Unit 9   Structured Knowledge Representation – II: Strong Slot – and – Filler Structures

Structure:

9.1 Introduction

In the last unit we have discussed concepts like semantic networks, partitioned semantic networks and frames. In this unit we shall discuss Conceptual Dependency and Scripts.

Objectives:

After studying this unit, you should be able to:

- explain Conceptual Dependency (CD)
- list advantages and disadvantages of CD
- define script and list the advantages and disadvantages of scripts
- name and explain different components of a script.

9.2 Conceptual Dependency (CD)

Conceptual Dependency originally developed to represent knowledge acquired from natural language input. CD is a **content theory** of how to represent simple sentences. Since it was created by Roger Schank (1992), CD has gone through various incarnations - different sets of primitive actions, different types of states, and different theories of inference. We'll consider a cleaned-up, "canonical" CD theory which is fairly close to

Schank's original conception but includes a cleaned-up theory of states, relations, and inferences.

At its core, CD is a theory of how to represent sentences. It has two basic axioms:

- For any two sentences that are identical in meaning, regardless of language, there should be only one representation.
- Any information in a sentence that is implicit must be made explicit in the representation of the meaning of that sentence."

From these axioms, Schank built a theory based on a primary set of *conceptualizations*, which come in two kinds: *active* and *stative*.

- **ACTIONS: (Active Conceptualizations)**:
  An ACTION is performed by an ACTOR on some OBJECT with some DIRECTION.

- **STATES (Stative Conceptualizations)**:
  An OBJECT is in a STATE with some VALUE ***Note –*** OBJECT and VALUE are **not English** words - they are conceptual cases which sometimes have counterintuitive meanings (for example, "Amit owns a book." could be represented: (POSSESS (OBJECT AMIT) (VALUE BOOK))

Additionally, there are relationships between states, including *static links* which are used to define the meaning of sentences, and *causal links* which can be used to infer new CDs:

- **RELATIONSHIPS: (Static Links)**:
  A RELATIONSHIP is defined between a SOURCE CD and a TARGET CD.

- **CAUSAL LINK (CD Inferences)**:
  A CAUSAL LINK is defined between a SOURCE CD and a TARGET CD.

This breakdown does not precisely match original CD theory, but it explains the core concepts well enough for our purposes. Now, on to defining actual CDs…

Advantages of CD:
The advantages of Conceptual Dependency (CD) are:
- Using these primitives involves fewer inference rules.

- Many inference rules are already represented in CD structure.
- The holes in the initial structure help to focus on the points still to be established.

Disadvantages of CD:
The disadvantages of Conceptual Dependency (CD) are:
- Knowledge must be decomposed into fairly low level primitives.
- Impossible or difficult to find correct set of primitives.
- A lot of inference may still be required.

9.2.1 ACTIONS

In order to represent identical meanings in an identical way, CD theory breaks actions down in two fashions: a core set of *primitive acts* which define the basic types of actions that occur, and a set of *conceptual cases* that add meaning to the basic action types.

While the canonical list of primitive acts has changed as CD theory has evolved, the original core set was:
- **ATRANS, PTRANS, MTRANS**
  transfers (of posession, of physical objects, and of ideas)
- **MOVE, PROPEL, GRASP**
  movement of body parts, application of force, grasping of objects
- **INGEST, EXPEL**
  eating and anti-eating
- **ATTEND, SPEAK**
  sensory attention, verbal output
- **MBUILD**
  mental construction
- **DO**
  anything not covered by the primitive 11 actions

However, these actions mean almost nothing by themselves. They must be augmented by conceptual cases that define how each action is played out with respect to the actor, the object of the action, the direction of the action, and so on.
- **Action Core**
  ACTION ?action
  ACTOR ?person
  OBJECT ?anything

- **Direction of Action**
  FROM ?location
  TO ?location
- **Modifiers of Action**
  INSTRUMENT ?conceptualization
  TIME ?time

These are the "canonical" list of slots for an action; only MTRANS and MBUILD have different slots (an MOBJECT rather than an OBJECT).

ATRANS

ATRANS refers to a transfer of possession - the abstract transfer of possession from one person to another, as in a *give* or a *buy*. No physical transfer need take place; the transfer occurs purely on the plane of ownership.

Example: "Amit gave his house to his son."
```
    (ATRANS (ACTOR  AMIT)
        (OBJECT HOUSE)
        (FROM   AMIT)
        (TO    SON)
        (TIME   PAST))
```

The primary state associated with ATRANS is POSSESS:
Example: "Amit's son has the house."
```
    (POSSESS (OBJECT HOUSE)
        (VALUE  SON))
```

(Technically, we could also specify a TIME for POSSESS, but we'll omit that for simplicity.)

PTRANS

PTRANS refers to a transfer of physical location - some objects moved from place to place, as in a *go* or a *move*. Ownership need not transfer; possession - the abstract transfer of possession from one person to another. No physical transfer need take place; the transfer occurs purely on the plane of ownership.
Example: "Vinay hands his wedding ring to the jeweler."
```
    (PTRANS (ACTOR  VINAY)
        (OBJECT WEDDING_RING)
```

```
            (FROM   VINAY)
            (TO     JEWELER)
            (TIME   PRESENT))
```

The primary state associated with PTRANS is AT-LOC.

Example: "The ring is at the jeweler's."

```
        (AT-LOC (OBJECT WEDDING_RING)
            (VALUE  JEWELER))
```

MTRANS

MTRANS refers to the transmission of an IDEA - some conceptualization is transmitted from one head to another (or within the same head). *Tell*, *forget* and *remember* can all be expressed with MTRANS. An idea is represented by an MOBJECT slot in CD, which is superficially like OBJECT except that it contains a whole concept as its value:

Example: "Vinay told Amit that his wedding ring was at the jeweler's."

```
        (MTRANS (ACTOR  VINAY)
            (MOBJECT (AT-LOC (OBJECT WEDDING_RING)
                        (VALUE  JEWELER)))
            (FROM   VINAY)
            (TO  AMIT)
            (TIME   PAST))
```

Frequently, we want to make a distinction between a person's memory (the LTM) and their central processor (CP) to allow us to discuss remembering and forgetting:

Example: "Amit forgot that Vinay's wedding ring was at the jeweler's."

```
        (MTRANS (ACTOR  AMIT)
            (MOBJECT (AT-LOC (OBJECT WEDDING_RING)
                        (VALUE  JEWELER)))
            (FROM   LTM)
            (TO     ?location)
            (TIME   PAST))
```

Example: "Vinay remembered that his wedding ring was at the jeweler's."

```
        (MTRANS (ACTOR  VINAY)
            (MOBJECT (AT-LOC (OBJECT WEDDING_RING)
                        (VALUE  JEWELER)))
            (FROM   LTM)
```

```
(TO    CP)
(TIME   PAST))
```

MOVE

MOVE refers to the movement of a body part, not the movement of an object. Normally MOVE is **instrumental** to some other action (such as a *kick* or a *throw*), but sometimes it is used by itself, as in *kiss*, *raise a hand*, and *scratch*.

Example: "Vinay raised his hand."

```
(MOVE (ACTOR  VINAY)
    (OBJECT HAND)
    (FROM   LOWERED)
    (TO     RAISED)
    (TIME   PAST))
```

The primary state associated with MOVE is POSITION.

Example: "Vinay's hand is raised."

```
(POSITION (OBJECT HAND)
        (VALUE  RAISED))
```

PROPEL

PROPEL refers to the application of force to an object. Normally PROPEL is **instrumental** to some other action, but sometimes it is used by itself. PROPEL verbs include *pushing*, *pulling*, *throwing* and *kicking*.

Example: "Vinay threw the ball."

```
(PROPEL (ACTOR  VINAY)
    (OBJECT BALL)
    (FROM   BOB)
    (TO  ?location)
    (TIME   PAST))
```

The primary state associated with PROPEL is AT-LOC; generally the PROPEL will also be associated with a PTRANS that allows us to deduce the location.

Example: "Vinay threw the ball to Geeta."

```
(PTRANS (ACTOR  VINAY)
    (OBJECT BALL)
    (FROM   VINAY)
    (TO     GEETA)
```

```
                    (TIME   PAST)
                    (INSTRUMENT (PROPEL (ACTOR  VINAY)
                                (OBJECT BALL)
                                (FROM  VINAY)
                                (TO  GEETA)
                                (TIME PAST)))
```

GRASP

GRASP refers to the gripping of some object by a person. Normally GRASP is **instrumental** to some other action, but sometimes it is used by itself. Note that FROM and TO in general have little meaning with respect to GRASP. GRASP verbs include *hold*, *grab*, *grasp* and *let go*.

Example: "Viany picked up the ball."

```
        (GRASP (ACTOR  VINAY)
            (OBJECT BALL))
            (TIME   PAST))
```

INGEST

INGEST refers to a person taking something inside his or her body: *eating*, *drinking*, *breathing*, etc.

Example: "Vinay ate an apple."

```
        (INGEST (ACTOR  VINAY)
            (OBJECT APPLE)
            (FROM   OUTSIDE-VINAY)
            (TO    INSIDE-VINAY)
            (TIME   PAST))
```

EXPEL

EXPEL refers to a person taking something outside his or her body: *spitting*, *crying*, *sweating*, etc.

Example: "Vinay spat out the seeds."

```
        (EXPEL  (ACTOR  VINAY)
            (OBJECT APPLESEEDS)
            (FROM   INSIDE-VINAY)
            (TO    OUTSIDE-VINAY)
            (TIME   PAST))
```

ATTEND

ATTEND refers to a person attending or focusing a sense organ towards a stimulus - *look*, *listen*, *feel*, and so on.

Example: "Monika saw Amit.''
    (ATTEND (ACTOR MONIKA)
        (OBJECT EYE)
        (FROM   ?location)
        (TO   AMIT)
        (TIME PAST))

SPEAK

SPEAK is an instrumental action that refers to the production of sound: *say*, *play music*, *scream*, and so on.

Example: "Monika screamed.''
    (SPEAK (ACTOR MONIKA)
        (OBJECT SCREAM)
        (TIME PAST))

MBUILD

MBUILD refers to the construction of a mental concept: *realize*, *decide*, *imagine*, *conclude*, etc. MBUILD frequently uses ATTEND as an instrumental action.

Example: "Monika saw Amit and realized he was in New Delhi.''
    (MBUILD (ACTOR MONIKA)
        (MOBJECT (AT-LOC (OBJECT AMIT)
              (VALUE ND)))
        (FROM ?no-location)
        (TO   CP)
        (INSTRUMENT (ATTEND (ACTOR MONIKA)
              (OBJECT EYE)
              (FROM   ?past-location)
              (TO   AMIT)
              (TIME   PAST)))
        (TIME   PAST))

DO

DO catches all the things that the first 11 primitive actions don't. It's also useful when we know something happened, but we don't precisely know what or how:

*Example: "*Amit fertilized the plants.''

```
(DO (ACTOR AMIT)
    (OBJECT FERTILIZER)
    (FROM   ?location)
    (TO     PLANTS))
```

Self Assessment Questions

1. Conceptual Dependency (CD) is a content theory of how to represent simple sentences and was created by _____.
2. _____ refers to a transfer of possession - the abstract transfer of possession from one person to another, as in a give or a buy.
3. _____ frequently uses _____ as an instrumental action.
4. What refers to the application of force to an object?

   _____

9.2.2 STATES

There is no set of "core states'' in CD; states are an **open set** that can be continually added to. States share a common format, however: an OBJECT is in a STATE with some VALUE. Many states, such as HEALTH, have VALUES that range from -10 to 10; other states, such as AT-LOC, have discrete VALUES such as ATLANTA and NEW_DELHI.

- **State Definition**
  STATE ?state
  OBJECT ?object
  VALUE ?anything

Some prominent states include:

- HEALTH:
  the physical well-being (or lack thereof) of a person, from perfect fitness (+10) to death (-10).
  *Example: "*Monika is alive.''

  ```
  (HEALTH (OBJECT MONIKA)
          (VALUE  +10))
  ```

- MENTAL-STATE
  the mental status of a person, from alert (+10) to unconscious (-10)
  *Example: "*Amit is unconscious.''
  >   (MENTAL-STATE (OBJECT AMIT)
  >   (VALUE -10))
- EMOTIONAL-STATE:
  the emotional well-being (or lack thereof) of a person, from ecstatic (+10) to suicidal (-10):
  Example: "AMIT is depressed.''
  >   (EMOTIONAL-STATE (OBJECT AMIT)
  >   (VALUE -5))
- AT-LOC
  the physical location of an object.
  Example: "Amit is in New Delhi.''
  >   (AT-LOC (OBJECT AMIT)
  >   (VALUE NEW_DELHI))
- POSSESS
  the state of ownership of an object.
  Example: "Amit owns the book.''
  >   (POSSESS (OBJECT BOOK)
  >   (VALUE AMIT))
- CONTROL
  the state of control of an object.
  Example: "Mr. Amit has the conn.''
  >   (CONTROL (OBJECT ENTERPRISE)
  >   (VALUE AMIT))
- FUNCTIONALITY
  the physical status of some device
  Example: "Voyager has been destroyed.''
  >   (FUNCTIONALITY (OBJECT VOYAGER)
  >   (VALUE -10))
- KNOWS
  whether some person has a concept in LTM
  Example: "Bo knows nonlinear dynamics.''
  >   (KNOWS (OBJECT BO)
  >   (VALUE NONLINEAR-DYNAMICS))

There are many other possible states; to represent a given sentence, we may need to invent a new state that captures the meaning. And many of these states would not be acceptable in a more detailed representation; when building an actual system, most designers go far beyond the simple STATE-OBJECT-VALUE triples of CD.

9.2.3 RELATIONSHIPS

We will distinguish two kinds of static relationships in CD: *conceptual-level relations*, which are CD conceptualizations in their own right, and *case-level relations*, in which a CD is attached by a conceptual case to another CD.

There are two primary flavors of conceptual-level relations, CAUSE and BI-CAUSE:

- CAUSE
  One CD can be the "cause" of another. This is subtly different from the traditional causal inferences; the primary difference is that CAUSE is used to *define* the basic meaning of a sentence explicitly, while causal types can be used to *infer* meanings from a sentence, even if those meanings are not explicitly stated.
    Example: "Geeta said something that made Monika listen."
      (CAUSE
          (SOURCE (SPEAK (ACTOR GEETA)
                  (OBJECT WORDS)))
          (TARGET (ATTEND (ACTOR MONIKA)
                  (OBJECT EAR)
                  (FROM   ?location)
                  (TO   GEETA))))

- BI-CAUSE (sometimes written CAUSES)
  Two CDs can "mutually cause" each other. Verbs like "bought" and "sold" are prime examples of this; they are defined in terms of *two* primitive acts that occur more or less simultaneously
    Example: "Amit bought a book from Monika."
      (BI-CAUSE
          (SOURCE (ATRANS (ACTOR MONIKA)
                  (OBJECT BOOK)
                  (FROM   MONIKA)
                  (TO   AMIT)

```
                          (TIME  PAST)))
             (TARGET (ATRANS (ACTOR  AMIT)
                        (OBJECT MONEY)
                        (FROM   AMIT)
                        (TO     MONIKA)
                        (TIME  PAST))))
```

There are two primary kinds of conceptual case relationships in CD, INSTRUMENT and MOBJECT:

- INSTRUMENT

  A CD can be instrumental to performing another state.

  Example: "Vinay threw the ball to Geeta."
```
    (PTRANS (ACTOR  VINAY)
         (OBJECT BALL)
         (FROM   VINAY)
         (TO     GEETA)
         (TIME   PAST)
         (INSTRUMENT (PROPEL (ACTOR  VINAY)
                        (OBJECT BALL)
                        (FROM   VINAY)
                        (TO     GEETA)
                        (TIME   PAST)))
```

- MOBJECT

  A CD can be a mental object of an MBUILD or MTRANS

  Example: "Monika saw Amit and realized he was in New Delhi."
```
    (MBUILD (ACTOR MONIKA)
         (MOBJECT (AT-LOC (OBJECT AMIT)
                   (VALUE  ND)))
         (FROM ?no-location)
         (TO   CP)
         (INSTRUMENT (ATTEND (ACTOR  MONIKA)
                        (OBJECT EYE)
                        (FROM   ?past-location)
                        (TO     AMIT)
                        (TIME   PAST)))
         (TIME   PAST))
```

9.2.4 CAUSAL RELATIONS

Unlike relationships, which are required to define the meaning of certain sentences but don't tell us much more about an action, a *causal type* allows us to infer certain things about existing sentences. (A causal type can also be used to define the meaning of a sentence, as we'll just see.) There are four primary types of causal relations:

- ENABLES
  A STATE can ENABLE a particular ACTION. For example, the state of an ACTOR being AT-LOC a particular LOCATION will ENABLE the ACTOR to PTRANS FROM that LOCATION:
  (RESULT (SOURCE (AT-LOC (OBJECT ?actor)
  　　　　　(VALUE ?location)))
  　(TARGET (PTRANS (OBJECT ?actor)
  　　　　　(OBJECT ?actor)
  　　　　　(FROM   ?location)
  　　　　　(TO   ?unknown))))

- RESULTS
  In turn, an ACTION can RESULT in a STATE. For example, an ACTOR PTRANSing TO some LOCATION will RESULT in the ACTOR being AT-LOC the LOCATION.
  (RESULT (TARGET (PTRANS (OBJECT ?actor)
  　　　　　(OBJECT ?actor)
  　　　　　(FROM   ?dont-care)
  　　　　　(TO   ?location)))
  　(SOURCE (AT-LOC (OBJECT ?actor)
  　　　　　(VALUE ?location))))

- INITIATES

  Whenever an event occurs or a state changes, an actor may become aware of it, and hence begin to think about it. This is an INITIATION causation.
  Example: "When Amit came to New Delhi, Monika realized he was there."
  　(INITIATES (SOURCE (PTRANS (ACTOR AMIT)
  　　　　　　(OBJECT AMIT)
  　　　　　　(FROM ?location)
  　　　　　　(TO ND)))

```
(TARGET (MBUILD (ACTOR MONIKA)
                (MOBJECT (AT-LOC (OBJECT AMIT)
                                 (VALUE  ND)))
                (FROM ?no-location)
                (TO  CP))))
```

Note: This example is subtly different from our earlier example where Mary saw John; here we don't have that information, but we can still build the relationship.

- REASON
  Whenever a thought occurs to an agent, an actor may act upon it. This is a REASON causation.

  Example: "When Monika realized Amit had come to New Delhi, she screamed.''

```
(REASON (SOURCE (MBUILD (ACTOR MONIKA)
                        (MOBJECT (AT-LOC (OBJECT AMIT)
                                         (VALUE  ND)))
                        (FROM ?no-location)
                        (TO  CP))))
        (TARGET (SPEAK  (ACTOR MONIKA)
                        (OBJECT SCREAM))))
```

Here Mary's mental realization prompts a perfectly reasonable physical action.

9.2.5 Conceptual tenses
The use of tense and mood in describing events is extremely important and schank introduced the following modifiers:

p   -- past

f   -- future

t   -- transition

$\mathbf{t_s}$ - start transition

$\mathbf{t_f}$ -- finished transition

k   -- continuing

?   -- interrogative

/   -- negative

delta	-- timeless

c	-- conditional

The absence of any modifier implies the *present tense*.

Self Assessment Questions

5. _____ and _____ are two primary flavors of conceptual-level relations.
6. What are the two primary kinds of conceptual case relationships in CD?
   _____
7. Whenever a thought occurs to an agent, an actor may act upon it. What is this called?

   _____

9.3 Scripts

A *script* is a structure that prescribes a set of circumstances which could be expected to follow on from one another. It is similar to a thought sequence or a chain of situations which could be anticipated. It could be considered to consist of a number of slots or frames but with more specialized roles.

Scripts were developed in the early AI work by Roger Schank, Robert P. Abelson and their research group, and are a method of representing procedural knowledge. They are very much like frames, except that the values that fill the slots must be ordered.

Understanding natural language often requires knowledge of typical sequences:

John went to a restaurant.

He ordered a big steak.

He had forgotten his wallet.

He had to wash dishes.

The sequence of sentences mentions only the parts of the story that are "different" from what might otherwise be expected. Understanding such a sequence requires knowledge of a "restaurant script" that specifies typical sequences of actions involved in going to a restaurant.

In contrast to the relatively static slots of a Frame, a Script may have a directed graph of events composing the script.

Thus Scripts is:
- collection of slots
- active type information

Advantages
The advantages of Script are:
- Scripts can predict events and answer questions
- Provide means for detecting unusual events
- A single coherent interpretation may be built up from a collection of observations.

Disadvantages
The disadvantages of Script are:
- Less general than frames.
- May not be suitable to represent all kinds of knowledge.
- Ad hoc
- Scripts either only account for details in a restricted domain so they are not interesting or they apply everywhere which is not likely.

Why are Scripts beneficial?
Scripts are beneficial because:
- Events tend to occur in known runs or patterns.
- Causal relationships between events exist.
- Entry conditions exist which allow an event to take place
- Prerequisites exist upon events taking place. *E.g.* when a student progresses through a degree scheme or when a purchaser buys a house.

Components of Script
The components of a script include:

Entry Conditions – these must be satisfied before events in the script can occur.

Results – Conditions that will be true after events in script occur.

Props – Slots representing objects involved in events.

Roles – Persons involved in the events.

Track – Variations on the script. Different tracks may share components of the same   script.

Scenes – The sequence of *events* that occur. *Events* are represented in *conceptual dependency* form.

Example of Script

Scripts are useful in describing certain situations such as robbing a bank. This might involve:

- Getting a gun.
- Hold up a bank.
- Escape with the money.

Here the *Props* might be

- Gun, *G.*
- Loot, *L.*
- Bag, *B*
- Get away car, *C.*

The *Roles* might be:

- Robber, *S.*
- Cashier, *M.*
- Bank Manager, *O.*
- Policeman, *P.*

The *Entry Conditions* might be:

- *S* is poor.
- *S* is destitute.

The *Results* might be:

- *S* has more money.
- *O* is angry.
- *M* is in a state of shock.
- *P* is shot.

There are 3 scenes: obtaining the gun, robbing the bank and the getaway.

The full Script could be described in figure 9.1.

Script: ROBBERY	Track: Successful Snatch
Props:	*Roles:*
G = Gun,	R = Robber,
L = Loot,	M = Cashier,
B = Bag,	O = Bank Manager,
C = Get away car.	P = Policeman.
Entry Conditions:	*Results:*
R is poor.	R has more money.
R is destitute.	O is angry.
	M is in a state of shock.
	P is shot.

Scene 1: Getting a Gun
> R PTRANS R into Gun Shop
> R MBUILD R choice of G
> R MTRANS choice
> R ATRANS buys G
> *(go to scene 2)*

Scene 2: Holding up the bank
> R PTRANS R into bank
> R ATTEND eyes M, O and P
> > R MOVE R to M position
> R GRASP G
> R MOVE G to point to M
> R MTRANS "Give me the money or ELSE" to M
> P MTRANS "Hold it Hands Up" to R
> R PROPEL shoots G
> P INGEST bullet from G
> M ATRANS L to M
> M ATRANS L puts in bag B
> M PTRANS exit
> O ATRANS raises the alarm
> *(go to scene 3)*

Scene 3: The getaway
> M PTRANS C

Figure 9.1: Simplified Bank Robbing Script

Some additional points to note on Scripts:

- If a particular script is to be applied it must be activated and the activating depends on its significance.
- If a topic is mentioned in passing then a pointer to that script could be held.
- If the topic is important then the script should be opened.
- The danger lies in having too many active scripts as much as one might have too many windows open on the screen or too many recursive calls in a program.
- Provided events follow a known trail we can use scripts to represent the actions involved and use them to answer detailed questions.
- Different trails may be allowed for different outcomes of Scripts (*e.g.* The bank robbery goes wrong).

Self Assessment Questions

8. A _____ is a structure that prescribes a set of circumstances which could be expected to follow on from one another.

9. Understanding natural language often requires knowledge of typical _____.

10. _____ are the sequence of *events* that occur.

9.4 Summary

In this unit we discussed the basics of conceptual dependency and scripts. Let's recap some of the important points covered in the unit:

- Conceptual Dependency originally developed to represent knowledge acquired from natural language input.
- A relationship is defined between a source CD and a target CD.
- ATRANS refers to a transfer of possession - the abstract transfer of possession from one person to another, as in a give or a buy.
- MOVE refers to the movement of a body part, not the movement of an object.
- There are two primary flavors of conceptual-level relations, CAUSE and BI-CAUSE.
- A script is a structure that prescribes a set of circumstances which could be expected to follow on from one another.

9.5 Terminal Questions

1. What are the advantages and disadvantages of CD?
2. Explain the following
   a) ATRANS
   b) PTRANS
   c) MTRANS
3. Write a note on causal relations
4. What do you mean by script? List advantages and disadvantages of scripts.
5. Why are scripts beneficial?
6. Name and explain different components of a script.

9.6 Answers

Self Assessment Questions

1. Roger Schank
2. ATRANS
3. MBUILD, ATTEND
4. PROPEL
5. CAUSE, BI-CAUSE
6. INSTRUMENT and MOBJECT:
7. REASON causation
8. script
9. sequences
10. Scenes

Terminal Questions

1. Advantage of CD: Using these primitives involves fewer inference rules. Disadvantage of CD: Knowledge must be decomposed into fairly low level primitives. (Refer section 9.2 for detail)

2. ATRANS refers to a transfer of possession - the abstract transfer of possession from one person to another, as in *a give or a buy.*
   PTRANS refers to a transfer of physical location - some objects moved from place to place, as in a *go* or a *move*.
   MTRANS refers to the transmission of an IDEA - some conceptualization is transmitted from one head to another (or within the same head).
    (Refer sub-sections 9.2.1 for detail)

3. Unlike relationships, which are required to define the meaning of certain sentences but don't tell us much more about an action, a *causal type* allows us to infer certain things about existing sentences. (Refer sub-section 9.2.4)

4. A script is a structure that prescribes a set of circumstances which could be expected to follow on from one another.(Refer section 9.3 for detail)

5. Scripts are beneficial because events tend to occur in known runs or patterns.
   (Refer section 9.3 for detail)

6. The components of a script include: Entry Conditions**,** Results etc.,
   (Refer section 9.3 for detail)