating that schema and as a result of which we are even though we are activating the schema, even though it is not explicitly mentioned in the sentence. All we need in this sentence to create the schema is 'into the wall' and on the other hand 'on the floor'. These are the cues that activate the schema even when nothing about the schema is talked about on the surface, the language, the linguistic output does not mention it anyway.

So, this is one area of use of image schema and how image schema and simulation go hand in hand and why they are important in terms of language processing.

Similarly, we have already looked at metaphor, how metaphors are created and how metaphors are understood, we have already seen that metaphors are primarily cross frame mapping. So, one frame of a concrete experience and an embodied, physical, lived experience is mapped onto another domain which is somewhat similar which is in the domain of abstract domain, which is understood through the concrete domain and then thereby we get the metaphors. So, 'life is a journey' as we have already seen.

So, what is happening here is, how does how do we map one frame onto another is basically dependent on the shared image schema of these two frames. So, basically when we talk about, when we think about life, when we understand life any you take any particular aspect of life: there is a beginning, there is you know a journey, there are points on that journey.

So, there are milestones of you know various ages, various achievements and various kinds of you know, so to say, segments of life, childhood and then adolescence and adulthood and so on and so forth. You can have your own way of segmenting the entire life into various you know meaningful segment, whatever is meaningful for us.

So, that is why the schema that it represents, that it actually gives you know that is fleshed out in the entire experience, into the entire frame, is basically the same. So, both of the experiences, whether concrete or abstract in this case can be understood by activating by looking at or by abstracting the image schema of source –path- goal.

And hence we have a very perfect match of, one to one mapping, of source and target domain. So, this is how for example, let us take an example like this, "categories are containers", remember when we talked about frame talked about metaphor, metaphors are represented as x is y or a is b or whatever.

So, basically frame a is equal to frame b, a x is y. So, containers are categories, but this is this may not be the way we talk about it. So, linguistic manifestation is always much more you know flowery and much more, it has much more uh possibilities of manipulation, but at the end of it, at the root of it 'categories are containers' is the metaphor that we are talking about.

So, when we say a sentence like 'humans fall in animal category', humans are part of animal category, you may change the sentence to sound make it sound better, but I have used a rudimentary sentence to make the point clear. So, 'humans fall in animal category' meaning that humans are part of 'animal' category.

So, what is happening here is that we are using the container image schema that we have already seen before. So, container image schema is the schema that binds the things together. So, on the one hand you know categories and on the other hand container.

So, categories can be a larger container that has animals into that like animals are a category that has other a humans and other things into it. Similarly, the animals are again part of a superimposed category, larger category, larger container so to say of 'living things' and so on and so forth.

So, categories are containers is the metaphor which uses the image schema of container. So, this is what we mean by metaphors, frames and image schema are interrelated. So, this is how we show that relationship. Similarly, our favorite example "life is journey" this is the metaphor. So, the schema used here is the path-schema and sentences like this.

So, what we typically have when in a human society, in a human communicative situation, in a day to day life, what we have is this. We do not see either this or this or this or this, what we see or hear or you know what we are exposed to is the sentential the linguistic output like “humans fall in animal category”, “we have a long way to go”, “its curtains for him”, you know “we have hit a roadblock” and so on and so forth.

So, from here we back form into understanding the metaphor and then once we have understood the metaphor we all can easily figure out the schema, that is at the root of this. So, this is how it actually works. This is how the relationship really pans out.

Then of course, like we have been saying from the in the beginning of this course, that every linguistic aspect we have been trying to connect with the cognitive as well as the neural underpinning. So, in this case as well, image schema, when we talk about image schema, we have seen it in language, we have seen it in metaphor creation and so on and so forth.

Now, there is also the neural underpinning of it. So, we have briefly talked about it in the introduction. So, now, let us look at a very interesting domain of research in case of image schema with respect to childhood, with respect to the developmental stages of infants, small kids, as to how do we have image schema in-built as a result of only experiences, later life experiences, what are the contributing factors.

So, we have already seen that the embodiment hypothesis makes a strong case for creation of image schema, that is, the perceptual experiences the lived experiences and how it creates a conceptual understanding of a schematic representation and so on and so forth. However, the there has there has been a recent development in this domain. So, the development of developmental course of image schema has been brought to focus by some researchers.

This is a recent phenomena, because Piaget for a long time, Piaget’s notions of the developmental stages of children, of from infancy to adulthood, have has dominated the psychological understanding of the developments of children. So, Piaget viewed infancy as a completely sensory motor stage and as a result of which, the it has no conceptual life.

This is a stage the infancy is a stage when child children are experiencing through their sensitive motor experiences, the environment around them and thereby they are building

up their skills. So, at this stage, the children are not infancy as in 4 months, 5 months, 6 months to you know 1 year 9 months, around those are the ages, those are the stages when which we are talking about here.

So, at that level, they are not expected kids are not expected, to have a conceptual life, as a result of which mental representations of schemas and so on and so forth may not really exist. However, in recent times, it has been found out that kids are small children, as small as 4 months or 6 months are actually capable of having higher order cognitive functions.

There have been a large amount of studies and large amount of data that is that has come out of it from the first year of a child's life. Even before the child is 1 year old, there have been studies, that shows that show that higher order cognitive functions are possible. Now, higher order cognitive functions cannot be possible without a conceptual life, without having some amount of mental representation of various things.

So, one of the important claims of this that comes out from these findings is that; that image the infants use image schema to generalize across perceptions. Because image schema, remember we abstract out, this is an abstraction of various perceptual experiences.

So, basically it means that using image schema, we can generalize across perceptual experiences and that is how we put them together in one category, that these all these experiences are of the same category, because they all share the schema. Similar findings have been reported by researchers working on infants, in the first year of life.

So, what are those, what are those things let us see a bit in detail. So, these are called 'preverbal concepts'. So, the depending the kids, the children that have been studied have taken part in many experiments and which has given us the idea that children actually have some amount of some concepts that already exists by the time, even before they are 1 year of old, 1 year of age.

So, these concepts are called 'preverbal concept', plainly because the verbal stage has not started, kids are still kid children before 1 year are not able to speak in proper, they are not yet speaking the language as they will do in later stages. So, this is that is why it is called preverbal concepts.

Now, the fact that children have been found to be having some amount of concept, we mean conceptual understanding, some amount of conceptual storage, some amount of schematic notions, means that certain things are probably primitives. Primitives as in foundational aspects of human thought.

In fact, very exciting research is still going on about um neonatal and very small children, and there are also hypotheses that probably certain some of these things are you know are really primitives in the sense that we are born with it. But it the it still its still the work is still going on in that domain.

So, but largely there these preverbal concepts in humans point to the possibility that there are certain primitives and foundational aspects of human thought, which probably includes image schematic understanding. And why is ‘preverbal concept’ very interesting to study is not only because it is you know we can then think of how the human mind is actually, so to say coded, how what are we born with, what are the primary tools that we are born with.

But at the same time, it also shows us that, shows us as this takes preverbal stage takes us to a particular phase in time, phase in developmental, in a developmental phase of humans, when both culture and language have not had much opportunity to shape those ideas.

Till now, we have been talking about you know how language, how various structures of language actually impacts the way we look at life, how it probably has ah some amount of influence on the way cognitive functions actually work. Simultaneously we have also looked at the socio cultural realities of various communities and how they differ and so on and so forth.

So, the linguistic output and the intermixing of cultural input from that and so on and so forth probably has ah some amount of modulating effect on cognitive mechanism. And that is exactly why we need to look at the preverbal stage, the infancy of children to see what are the concepts that we are probably born with, even before they have been influenced by either language or culture or you name it, whatever is there.

So, what are the foundational aspects of human thought, this is why it is important and also these concepts actually are creating the entry point to language understanding. So, if the child has been born with some amount of foundational aspects of the schematic

understanding and obviously, it grows, as the child grows simultaneously along with the age.

And then as the child starts learning language this helps us, this act as an entry point to language understanding. Because language, as it is spoken in the surroundings, is already fixed, it is already there, it already has its own structure, has its own conceptualization pattern and so on and so forth.

So, the child by the time he or she starts to speak, by the time he or she makes an entry into that domain of language, he already has certain concepts in place. In fact, very interesting studies on barn owl have been carried out, as well as alongside human children to see what are, the how those developments might actually be occurring, but those are of course, outside the scope of this course.

And so what are the, what are the preverbal concepts that have been found out in children? That is understanding with regard to object and relational concepts, objects and their orientation and how they interact with each other in space and the relational concepts between them. Early concepts about ‘event’ as well as ‘objects’ as well as event are there.

So, this as far as objects are concerned, the understanding of’ object’ and their relationship with each other that is one domain that have been found out to be present in infancy. Similarly, early concepts about ‘event’ also is there.

So, what does that consist of? Event notions consist of path notions, like self motion, goal and of also of course, spatial relation like containment and support. All these things as you might easily understand, point to the image schematic nature of abstraction. Abstraction of, you know, from various recurring patterns as to how I look at it.

So, these are very very fundamental understanding containment, support, you know motion in terms of path and goal, these are fundamental understanding about things which is which has been found to be present in very very small children, preverbal stages, children with a preverbal stage.

So, the studies that have been carried out at various kinds of paradigms have been used primarily, recall, inductive reference and mental problem solving. So, children have been

found to be able to take part in these various tasks which basically take us to the understanding that we have seen just now.

One of the foremost researchers in this Mandler called this concept creating mechanism, he she has given a name to it ‘perceptual meaning analysis’. So, this entire mechanism that is pre that is found in preverbal children, preverbal infants and that is found through these tasks of recall and inductive reference and as well as mental problem solving, the name she has given is ‘perceptual meaning analysis’.

So, findings suggest that children can abstract relations among diverse range of sensory perceptual events, and this of course, fits with our understanding of what an image schema is. Some references are here these are the some of the path breaking works that has that gives that were from where we get our data.

If we are in we can always look up those papers, they are they stand out as the most important in this domain. Secondly, now let us move on to the socio cultural influence of image schema. So, many researchers have focused on the bodily origin of image schema, we have seen already that, bodily origin, physical experiences and so on and so forth and then the experiences with the between the organism and the environment.

Now, the research in there is another, yet another interesting domain in the research of first language acquisition. Language acquisition of course, have various types, there are there is first language acquisition, second language acquisition and so on. So, the research in first language acquisition also has pointed towards the manipulation of objects in material culture, as a source.

What is happening here is that on the one hand we have lived experiences, physical bodily experiences of, you know, body being a container of things and body being contained in many other things and so on and so forth. And then the relationship between the human body and the environment, all these are fine as the you know source of creating schemas, but it does not stop there. Researchers have found out that even the objects in the material culture, why material culture is important is that not all cultures in the across the world have the same material artifacts.

So, in our in the mainstream society, that we are becoming more and more homogeneous. So, more or less, we are surrounded by similar kind of objects, a large array of objects, but

if we go to cultures that have that are surrounded by lesser number of material objects, then we see a slight difference. So, that is exactly what the researchers mentioned here. Chris Sinha and his group has found out, the their studies they carried out their studies on Zapotec children as well as English and Danish speaking children.

So, children when they are learning the language, first language. So, depending on what language they are speaking, so English acquizing, acquiring children, Danish language acquiring children and Zapotec language acquiring children. So, what they find out is that this is just one example, that I have taken from their studies.

So, 'containment' schema represented by 'in' in English and other many languages, we have the proposition 'in', that includes that basically takes us to the contain 'container' image schema. The moment we say I am in problem, basically means that I am considering myself being surrounded by or you know there is a boundary of problem around me. So, this is an abstract understanding.

Similarly, we can how 'I am in this room'. So, I am physically inside this room. So, the containment image schema is activated, the moment you use the word, the preposition 'in' in English. Any other languages that might differ, the grammaticality might differ, but the containment image schema is activated.

Now, when we say container, so there is a tea in the cup, water in the bottle and so on and so forth. There is a bias towards the canonical orientation of the container, this is very important. What it means is that in case of English and Danish, the container the thing that holds the other the actual object has an orientation that is canonical, canonical as in the usual orientation.

So, the straight orientation, the bottle is standing straight, the cup is straight and so on and so forth. This can also have a reverse orientation, like the upside down orientation. So, the cup can be upside down, the bottle can be upside down, the box can be upside down and so on and so forth.

But in case of English and Danish language, the containment image schema, container image schema represented by 'in' typically has a bias towards the canonical orientation of the container. What Sinha and his group found out is that, this is not the case with Zapotec children. In case of Zapotec children, because they are surrounded by, the material artifacts

in their culture are very different from the material artifacts in case of English and other such languages.

So, in Zapotec, the basket is a common, very commonly utilized item. So, the basket is used not only for putting things inside it in its canonical orientation, but it is also used to cover things. So, in both cases the 'container' image schema will be activated. So, not only when it is in canonical orientation, but also in the reverse orientation.

So, in this language therefore, the image schema has no bias towards the orientation. This is something that is very interesting, if you look at how schemas are, if in English language for example, when the container is in the reverse orientation, when it is upside down, inverted, it will have a very different schema it will be under.

So, you know 'the ball is under the cup', there are there are those games where you see the cats and dogs play, they typically cats, cats find out when the ball is under which of the glasses there are so many glasses that will be rearranged and arranged and so on and so forth. And so the in that case we will not say the ball is in the cup, we will say ball is under the cup, but in case of Zapotec in both cases, the same containment image schema will be utilized.

So, this is what we mean by socio cultural influence, the influence as Sinha calls it the influence of the material culture on the creation and utilization of image schema in various languages. So, that is yet another interesting angle towards understanding image schema and how it really works and what are the various angles of experience that might have a role to play in this.

Similarly, there is yet another domain which is computational modeling, that utilizes the understanding of image schema. So, conceptual structures emerge out of spatial perceptual analysis of bodily as well as environmental interaction, that we have already seen. So, because this is so fundamental, because of its the nature of the mechanism which is an abstraction that can be, that can be taken out of various experiences, this if you can model this it can be used to create a model for learning process.

So, as a keeping that as a fundamental premise, various researchers, researchers in various domains have tried to have utilized this and created various kinds of models, most notably

the neural theory of language project by a group of researchers, they have used what is called the execution schema or X-schema.

Similarly, the this X-schema has been later on extended by Srini Narayanan and his group, to model metaphorical reasoning about political economy. And similarly, of course, we have seen Regier's computational model, for categorizing spatial relationships in Russian and other languages, which we have seen before. So, computational modeling is yet another area, AI is yet another area, which uses the notion of image schema albeit in a slightly different way, but the fundamental understanding remains the same.

And then spatial schemata; we have actually the whole idea of schemata and image schema basically started out of spatial understanding, because we said that the objects in space and how they are related to each other and how they move in space and so on. So, the domain of understanding of spatial reasoning has been a very important domain to, towards creation of image schematic notions. So, let us move on to the spatial schemata notions of spatial schemata.

So, spatial representation refers to, what does it refer to? It refers to geometric properties of objects and the relationship between them, how one object looks, out of the orientations and you know, functions and then how are those things related to each other. This information about objects and their orientation and so on and so forth is arrived at through our senses through various senses. Primarily the modalities of vision, audition and haptic; haptic is touch. So, we see and then we hear, we will see it in detail a little while.

Now, even though, there is a modality specific source of information with regard to spatial information, but the representation has to be either amodal or it has to be you know kind of a connecting link between these various modalities and something that you know that takes is to take this representation to the execution level.

What we mean by execution level is that, we get the information about spatial schemata through our vision, through hearing, through touch and so on and so forth. And then there is an abstraction of that information into the mind and then that information is utilized for our behavioral output.

How? What kind of behavioral output? It starts with a very simple notion of moving around, until and unless we have figured out the layout of the room, we will be bumping

into objects. We never do that is of course, a different domain of study altogether, body schema, but this is what we mean. So, the schematic representation has to again be translatable to the behavioral output. So, this representation is translatable to the motor system. So, that we it can guide our behavior. So, this is the fundamental notion of spatial schemata.

So, spatial representation is, as a result of which, is considered one of the basic conceptual representation. We must understand we must have a map of schematic map of our environment, of the objects in the environment and so on and so forth to guide our movement around. So, this has been shown to be varying in terms of the biological entity's interaction with the environment and linguistic input. This is what we will see in slight detail now.

Because this is a very exciting area of research, that has been going on for some time now. So, the concept of space is, of course, as you all know is central to human cognition because it provides a framework for concrete thinking as well as abstract thinking. So, we have already been talking about this, that the understanding of space also colors our understanding of time and our understanding of various other things. So, not only is spatial understanding a framework for concrete cognition, but also about abstract notions.

So, humans are born with an inherent system, inherent system of spatial perception and processors. So, we have the senses as well as there are distinct neuronal networks that are the that are dedicated to this particular function.

So, touch gives us you know shape, textures like vision, motor system, also as all geared up. So, basically the on the one hand you have the senses: the vision, auditory and haptic and on the other hand, you have the motor system geared up to work in tandem with the information that is generated through the same.

Similarly, parts of the brain like the hippocampus is dedicated to spatial memory. So, the hippocampus is the domain in the brain that maintains a map of the environment, that is why, if we have been to one place and we have already created a map in our head and next time we do not have to learn it anew. So, there is already a mechanism in place.

Similarly, there are many other brain regions that are responsible for processing this information. So, basically it means that humans are born with the, with various tools so to

say, to understand and deal with, to maneuver, spatial information and negotiate the same for our life.

So, when it comes to language on the other hand. So, spatial cognition, spatial perception is on the one hand, language on the other hand. So, when we look at, we look at space, when we look at objects in space, we basically break it down, break it down into a figure and an object. And then the figure and the object moves in terms of the.

So, language a figure language selects one portion of a scene. So, basically we are talking about a figure in terms of a ground let us say. So, 'there is a car in front of the building'. So, the car becomes the figure which is the object of the sentence and then we understand it in terms of the larger object which is the 'ground'. But it may not be that, we may not sometimes also need the ground we can simply talk about the object as the figure and the figure moves from point a to point b. So, 'the car went from this building from my house to the market' and so on and so forth.

So, when we talk about, when we think about we use language to talk about space and spatial arrangements we basically break it down to certain smaller units and these are the units.

Now, bringing them together what we do is basically we have. So, we have the figures, we have the layout in our mind and then how we look at the layout is what we call the spatial conception in terms of human spatial conception. So, how we really look at the world? Fine, we have understood in terms of the 'figure' and the 'ground' and how we look at it in terms of image schemas, but is it all?

Appear turns out that it is not all, because there is something called a frame of reference. So, we create a frame, we kind of create coordinates in the environment, in the on different planes on the vertical and the horizontal plane and we divide the atmosphere into coordinates. And accordingly, create a language, accordingly create a framework in order to talk about talk about space and spatial arrangements.

So, one of the most commonly realized frame is what we call 'relative' frame. So, let us start our journey with relative frame. So, what happens in relative frame is that, the horizontal plane is divided into front, back, left right, halves. So, importing the ego's body axes. So, the ego the person who is speaking,, right now I am speaking so I am the ego in

this case. So, in my, dependent on my orientation the way I am you know located in space depend taking that as a cue.

Now, I have I can divide the horizontal axes into front back, left right and so on and then talk about them in terms of, in front of him, behind him and so on and so forth. So, the chair is in front of me, the screen is behind me and so on and so forth. So, this is what it means, this consequence of the system of horizontal direction is that it changes according to the ego's position and orientation.

So, we are talking about various systems, various frames of reference in terms of a space, spatial arrangement. One of this frame is called the 'relative frame of reference', what happens in relative frame of reference is that it is relative to the ego.

So, the person who is speaking, so depending on who is speaking, we kind of you know create coordinates on the on the surroundings, on the environment and have a, basically we divided into front and back and left and right and top and down and so on and so forth. And then in linguistic terms, we talk about x is in front of me, x is behind me, x is to my right, to my left and so on and so forth.

So, the moment it becomes relative to the egos position it will change depending on the ego. So, if when I am speaking something is in front of me, if but then if the speaker changes another person is talking about the same object it might be described in a very different terms. So, this is what we mean by relative system. Relative system terminologies differ in terms of the change of the position of the speaker.

So, if the speaker changes or even the simply the orientation of the speaker changes. So, right now I am facing this side, if I face this side what is in front of me now will become to my left. So, this is what we mean by the speakers position and orientation will change the entire understanding.

So, this is a 'viewer centric' frame, because the viewer is the at the core of it. So, objects are represented in a retino-centric, head centric and body centric coordinate system that is something we have already talked about. They basically mean the same thing. So, the head and the body and the retina. So, the way we are looking. So, something that is in front of my eyes is in front of me, simply.

Now, this seems very very common sensical yes, that is how we all talk about it, but it turns out that is not all about it. There are languages in the world which do not use this kind of a coordinate schema, coordinate system of , you know, spatial arrangement to talk about objects. There are languages which use what we call an 'absolutive' system, absolute system.

Absolute system is when the orientation and the location of objects depend on some fixed coordinates, something like north, south, east and west, the cardinal directions that we use in case of English language. So, we so what is north will always remain north no matter where I am, even if somebody else is talking about it sitting on that in that corner of the room, it will still remain to the north.

So, the Kashmir is to the north of India, Kanyakumari is in the south of in the south of India that remains irrespective of wherever we are, sitting in India and talking about Kashmir or Kanyakumari. So, this is call what is called 'absolutive' system. Typically, most languages of the world use this absolutive system to talk about a large geographical area, large, like we are talking about a map and something like this or even a smaller scale, but still maps. So, you know West Bengal is to the west of Assam and so on and so forth.

However, there are languages in the world which uses a cardinal direction system, which is absolutive system to talk about even small things. Like just now I say that the 'chair is in front of me', 'the screen is behind me', those languages will not use in front of or behind or left or right, they will still use a north, south sort of a direction. They have different coordinates, but it is similar to north, south because they depend on the cardinal directions.

So, this is as a result an environment centric frame. So, relative frame is a ego centric frame, the speaker centric frame, but in this case it is environment-centered frame. As a result of which objects are represented with respect to salient features of the environment. It can be different from one language to another, sometimes it can be some landmark, sometimes it can be gravity, sometimes some kind of a mountain or a river or something from there from where the coordinates are derived. As a result of which, the position of the objects in space will not change depending on the ego's position.

So, something like this will be a common way of talking in these language. So, the toy is to the north of the bed, we do not talk about, we can say toy is to the you know to the right of the bed or to the left of the bed or on top of the bed or so on. But they will say these

languages will use north, south, east, west to denote the location, spatial location of objects using the this kind of a cardinal system.

And that is where the schemata differs. The primary image schema with respect to space is different in these two frames of reference. They are actually they are called FoR, this is how it is written frame of reference, F for frame o for of and reference. There is a third kind of frame of reference as well, which is called intrinsic. Now, intrinsic frame of reference locates the 'figure' with respect to 'ground'.

Now this is an 'object centered' frame. So, objects are coded with respect to their intrinsic axes. So, the ground, that is the bigger object with respect to which the figure is located, the ground will be given a kind of a coordinate system as if the ground itself has uh some kind of an axes, which of course, is derived from the ego's axes. So, the foot of the bed is always down and the top of the you know 'head of the tree' is always up.

So, basically importing the or let us say the transporting the egos axes on to the object and thereby giving it as if it has its intrinsic orientation and so on and then divide deciding the location of the 'figure' with respect to that ground. So, this is called intrinsic, intrinsic frame of reference is also utilized sometimes in all languages, in English or other languages as well as in smaller languages.

Now, why are we even talking about it? It is fine, I mean the most of the languages use a relative frame of reference, most of the worlds languages use the ego as the starting point for locating objects in space and so on and so forth. So, and some languages do not. But then, why is it important? Why is it important to know that a particular language divides the you know creates a different axes on the basis of which the spatial schemata is created and talked about; is it really important? And, if so, how?

So, their underlying computation is what is of interest for us, various source of input and their various outputs, point towards 'inner language' of spatial conception. So, basically in terms of the frame of reference that we are using we are basically taken to a very different 'inner language'. So, in case of intrinsic cognitive system parses objects into their major parts.

So, when you are using an intrinsic system, you are talking about so the 'bird is sitting at the on the head of the tree'. So, we are basically parsing the tree into different parts. So, it

has a head, it has foots and so on and so forth. It may depend on the oriented template or the functional criteria.

So, the face of a building, you know the 'building was defaced' meaning that a building has a face the front of a building. Which is the front of a building? typically the side of the building where the entry gate is. So, this is what we mean by functional criteria. So, an object having an you know taking up an axes, taking up its own coordinates dependent on various kinds of criteria. Either oriented template like a tree or the a building having a face and so on.

So, this is how we parse the object. In the relative frame of reference, we lift the axes from the self and then rotate and apply to other objects. An absolute, but our most important, most interesting frame of reference is the absolute system, because what happens in this particular frame of reference is that the speaker must know at all times and all locations where the fixed bearings are.

For many of us, to locate you know what is to the north of this building, will take a few moments, it can actually be a spectrum for me it might take more than moments, for some people it might be quicker. But we will take some time to really figure out what lies to the north of this building, sitting inside the room. But if you are using a system an absolutive frame of reference, one has to be, the speakers of those languages have to be at all times aware of those fixed coordinates as to where your north and where your south and where your east and so on and so forth exist, at all given point of time.

As a result of which the speakers run a mental compass all the time, all the time they are running a mental compass and a constant background computation is going on.

So, how do we know that? There are many studies that have been carried out on these languages, one of them is Balinese, which has this kind of a coordinate system, they have four ways of directions, which remains constant which is utilized for denoting spatial location to objects even at a smaller scale.

So, like the objects on this table will be will be talked about in terms of this kind of 4 major orientation. So, the this orientation is derived from a central mountain, which is considered sacred, so depending on that mountain's location, everything else is. So, direction of the

mountain, direction of the sea and then of course the sun and then opposite. So, like this these are the 4, these are the coordinates in this language.

So, what happens is that, these are space games utilized by the Nijmegen MPI Nijmegen group where they talk about. So, this is a English description, there is a scene, where they have to describe the scene. The description in English would be like this, but in Bali in this language Balinese language, this is how it will be described. One man is [kauh] and the other is on [kangin] and so whatever and this is how it goes on.

So, basically it is something like north, south. So, he is one two men are standing side by side rather than saying that, because side by side has no meaning when you are using a you fixed coordinate. So, one has to be on the north, one has to be on the south and so on. And then one who is on the north is looking towards yet another direction, right, and each holding a stick.

So, like this the other one is looking on the opposite side, you see this is how it goes. Even on a small scale a person standing, two people standing next to each other and holding a stick in each of their hands, looking on the opposite direction can will be described using this kind of a coordinate. So, this is what we mean being constantly aware of the coordinates all the time.

Similarly, this is yet another language which also uses a roughly translatable to north, south, east, west coordinate, with respect to the absolutive system.

This is how a sentence in that language looks like. So, ‘I left my mother in the east’, inside the ‘building to the north’, ‘send him from the east’, of course, it might not mean much to us, but the speakers and hearers of that language perfectly understand what the meaning in this case is.

So, what we have seen in this case in absolutive frame of reference is that it creates a very different spatial schemata to understand the coordinates, to understand to give voice to the to the coordinates in space and with respect to which the objects, the location as well as movement is are understood and which is very different. And because of this difference, we already we can derive the and understanding that there is a constant computation on that is running in the mind of these people.

Now, the implications for this is that, they are expected to know the cardinal directions at all point with respect to, in all positions of the ego. Now, even though the directions do not change with respect to the ego, in as in relative frame of reference. Remember in relative frame of reference, we will be having the front, back, left, right will change if the egos position and the position changes, but in this case the ego may move around, but the coordinates remain the same.

So, now the ego has to position himself with respect to the coordinate, rather than the other way around. So, this is what makes it very tricky affair and the best part of the story is that there have been many studies carried out on these groups, you know, many many experiments and they have been always able to dead reckon the location of objects in a in a with very very less error rate, very very less error rate.

So, in all positions they have taken, the you know researchers have taken them in circles, in the forest and left them somewhere and then asked where x is, they have been able to tell.

Similarly, many other such experiments have been carried out and a constant mental computation has been found to be giving out very less error rate. So, basically it means that they are somehow, so because of this kind of a frame of reference existing in this language, because of which they can probably have a much finer understanding, much finer computational capacity, with respect to locating objects in space, with respect to the coordinates.

And this is something very interesting because it might actually help us understand as to how this kind of computation really takes place.

So, there are many studies that have been going on, this is one such famous study where, so the study was like this. First they the subjects were facing north and they were taken to a room and there were these two tables, right and then this is how the objects are there this object on the left and this is on the right. The subject is facing like this way now, they see these objects and on a table and then they are taken out of the room and taken to yet another room.

Now, the crucial manipulation here is that, the room on this side, when they are coming into this room the tables are on this part of the room as a result of which, now when the

subject comes into this room and faces the table, he is actually facing south. So, in the previous room he was facing north, this room he is facing south and then they were asked to pick up that table which has the same arrangement of the objects they saw in the previous room.

So, in the previous room they saw this table, where the black object was on to the left of the white object, that is for us if we speak in English. So, if we come back to this room and then, now we face these two these two tables; for us this is the table that represents the previous table, that matches with the previous table. But for these people they will always pick up this particular table in terms of, if you ask them which is the table they saw before.

So, this is the table they will pick up. Why? Because this depends on the absolute 'absolutive frame of reference' because this object, the location of this object vis a vis this object does not change even if the ego has changed its position, as well as orientation. Remember here he was looking at this way, here he is looking at this way. However, it will change only if you are deriving the location of the object with respect to yourself, the ego, the viewer, but that is not happening in this particular case.

So, all the absolutive speakers have always gone for this solution rather than this solution. This will be the solution picked up by a speaker of an English language for example, or a Hindi or you know many of these languages. However, this is what it means, this is what how experimentally we researchers have been able to show what it actually means to have an absolutive frame of reference. So, this table is the same as this table, because they are, in terms of the cardinal directions, their position has not changed.

Similarly, similar mechanism has been utilized, similar logic has been also utilized to check the absolutive frame of reference, people doing carrying out non linguistic tasks. So, here they are not using language at all, they are not using the terms for those spatial arrangements. They are simply carrying out a task that requires them to understand, identify and accordingly place objects in space and this is where we see the relationship of the spatial language on the spatial cognition.

So, there is a lot of study, there has been a lot of study still going on, as to whether language the language actually shapes the cognition in this particular domain. So, does your spatial language change your spatial cognition or not. But so far we know that there is a there is a connection because this language uses absolutive terms to locate objects in space and

this is visible in also the way they actually understand those objects, even when language is not utilized.

So, basically what is the take home lesson from this the study is that, the system of thinking about space is against that hypothesis that universally all spatial conception is based on co-ordinates based on the human body. So, our so this basically cancels or let us say, it rejects the idea that all spatial conception, all spatial schemata is body based. It is not always body based, in fact there are various kinds of other-centric coordinates that are also there which are perfectly usable and they are used in spatial cognition.

So, the computing device does not alone determine the cognitive architecture, which means that linguistic diversity aligns with cognitive diversity. Because there is a diversity in terms of how you talk about space, how you talk about objects in space, you are also thinking of them differently.

So, probably there are different co-ordinates, probably there are different ways of creating that schemata in terms of in terms of image schema as far as space is concerned. So, spatial tasks have, results from spatial tasks, have shown us this particular aspect of the schemata with respect to spatial cognition.

So, this is what we had in terms of image schema, image schema the description, the analysis and its usage in various domains of research and so on. So, here we also have some supplementary material, these are the image schemas because all the schemas were not discussed in detail before, but the this is the list that Johnson gives in his book a large number of schemas.

And then these are some examples of how the schema is actually represented in a schematic so to say schematic way, this is how it is represented. So, this is the path schema, in-out schema, this is the landmark from which something is going out, so the trajectory, trajector is moving out of the landmark, so this is in and this is out. And this is of course, the container schema, interior this object is inside so, x this is in the container. So, there is an interior, there is an exterior and there is a boundary and so on. So, this is how schemas are represented in literature.

And these are the references.

Thank you.