Chapter 4

Analogies and the Representation of Expert Domains

A model of the physical world

In the previous chapters we have presented a number of ideas without being very specific about the meaning of abstract concepts such as store. Our goal in defining the OWL notation is to make possible the construction of large systems. We want to provide conventions and make simplifying assumptions whenever possible in order to reduce the compexity of the system description. Of course, if we go too far, the resulting systems will not be able to represent important subtleties of the expert problem solving environment. On the other hand, if we attempt to include too many fine points, or leave too many decisions to the subsystem builder, we can expect that no subsystem will be successfully completed. It is with this in mind that we introduce the sylized OWL concept of the physical world.

In OWL we define the physical world to be made up of PHYSICAL-OBJECT's, each of which has PROPERTY's. TIME advances in the physical world, and over time PHYSICAL-OBJECT's come into existence or cease to exist; also, their properties change. Basically, a physical object is something made of matter, what Shank would call a "picture producer", we include air, and, as was mentioned earlier, a smell. The properties of physical objects fall into two classes; those which they have intrinsically, such as COLOR, and POSITION, PART, and CONSTRAIN, which they have with respect to other physical objects. A SCENE is a collection of physical objects and their properties. At any point in

time the physical world is completely described by listing all of the objects in it and their properties.

As we move from one point in time to the next most things in the physical world stay the same. This makes it highly desirable to describe a new state of the world in terms of the CHANGE from a previous state. It is not clear what the best terms are for expressing these CHANGE's. We could, of course, have only an operator which says that a certain property of a given object changed from one value to another. This approach, however, corresponds too closely to computer micro-code. The level of detail is too great to make it easy to store, retrieve, and manipulate such descriptions although it may be fine for executing them. Since it is primarily the predictive power of our model of the physical world which interests us, manipulation of the descriptions is much more important than execution. We will, therefore, seek a more aggregate description of each.

This need for prediction leads us to include the notion of AGENT of a CHANGE in our model. Even if we do not model the motivations of the AGENT, observed sequences of acts by the same AGENT give us predictive power. We will in fact allow some modeling of the agent's motivations and PURPOSE but this model will lie outside the physical world.

Analogies to the physical world

There are many concepts such as idea, plan, and family which will not appear in the physical world. We will allow additional concepts in OWL, but only if they are defined in terms of a world which is an analogy to the physical world. Shank and others have called attention to the fact that some verbs seem to have meaning on a physical, social, or mental level. The meanings are related by analogy. For example, we can say

He came to a tree.

He came from a good family.

He came to a conclusion.

By way of demonstration, we will construct three analogies to the physical world. In OWL we allow the user to define whatever additional analogy worlds he wishes. The most complete analogy to the physical world is one which involves primarily social concepts. The purpose of the model is understanding any AGENT which has a stimulus response type of behavior. We will call this the system world. The principal entities in the system world are shown in Fig. 4.1. It should be obvious that doctors, lawyers, business men, and programmers are concerned with this system world. The principal use of OWL will be the manipulation of the descriptions of systems.

As one can see in Fig. 4.1, there are many types of systems. Animals can create organizations by mutually agreeing to respond in certain ways. The concepts for describing this, such as responsibility, fall into the system world.

```
SOMETHING
        REACTIVE-COMPLEX
          DISEASE
          SYSTEM
                MACHINE
                GOAL-DIRECTED-SYSTEM
                  SEARCH-ORIENTED-COMPUTER-PROGRAM
                  EMOTIONAL-SYSTEM
                        SOCIAL-CLASS
                          WORKING-CLASS
                        MARKET
                        PERSON
                        ORGANIZATION
                          NATION
                          ENTERPRISE
                            STORE
                          DIVISION
                          FAMILY
                          CHURCH
                          POLITICAL-PARTY
                        INTERACTION
                          DISCUSSION
                            ARGUMENT
                            NEGOTIATION
                          COMPETITION
                            GAME
                            FIGHT
                                WAR
  SOMETHING
        SOCIAL-CONVENTION
                RESPONSIBILITY
                AUTHORITY
                OWNERSHIP
                CONTROL
                AGREEMENT
                  CONTRACT
                RULE
```

Fig. 4.1

Entities in the system world.

Properties of systems are shown in Fig. 4.2. Fig. 4.3 shows typical social locations. Corresponding to PART in the physical world, one can be PART of an organization. A kind of a PART is a MEMBER. An organization may have a TOP, a BOTTOM, and a HEAD.

The essence of this world is the recognition of systems and in particular organizations. Organizations establish the conventions of ownership, control, responsibility, authority. Organizations make rules and individuals make agreements. By having this model we can understand the organizational constraints placed on AGENT's, and the types of AGENT's which can be controlled.

```
(CHARACTERISTIC GOAL-DIRECTED-SYSTEM)
        (RELATIVE PERSON)
        (CUSTOMER ENTERPRISE)
        (SUPPLIER ENTERPRISE)
        (POSITION SOCIAL-CONVENTION (AT EMOTIONAL-SYSTEM))
        (SOCIAL-POSITION PERSON SOCIAL-LOCATION)
        (NOMINAL-CHARACTERISTIC GOAL-DIRECTED-SYSTEM)
                (BUSINESS ENTERPRISE)
                (OCCUPATION PERSON)
                (ORDINAL-CHARACTERISTIC GOAL-DIRECTED-SYSTEM)
                        (ORGANIZATION-SIZE ORGANIZATION)
                        (SUCCESS GOAL-DIRECTED-SYSTEM)
```

Fig. 4.2

Properties of Systems

```
SOCIAL-LOCATION
        (ON TRIAL)
        (UNDER INVESTIGATION)
        (IN SURGERY)
        (ON SOCIAL-SCENE)
        (IN ORGANIZATION)
        (IN SOCIAL-CLASS)
        (LOCATION-RELATION HOME)
        (LOCATION-RELATION WORK)
        (ON THE-SPOT)
        (IN TROUBLE)
```

Fig. 4.3

Social locations

Plans and Actions

We have modeled the physical world where directly observable changes take place. In order to better predict these changes we have introduced the notion of AGENT. In the world of systems we can describe all possible agents, and the organizational constraints placed upon them. In order to better predict how these agents will act, we need the notion that some of these agents, namely animals and organizations, carry out actions in accordance with plans. Entities in the world of plans and actions are shown in Fig. 4.4. Animals and origanizations have plans which are made up of goals as explained in Chapter 2. A goal can be any action, but there are some actions which make sense only

```
SOMETHING
     PLAN
      INTENTION
      ALTERNATIVE
     GOAL
      (MAINTAIN CONDITION)
      (INSURE EVENT)
      (LIMIT QUANTITY)
      (TRICK GOAL-DIRECTED-SYSTEM)
     MISTAKE
       TROUBLE
       RESOURCE
        INFORMATION
     ACTION
```

Fig. 4.4

Entities in the world of plans and actions

in the context of plans. Using resources, agents take actions. These are either in accordance with plans or they are mistakes. Characteristics of these entities are shown in Fig. 4.5. The position of a plan is given by its degree of completion.

We will call our final model the mental world. The principal entities in the mental world are shown in Fig. 4.6 Characteristics of mental entities are shown in Fig. 4.7. It is in the mental world that the plans are formulated.

These four models give a surprisingly complete model of the world. To see this we must describe the activities which take place in each model.

```
SOMETHING
      (DEGREE-OF-COMPLETION PLAN)
      (PURPOSE PLAN)
      (RESULT ACTION)
      (NECESSITY ACTION)
      (DIFFICULTY ACTION)
      (COMPLEXITY ACTION)
      (PROBABILTY RESULT)
      (READINESS RESOURCE)
```

Fig. 4.5

Characteristics in the world of plans and actions

```
something
      mental-entity
      situation
      problem
      question
      answer
      suggestion
      offer
      order
      concept
      fact
      idea
      decision
      choice
      reason
      view
        opinion
      view-point
      frame-of-reference
      mind
      attention
      thinker
```

Fig. 4.6

Entities in the mental world

```
(WISDOM THINKER)
(KNOWLEDGE THINKER)
(BELIEF THINKER)
(DOUBT THINKER)
(ASSUMPTION THINKER)
(SUPPOSITION THINKER)
(CONCLUSION THINKER)
(NAME SOMETHING)
(POSITION MENTAL-ENIETY MENTAL-LOCATION)
(INTELLIGENCE THINKER)

MENTAL-LOCATION
   (IN MIND)
      (IN (PART MIND))
   (ON TONGUE)
   (ON (TIP TONGUE))
   (IN HEAD)
   (ON SOLID-SURFACE)
```

Fig. 4.7

Characteristics in the mental world

Simple activities in the physical world

As we have defined it, all activities in the physical world must ultimately be definable in terms of the creation and destruction of physical-objects or a change in their properties. Thus, it would seem that the only three activites; create, change, and destroy would be needed. The use of a small number of basic activites is in fact recommended by Shank, who claims there are only six needed for the physical world: MOVE, INGEST, PTRANS, PROPEL, GRASP, and EXPEL. Discussing an example in the mental world he states "What is important here is that we need only this one inference rule for MTRANS in order to answer such a question regardless of how the information was MTRANSed. Thus, if Mary had "read" X rather than being 'told' it, we would still have MTRANS and thus would require no new rules. Since there are thousands of verbs and only fourteen ACTs for which inference rules need be written, this amounts to a tremendous saving and is probably quite a bit more like the way people operate."

Our notion in OWL that inference is often made by matching what would be at the basic level a complex pattern of highly specialized facts, does not fit with Shank's view. Inference rules for a single ACT would only be able to distinguish the highly specialized facts if the conceptual data structure were very extensive, thus making the rules very difficult to write. In Shank's notation the sentence "The fox tricked the duck". would be broken down into many sub-actions. Answering the question "Is the fox reliable." the system would have to recognize these subactions as an instance of trickery and say no.

A further difficulty with Shank's approach is that it makes it harder to use different representations of the same situation in different problem solving tasks. This has been quite useful, however, in problem solving programs.

While we dislike Shank's scheme we hesitate to give up the ability to classify actions in terms of what are frequently their most important properties. In order to base OWL on English, we employ what Miller calls the menthod of incomplete definitions. Suppose we want to express a change of position with CHANGE. We might say

John changed the position of the chair from in front of the table to near the window.

To focus only on the new position we can replace changed the position of with put.

John put the chair near the window.

Note that what happens here is similar to buy-sell-pay. The DESTINATION of (CHANGE POSITION) is the SPECIFIC-LOCATION of PUT, the OBJECT of POSITION is the OBJECT of PUT, and PUT does not take a case corresponding to the SOURCE of (CHANGE POSITION). Next, suppose we don't even want to mention the new position, only that a new position has been given. We can replace PUT with POSITION.

John positioned the chair.

If we add near the window to this sentence it will not indicate whether the chair was there before or not. It gives the POSITION of the act not the SPECIFIC-POSITION. Note that POSITION has a connotation of precision which is missing from PUT. Thus PUT is an incomplete definition of POSITION. Just as it is useful to know that a dog is an animal, it is useful to know that put is a change of position. By substituting this heirarchy for Shank's primitive ACT's we can make deductions with the simple verbs when that is appropriate and still retain the overtones of a word like POSITION.

As Charniak has observed, the answer to the question

Where is Spot?

can be

At the window.

or

With Bob.

or

Bob has him.

but not

At Bob.

When the position of an object is given as a person, the question immediately arises as to whether the person controls it. The default assumption is that he does. The verb give lets us make this specific.

I put the chair in Bob's control.

I gave the chair to Bob.

I put my dog in Bob's care.

I gave Bob my dog to care for.

The DESTINATION of give is AGENT of control. (Remember there is no ownership in the physical world.)

If we want to concentrate on the original position, we use GET. Here the problem of control arises in a different form.

Same took the chair from Bob.

Sam got the chair from Bob.

Note that take does not imply that Bob gave the chair to Sam. For this meaning we must use get.

It is also possible to concentrate on the motion, rather than the initial and final positions. To do this we use move.

I moved the chair from in front of the table across the rug to the window.

When using move, we can also include a trajectory but we cannot give a location for the destination. To indicate that the agent did not move with the object we replace move with send. As with give and get, the destination of send can receive. Bring and Take are used when the AGENT goes too. Fig. 4.8 shows the heirarchy we have built up so far. We

now turn to a more comprehensive approach.

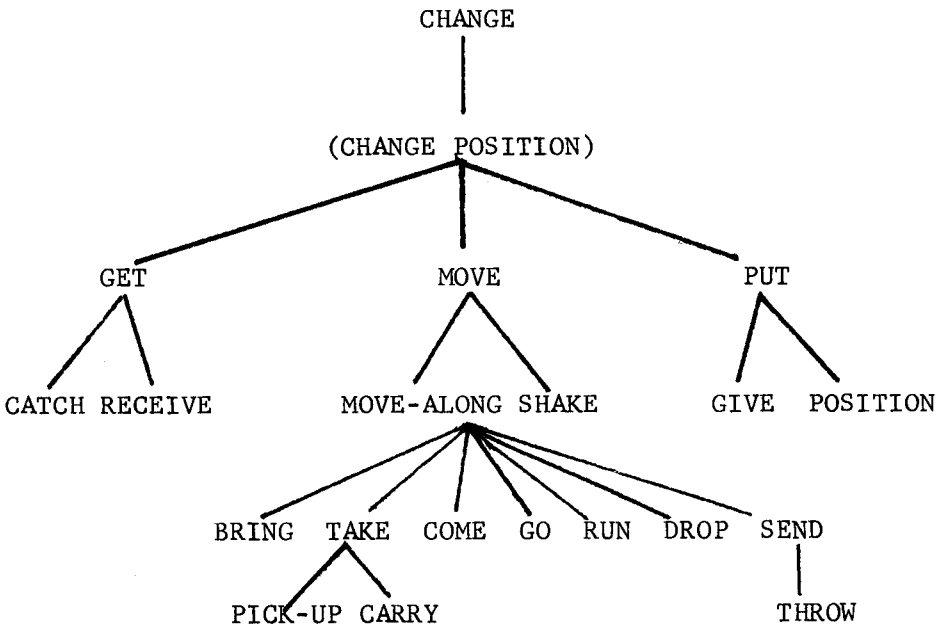

Fig. 4.8

Verbs involving change of position

BASIC ENGLISH

OPERATIONS ETC.

100

COME
GET
GIVE
GO
KEEP
LET
MAKE
PUT
SEEM
TAKE
BE
DO
HAVE
SAY
SEE
SEND
MAY
WILL
ABOUT
ACROSS
AFTER
AGAINST
AMONG
AT
BEFORE
BETWEEN
BY
DOWN
FROM
IN
OFF
ON
OVER
THROUGH
TO
UNDER
UP
WITH
AS
FOR
OF
TILL
THAN
A
THE

THINGS

400 General

ACCOUNT
ACT
ADDITION
ADJUSTMENT
ADVERTISEMENT
AGREEMENT
AIR
AMOUNT
AMUSEMENT
ANIMAL
ANSWER
APPARATUS
APPROVAL
ARGUMENT
ART
ATTACK
ATTEMPT
ATTENTION
ATTRACTION
AUTHORITY
BACK
BALANCE
BASE
BEHAVIOUR
BELIEF
BIRTH
BIT
BITE
BLOOD
BLOW
BODY
BRASS
BREAD
BREATH
BROTHER
BUILDING
BURN
BURST
BUSINESS
BUTTER
CANVAS
CARE
CAUSE
CHALK
CHANCE
EDUCATION
EFFECT
END
ERROR
EVENT
EXAMPLE
EXCHANGE
EXISTENCE
EXPANSION
EXPERIENCE
EXPERT
FACT
FALL
FAMILY
FATHER
FEAR
FEELING
FICTION
FIELD
FIGHT
FIRE
FLAME
FLIGHT
FLOWER
FOLD
FOOD
FORCE
FORM
FRIEND
FRONT
FRUIT
GLASS
GOLD
GOVERNMENT
GRAIN
GRASS
GRIP
GROUP
GROWTH
GUIDE
HARBOUR
HARMONY
HATE
HEARING
HEAT
METAL
MIDDLE
MILK
MIND
MINE
MINUTE
MIST
MONEY
MONTH
MORNING
MOTHER
MOTION
MOUNTAIN
MOVE
MUSIC
NAME
NATION
NEED
NEWS
NIGHT
NOISE
NOTE
NUMBER
OBSERVATION
OFFER
OIL
OPERATION
OPINION
ORDER
ORGANIZATION
ORNAMENT
OWNER
PAGE
PAIN
PAINT
PAPER
PART
PASTE
PAYMENT
PEACE
PERSON
PLACE
PLANT
PLAY
PLEASURE
SENSE
SERVANT
SEX
SHADE
SHAKE
SHAME
SHOCK
SIDE
SIGN
SILK
SILVER
SISTER
SIZE
SKY
SLEEP
SLIP
SLOPE
SMASH
SMELL
SMILE
SMOKE
SNEEZE
SNOW
SOAP
SOCIETY
SON
SONG
SORT
SOUND
SOUP
SPACE
STAGE
START
STATEMENT
STEAM
STEEL
STEP
STITCH
STONE
STOP
STORY
STRETCH
STRUCTURE
SUBSTANCE
SUGAR

200 Pictured

ANGLE
ANT
APPLE
ARCH
ARM
ARMY
BABY
BAG
BALL
BAND
BASIN
BASKET
BATH
BED
BEE
BELL
BERRY
BIRD
BLADE
BOARD
BOAT
BONE
BOOK
BOOT
BOTTLE
BOX
BOY
BRAIN
BRAKE
BRANCH
BRICK
BRIDGE
BRUSH
BUCKET
BULB
BUTTON
CAKE
CAMERA
CARD
CARRIAGE
CART
CAT
CHAIN
CHEESE
CHEST
KNEE
KNIFE
KNOT
LEAF
LEG
LIBRARY
LINE
LIP
LOCK
MAP
MATCH
MONKEY
MOON
MOUTH
MUSCLE
NAIL
NECK
NEEDLE
NERVE
NET
NOSE
NUT
OFFICE
ORANGE
OVEN
PARCEL
PEN
PENCIL
PICTURE
PIG
PIN
PIPE
PLANE
PLATE
PLOUGH
POCKET
POT
POTATO
PRISON
PUMP
RAIL
RAT
RECEIPT
RING
ROD

QUALITIES

100 General

ABLE
ACID
ANGRY
AUTOMATIC
BEAUTIFUL
BLACK
BOILING
BRIGHT
BROKEN
BROWN
CHEAP
CHEMICAL
CHIEF
CLEAN
CLEAR
COMMON
COMPLEX
CONSCIOUS
CUT
DEEP
DEPENDENT
EARLY
ELASTIC
ELECTRIC
EQUAL
FAT
FERTILE
FIRST
FIXED
FLAT
FREE
FREQUENT
FULL
GENERAL
GOOD
GREAT
GREY
HANGING
HAPPY
HARD
HEALTHY
HIGH
HOLLOW
IMPORTANT
KIND

50 Opposites

AWAKE
BAD
BENT
BITTER
BLUE
CERTAIN
COLD
COMPLETE
CRUEL
DARK
DEAD
DEAR
DELICATE
DIFFERENT
DIRTY
DRY
FALSE
FEEBLE
FEMALE
FOOLISH
FUTURE
GREEN
ILL
LAST
LATE
LEFT
LOOSE
LOUD
LOW
MIXED
NARROW
OLD
OPPOSITE
PUBLIC
ROUGH
SAD
SAFE
SECRET
SHORT
SHUT
SIMPLE
SLOW
SMALL
SOFT
SOLID

EXAMPLES OF WORD ORDER

THE
CAMERA
MAN
WHO
MADE
AN
ATTEMPT
TO
TAKE
A
MOVING
PICTURE
OF
THE
SOCIETY
WOMEN
BEFORE
THEY
GOT
THEIR
HATS
OFF
DID
NOT
GET
OFF
THE
SHIP
TILL
HE
WAS
QUESTIONED
BY
THE
POLICE

WE
WILL
GIVE
SIMPLE
RULES
TO
YOU
NOW

ALL
ANY
EVERY
NO
OTHER
SOME
LITTLE
MUCH
SUCH
THAT
THIS
I
HE
YOU
WHO
AND
BECAUSE
BUT
OR
IF
THOUGH
WHILE
HOW
WHEN
WHERE
WHY
AGAIN
EVER
FAR
FORWARD
HERE
NEAR
NOW
OUT
STILL
THEN
THERE
TOGETHER
WELL
ALMOST
ENOUGH
EVEN
NOT
ONLY
QUITE
SO
VERY
TOMORROW
YESTERDAY
NORTH
SOUTH
EAST
WEST
PLEASE
YES

CHANGE
CLOTH
COAL
COLOUR
COMFORT
COMMITTEE
COMPANY
COMPARISON
COMPETITION
CONDITION
CONNECTION
CONTROL
COOK
COPPER
COPY
CORK
COTTON
COUGH
COUNTRY
COVER
CRACK
CREDIT
CRIME
CRUSH
CRY
CURRENT
CURVE
DAMAGE
DANGER
DAUGHTER
DAY
DEATH
DEBT
DECISION
DEGREE
DESIGN
DESIRE
DESTRUCTION
DETAIL
DEVELOPMENT
DIGESTION
DIRECTION
DISCOVERY
DISCUSSION
DISEASE
DISGUST
DISTANCE
DISTRIBUTION
DIVISION
DOUBT
DRINK
DRIVING
DUST
EARTH
EDGE
HELP
HISTORY
HOLE
HOPE
HOUR
HUMOUR
ICE
IDEA
IMPULSE
INCREASE
INDUSTRY
INK
INSECT
INSTRUMENT
INSURANCE
INTEREST
INVENTION
IRON
JELLY
JOIN
JOURNEY
JUDGE
JUMP
KICK
KISS
KNOWLEDGE
LAND
LANGUAGE
LAUGH
LAW
LEAD
LEARNING
LEATHER
LETTER
LEVEL
LIFT
LIGHT
LIMIT
LINEN
LIQUID
LIST
LOOK
LOSS
LOVE
MACHINE
MAN
MANAGER
MARK
MARKET
MASS
MEAL
MEASURE
MEAT
MEETING
MEMORY
POINT
POISON
POLISH
PORTER
POSITION
POWDER
POWER
PRICE
PRINT
PROCESS
PRODUCE
PROFIT
PROPERTY
PROSE
PROTEST
PULL
PUNISHMENT
PURPOSE
PUSH
QUALITY
QUESTION
RAIN
RANGE
RATE
RAY
REACTION
READING
REASON
RECORD
REGRET
RELATION
RELIGION
REPRESENTATIVE
REQUEST
RESPECT
REST
REWARD
RHYTHM
RICE
RIVER
ROAD
ROLL
ROOM
RUB
RULE
RUN
SALT
SAND
SCALE
SCIENCE
SEA
SEAT
SECRETARY
SELECTION
SELF
SUGGESTION
SUMMER
SUPPORT
SURPRISE
SWIM
SYSTEM
TALK
TASTE
TAX
TEACHING
TENDENCY
TEST
THEORY
THING
THOUGHT
THUNDER
TIME
TIN
TOP
TOUCH
TRADE
TRANSPORT
TRICK
TROUBLE
TURN
TWIST
UNIT
USE
VALUE
VERSE
VESSEL
VIEW
VOICE
WALK
WAR
WASH
WASTE
WATER
WAVE
WAX
WAY
WEATHER
WEEK
WEIGHT
WIND
WINE
WINTER
WOMAN
WOOD
WOOL
WORD
WORK
WOUND
WRITING
YEAR
CHIN
CHURCH
CIRCLE
CLOCK
CLOUD
COAT
COLLAR
COMB
CORD
COW
CUP
CURTAIN
CUSHION
DOG
DOOR
DRAIN
DRAWER
DRESS
DROP
EAR
EGG
ENGINE
EYE
FACE
FARM
FEATHER
FINGER
FISH
FLAG
FLOOR
FLY
FOOT
FORK
FOWL
FRAME
GARDEN
GIRL
GLOVE
GOAT
GUN
HAIR
HAMMER
HAND
HAT
HEAD
HEART
HOOK
HORN
HORSE
HOSPITAL
HOUSE
ISLAND
JEWEL
KETTLE
KEY
ROOF
ROOT
SAIL
SCHOOL
SCISSORS
SCREW
SEED
SHEEP
SHELF
SHIP
SHIRT
SHOE
SKIN
SKIRT
SNAKE
SOCK
SPADE
SPONGE
SPOON
SPRING
SQUARE
STAMP
STAR
STATION
STEM
STICK
STOCKING
STOMACH
STORE
STOVE
SUN
TABLE
TAIL
THREAD
THROAT
THUMB
TICKET
TOE
TONGUE
TOOTH
TOWN
TRAIN
TRAY
TREE
TROUSERS
UMBRELLA
WALL
WATCH
WHEEL
WHIP
WHISTLE
WINDOW
WING
WIRE
WORM
LIKE
LIVING
LONG
MALE
MARRIED
MATERIAL
MEDICAL
MILITARY
NATURAL
NECESSARY
NEW
NORMAL
OPEN
PARALLEL
PAST
PHYSICAL
POLITICAL
POOR
POSSIBLE
PRESENT
PRIVATE
PROBABLE
QUICK
QUIET
READY
RED
REGULAR
RESPONSIBLE
RIGHT
ROUND
SAME
SECOND
SEPARATE
SERIOUS
SHARP
SMOOTH
STICKY
STIFF
STRAIGHT
STRONG
SUDDEN
SWEET
TALL
THICK
TIGHT
TIRED
TRUE
VIOLENT
WAITING
WARM
WET
WIDE
WISE
YELLOW
YOUNG
SPECIAL
STRANGE
THIN
WHITE
WRONG

NO 'VERBS'

IT
IS
POSSIBLE
TO
GET
ALL
THESE
WORDS
ON
THE
BACK
OF
A
BIT
OF
NOTEPAPER
BECAUSE
THERE
ARE
NO
'VERBS'
IN
BASIC
ENGLISH

A
WEEK
OR
TWO
WITH
THE
RULES
AND
THE
SPECIAL
RECORDS
GIVES
COMPLETE
KNOWLEDGE
OF
THE
SYSTEM
FOR
READING
OR
WRITING

RULES

ADDITON OF 'S'
TO THINGS WHEN
THERE IS
MORE THAN ONE

ENDINGS
IN 'ER,' 'ING,' 'ED'
FROM 300 NAMES
OF THINGS

'LY' FORMS
FROM
QUALITIES

DEGREE
WITH
'MORE' AND 'MOST'

QUESTIONS
BY CHANGE OF
ORDER,
AND 'DO'

FORM-CHANGES IN
NAMES OF ACTS,
AND 'THAT,' 'THIS,'
'I,' 'HE,' 'YOU,'
'WHO,' AS IN
NORMAL ENGLISH

MEASURES
NUMBERS
DAYS, MONTHS
AND THE
INTERNATIONAL
WORDS
IN ENGLISH
FORM

THE
ORTHOLOGICAL
INSTITUTE
LONDON

Basic Engish

There are a great many verbs in English, however, many of these seem so obscure that it is improbable that a theory of the language would hinge on their treatment. In an attempt to get a small set adequate for the development of a theory we have turned to Basic English.

Basic English is a subset of English developed by Ogden in the 1930's as a proposed international language. Ogden sought to simpify things by using only the verbs: come, get, give, go, keep, let, make, put, seem, take, be, do, have, say, see, send, may, and will. He then included many nominals derived from verbs, which have been taken as verbs for this data. In his selection of words Ogden used criteria very suitable to our purposes here. As he says (p. 11) "For all practical purposes, there are objects which we wish to talk about, the operations which we perform on them, and the directions in which we operate. When the most necessary names, the most fundamental operation-words, and the essential directives have been determined, it can be shown that a verb is primarily a symbolic device for telescoping an operation and an object or a direction (enter for go into). Sometimes an operation-word, a directive, and a name are thus telescoped, as in the word disembark (get, off, a ship)."

It was Ogden's hypothesis that the telescoped words could be removed. Ogden gave 850 words in his basic list and indicated that this should be extended by about 150 words for a given field. We have added the verbs which arose in the protocols of two managers asking questions

about production data, and a few others in order to flesh out the picture which was being formed.

We have classified these verbs in a heirarchy along the lines just explained. Each of them applies to one or more of the physical, system, plans and actions, and mental worlds. Some have meanings which carry over by analogy from one world to the next. Our top level physical world actions are physically-orient, constrain, notice, remain, change, destroy, consume, devide, make, emit, bear, combine, and touch. It is interesting to compare our list with Shank's.

```
ACTIVITY
  PHYSICALLY-ORIENT
        STAND
        SIT
        LIE
        POINT
  CONSTRAIN
        SUPPORT
        CONNECT
        SURROUND
        CONTAIN
        COVER
  NOTICE
        LISTEN-TO
        LOOK-AT
        SMELL
        TOUCH
        TASTE
  REMAIN
        LIVE
        SLEEP
  CHANGE
        (CHANGE POSITION)
          (GET PHYSICAL-OBJECT)
                CATCH
                RECEIVE
                PUT
                        SET
                        PLACE
                        POSITION
                        EMBED
                        DISTRIBUTE
                        DISSOLVE
                        EXCHANGE
                        GIVE
                MOVE
                        SHAKE
                        SHIVER
                        MOVE-ALONG
                          COME
                            ARRIVE
                            ENTER
                          GO
                            LEAVE
                            DEPART
                            DISAPPEAR
                          RIDE
                          RUN
                          WALK
                          FLY

                          SWIM
                          ROLL
                          FALL
                          JUMP
                          SLIP
```

DROP
FORCE
  PUSH
  PULL
ACCOMPANY
SEND
  KNOCK
  KICK
  THROW
TAKE
  PICK-UP
  CARRY
BRING

(CHANGE DIRECTION)
  TURN
(CHANGE FORM)
  FORM
  TWIST
  CRACK
  BURST
  EXPAND
BECOME
  GROW
  INCREASE
  DECREASE
  FLUCTUATE
(CHANGE STATE)
  FREEZE
  DIE
  COOK
  BAKE
  BURN
  WAKE-UP
PROCESS
  KILL
  RUB
    POLISH
  FOLD
  HEAT
  MARK
DAMAGE
  BREAK
    SMASH
  CRUSH
  BITE
DESTROY
CONSUME
  EAT
  DRINK
  SWALLOW
DIVIDE
MAKE
  (MAKE SOUND)
    COUGH
    SNEEZE
    CRY

```
                ROAR
                LAUGH
                TALK
                SPEAK
        PRODUCE
                FLOWER
                MANUFACTURE
                BUILD
                PRINT
EMIT
        SMOKE
        STREAM
BEAR
COMBINE
        ADD
TOUCH
        HIT
        STEP-ON
```

Fig. 4.9

Activities in the physical world.

```
ACTIVITY
     CONTRAIN
         SUPPORT-FINANCIALLY
                     LIKE
                     PREFER
                     LOVE
                     WANT
                     HOPE
                     DISLIKE
                     MIND

     CHANGE
          (CHANGE POSITION)
                          (GET SOLIAL-ENTITY)
                              (BUY OWNERSHIP)
                              (RECIVE OWNERSHIP)
                          (GIVE SOCIAL-ENTITY)
                              LET
                              PROVIDE
                              CONTRIBUTE
                              SUPPLY
                              SELL
                              TRADE
                          MOVE
                             MOVE-ALONG
                                  COME
                                  GO
                                     (LEAVE SOCIAL-SCENE)
                                  SLIP-SOCIALLY
                                  DROP-OUT
                                  RUN-FROM-RESPONSIBILITY
                                  RISE-SOCIALLY
                                  FALL-SOCIALLY
                                  FORCE
                                     PUSH
                                     PULL
                                     RUN
                                     DRIVE
                                     RIDE
                                     LEAD
                                     DIRECT
                                     GUIDE
                                     DELIVER
          (CHANGE FORM)
                          (EXPAND SYSTEM)
                          SPECIALIZE
          BECOME
                        SUCCEED
                        MATURE
                        FAIL

                     CONTROL
                          MANAGE
```

```
                    CHANGE-MOOD
                     REWARD
                     PUNISH
                     AMUSE
                     COMFORT
                     DISGUST
                     HUMOR
                     SHOCK
                     PLEASE
                     SURPRISE
                     TROUBLE
                     ALIENATE
                     INTEREST
                         ATTRACT
                     FLATTER
               (BREAK ORGANIZATION)
                        (SMASH ORGANIZATION)

DISBAND
DISCHARGE
(DIVIDE ORGANIZATION)
MAKE
      (MAKE RULE)
              RULE
     BEFRIEND
ORGANIZE
FOUND
MERGE
COMPLETE
FIGHT
MEET
```

Fig. 4.10

Activities in the world of systems