Object-Oriented Context Description for Movie Based Context-Aware Language Learning

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Abstract—**Context-aware ubiquitous learning is a promising way to learn languages; however, it requires developers and operators of much effort to construct, deploy, and use the specialized system. As its alternative, this paper proposes movie based context-aware language learning (MBCALL) that enables learners to learn languages through quizzes generated along virtual contexts occurring in the movie to be replayed. Since full automatic context capturing from the movie is impossible, the authors define an object-oriented context model (OOCM) and also a textual context description language subject to the OOCM to describe the movie context easily by human work. The OOCM introduces the case grammar concept of natural language processing. This enables quiz generation based on types of the words for objects, actions, and modes found in the movie. Evaluation with a small movie by three subjects shows that the OOCM can guide them to enrich information included in the movie context; therefore, we can generate more types of quizzes based on the movie context.**

Keywords—*Movie based context-aware language learning (MB-CALL); object-oriented context model (OOCM); context description language; case grammar*

I. Introduction

So far many context-aware ubiquitous learning systems have shown that learning from real environment is attractive and effective for learners. However, it requires developers and operators to make much effort for using context-aware ubiquitous learning systems in practice. Developers have to develop complicated learning applications interacting with real environment through various sensors and smart devices. Operators have to prepare contextual learning materials that can provide learning tasks reacting to dynamic situations. Physical devices deployed in real environment can be out of order by long time operation under harsh environment such as outdoors. Availability of real time network connection is another important issue to be concerned. These matters will lead more development and operation cost or limited functionality of the learning system.

The movie can be a place in where context-aware ubiquitous learning is virtually practiced. The authors propose the concept of movie based context-aware learning (or MBCAL for short) as an alternative approach for context-aware ubiquitous learning to overcome the above-mentioned difficulties on development and operation [1]. MBCAL utilizes movies to facilitate learner's proactive learning from the context situated in the scenes as ubiquitous learning systems try to do in real environment. Moreover, it does not require any physical equipment to be deployed in real environment and any specific learning applications interacting with them, since every learning is performed in the movie player with learning functions. Considering the movie has been utilized to teach languages so far, one of the most suitable MBCAL applications will be language learning, which is hereinafter called as Movie Based Context-Aware Language Learning (or MBCALL for short). This paper focuses solely on MBCALL.

In MBCALL, the learner watches the movie and the movie player with learning functions generates quizzes automatically based on both movie's and learner's contexts [2]. The MBCALL system generates different quizzes to different learners depending on their different contexts even for the same movie.

The movie context is the current scene of the replayed movie and any information derived from it. It is desirable to compose the movie context description automatically from the movie; however, considering state-of-the-art image and phonetic recognition and understanding technologies, only a limited class of automatic composition is possible. Moreover, the movie sometimes includes the context which is not represented explicitly and is deduced from its story or implication. Therefore, human work is needed for composition of the movie context. The instructor describes the movie context by language independent context description and associates them with relating movie frames. This paper defines and evaluates a language for movie context description.

On the other hand, the learner context is information relating to the learner such as his/her learning level, completed learning tasks, watched/unwatched movies, and preferred movies. It is initially given by the learner him/herself and updated by the system along with his/her learning activity.

Followed by related work in Section II, the authors show

the standing point of the movie based context-aware learning as well as its comprehensive comparison to existing learning paradigms in Section III. Section IV presents a scheme to describe the movie context with the object-oriented context model (or OOCM for short) and the textual context description based on the model, which are key conceptual contribution of this paper. In Section V, the authors evaluate how the OOCM can guide us to enrich information included in the movie context. Finally, Section VI concludes the paper.

II. RELATED WORK

Development of information and communication technology (ICT) has derived a series of emerging learning paradigms. Ogata and Uosaki presented a research map on use of computers in education that identifies six emerging learning paradigms including CAI (computer assisted instruction) / ITS (intelligent tutoring system), game based learning (GBL), computer supported collaboration learning (CSCL), web based learning (or e-learning), mobile learning (or m-learning), and ubiquitous learning (or u-learning), along with involved ICTs and their contribution to user behaviors [3].

CAI is a form of computer supported learning and teaching using fixed PC, which was introduced in 1960s. Later, researchers incorporated artificial intelligence into CAI to improve learning and problem solving [4], which is known as ITS or ICAI (Intelligent CAI).

GBL, which was introduced in 1980s along with emergence of multimedia technologies, is another type of learning incorporating the subject matter into game play with defined learning outcomes. The learner can apply what they have learned to the real world through the game play.

CSCL, which is derived by invention of the world wide web (WWW) in 1990, facilitates interaction and collaboration among a group of learners connected each other.

E-learning facilitates learning on web based services in the internet.

M-learning facilitates learning in mobility, which is realized by mobile and wireless network and technologies.

U-learning facilitates learning through learner's surroundings captured by mobile, wireless, and ubiquitous network and technologies such as sensors and RFIDs.

E-, m-, and u-learnings have similar potential in enhancing social interaction and cooperative learning among learners through network. Moreover, u-learning enables learning from experience through interaction between cyber and physical spaces. Various research and commercial applications of these learning paradigms are available in various learning domains.

Movie based learning is an alternative way to achieve learning from experience, although the experience is virtual. Therefore, the movie has been practically used for learning so far. Kerber *et al.* encouraged students to learn the medical theory from corresponding provided movies [5]. Lumlertgul *et al.* conducted a cinemeducation project, which aimed to help students learn medical professionalism using movies [6]. Jungraithmayr and Weder improved the learning process on technique of orthotropic mouse lung transplantation with full-length movie visualization [7].

Furthermore, the movie can facilitate to learn context dependent aspects of the language. Chan and Herrero used movie clips to teach various languages in the classroom in their project and stated that plentiful contexts in the movie can be utilized for language learning as same as real environment, as it is known that the movie can facilitate comprehension activities perceived as real [8]. Ismaili showed effectiveness of using movies in the EFL classroom [9].

It is demonstrated by these researchers that movies improve student's understanding significantly and attract student's attention successfully. Additionally, in the field of language learning, the movie presents languages naturally as well as shows quite rich linguistic and environmental contexts that can be perceived as real. Considering the above-mentioned facts, the authors are motivated to incorporate the movie into a learning platform and develop an MBCALL system.

III. MOVIE BASED CONTEXT-AWARE LEARNING

Movie based context-aware learning, which the authors propose, is a concept that introduces context-awareness into movie based learning. MBCAL enables learning from virtual experience in the movie as efficiently as u-learning that enables learning from experience in real environment through ubiquitous networks and technologies.

To compare MBCAL with e-, m-, and u-learnings and clarify differences, the authors surveyed existing work in the field of e-, m-, and u-learnings and adopt six features for comparison including permanency, accessibility, immediacy, interactivity, context-awareness, and content of the learning portfolio. The features except the content of the learning portfolio are adopted by many researchers as presented in [10], [11], [12] and [13]. The content of the learning portfolio is solely mentioned in [11]. These features are too abstract to differentiate the learning paradigms; thus, the authors define some levels of functionality with explanation for each feature.

As shown in Table I, these four learning paradigms can be accessed through the wireless network, show context-awareness based on the learning portfolio, and record learner's online behavior. Both e-learning and MBCAL can be accessed also via the wired network, while m-learning and u-learning must be accessed via the wireless network for its inherent characteristics. Both u-learning and MBCAL are able to keep learner's work permanently and provide dynamic adaptive services. In terms of interactivity, u-learning shows effective interactivity with peers, teachers, and experts. While both m-learning and MBCAL may have active interactivity, e-learning has interactivity in a limited form. Furthermore, the most recognized advantage of u-learning is context-awareness by both learner's physical context and real environment context. On the other hand, MBCAL shows context-awareness by utilizing virtual environment; *i.e.* movie scenes but with some technical limitations in performing real/physical context in u-learning. Lastly, u-learning records all aspects as the learning portfolio; namely, on-line behaviors, real-world behaviors, and corresponding environmental information of the learner. The others record online behaviors only.

In short, MBCAL has closest functionality to u-learning. Although it has functionality almost common to u-learning,

TABLE I.   COMPARISON OF LEARNING PARADIGMS

Features	Functionality	e-learning	m-learning	u-learning	MBCAL
Permanency	The leaner cannot keep learning record.	X			
	The learner can keep learning record partially.		X		
	The learner can keep every learning record.			X	X
Accessibility	The learner can access the system via the computer network.	X			X
	The learner can access the system via the wireless network.	X	X	X	X
	The learner and related devices can communicate with ubiquitous technologies.			X	
Adaptive Services	The learner cannot get services immediately.	X			
	The learner can get information immediately in fixed environment.		X		X
	The learner can get information immediately in dynamic environment (as active services).			X	
Interactivity	The learner can interact with peers, teachers, and experts in a limited form.	X			
	The leaner can interact with peers, teachers, and experts actively.		X		X
	The learner can interact with peers, teachers, and experts effectively.			X	
Context-Awareness	The system can provide context-aware learning based on the learning portfolio.	X	X	X	X
	The system can provide context-aware learning based on learner's personal context (physical context).			X	
	The system can provide context-aware learning based on the context of real environment.			X	
	The system can provide context-aware learning based on the context of virtual environment.				X
Content of Learning Portfolio	The system records the online behaviors.	X	X	X	X
	The system records the real-world behaviors.			X	
	The system records the corresponding environmental information of the learner.			X	

MBCAL has one unique functionality; that is, context-awareness in virtual environment. Note that Table I lists possible aspects of functionality that each learning paradigm may show generally; yet, in practice, an application of each learning paradigm may not show all of them. Applications of a certain learning paradigm may show slightly different functionality depending on their purposes.

IV. OBJECT-ORIENTED CONTEXT MODEL AND TEXTUAL CONTEXT DESCRIPTION

In the MBCALL system, learners learn vocabularies and language expressions along the context in the movie. In contrast to the context-aware u-learning system which requires sensing devices and other data sources to acquire the context of physical environment, MBCALL requires none of them. Instead, MBCALL requires context description of movie scenes to be prepared before learning. Quizzes and their expected answers are generated based on the context description prepared for the movie.

The context description must be uniform, universal, and natural language independent to guarantee its reusability for different languages [14]. The authors have introduced the object-oriented paradigm and defined an object-oriented context model (or OOCM for short) to achieve this goal. The OOCM introduces the case grammar concept, which is a concept in the field of natural language processing, for its definition. The textual description based on the OOCM is defined as a means to describe the movie scenes.

A. Case Grammars

Fillmore proposed the case grammar concept [15]. The basic structure of the sentence can be divided into a couple of constituents: proposition and modality. The proposition consists of a tenseless set of relationships involving verbs and cases. The verb represents an event or activity, while cases are nouns having semantical relationships to the verb. Fillmore defines the following cases:

- Agentive: Who causes the event or activity?

- Instrument: What is used for the event or activity?

- Dative: Who experienced the event or activity?

- Factitive: What is the result of the event or activity?

- Locative: Where the event or activity happens?

- Objective: What is the target of the event or activity?

The modality includes such modalities on the sentence as-a-whole as negation, tense, mood, and aspect. For example, "Alice slices the bread with the knife" can be broken into *Alice* as agentive, *cut* as verb, *bread* as objective, and *knife* as instrument.

Followed by Fillmore, many linguists have refined his case grammar concept and introduced more cases. The authors surveyed those works[15], [16], [17], [18] and summarized as shown in Table II. Note that there are some cases which have the same or similar meaning but are named differently by different linguists; for example, Fillmore's *agentive* is renamed as *agent* by Jurafsky and Martin[16] and as *cAgent* by Parunak[17].

The cases in the table have the following meanings:

- An *agent* means a perceived instigator of the action of the verb.

- An *object* means a thing affected by the action or state of the verb.

- An *instrument* means force or an inanimate object casually involved in the state or action of the verb.

- An *experiencer* means an entity whose mental or emotional state is affected by the action of the verb.

- A *factitive* means a thing produced by the action of the verb.

- A *goal* means a place to where something moves or thing toward which an action is directed.

- A *beneficiary* means an entity that possesses an object or participates with an agent in transfer of an object.

- A *manner* means how the action, experiences, or process of an event is carried out.

- A *time* indexes the action of the verb in time.

- A *location* identifies the place or spatial orientation of the state or action.

- A *measure* means quantification of the event.

- A *source* means the place of the origin, entity from which a physical sensation emanates, or original owner in a transfer.

- A *commutative* refers to somebody else who performs an action with the agent.

- A *complement* means the new state of a factitive case.

- A *causer* means the referent which instigates an event rather than doing it actually.

B. Object-Oriented Context Model based on the Case Grammar Concept

Since the cases represent what the human being can cognize and verbalize, the case grammar concept can be used to describe movie scenes in a semantically formalized manner. The authors defined the OOCM integrating the case grammar concept for this purpose [14]. In this paper the OOCM of the previous work is improved for more comprehensive context description after writing movie contexts. The classes are defined by selecting cases from the summary shown in Section IV-A and mapping them on the OOCM as roles of the class. Fig. 1 shows the OOCM in the class diagram.

The OOCM has 11 classes. Classes *Thing*, *Action*, and *Mode* are the most fundamental ones.

- Class *Thing* means a thing appearing in the movie.

- Class *Action* means an action performed in the movie.

- Class *Mode* means a mode of the thing or the action.

Thing has the following descendant classes:

- Class *Animate*, a sub class of *Thing*, has its own intention.

- Class *Inanimate*, a sub class of *Thing*, does not have any intention.

- Class *Object*, a sub class of *Inanimate*, is something passively involved in the action.

- Class *Space*, a sub class of *Inanimate*, represents a location.

- Class *Time*, a sub class of *Inanimate*, represents a time instant of a duration.

Action has the following sub-classes:

- Class *Transitive Action* is an action that finishes immediately.

- Class *Continuous Action* is an action that continues for a certain duration.

C. Context Description Language

The movie context can be represented by the object diagram instantiated from the OOCM explained in the previous subsection. Since it is time consuming to edit the object diagram, the authors define the context description language (or CDL for short) to compose the movie context easily and quickly in a textual form. Fig. 2 shows the syntax of the CDL in the extended BNF in accordance with the current version of the OOCM.

The start symbol of the grammar is `ContextScript`. Symbol `ClassName` is the name of a class defined in the OOCM. Symbol `AssocName` is the name of an association between classes defined in the OOCM. `ClassName` and `AssocName` must be prefixed by the backslash (`\`). Symbol `LanguageCode` is a language code specified by ISO 639-1[19] and 639-3[20] such as `en` for English, `fr` for French, `zh` for Chinese, *etc.* Symbol `DQ` represents a double quotation mark (`"`).

For example, the movie scene shown in Fig. 3 can be modeled by the OOCM as shown in Fig. 4 and described in CDL as shown in Fig. 5.

V. EVALUATION

In order to evaluate the descriptive power of the OOCM, the authors conducted an experiment by asking three volunteer subjects to describe the context of a public domain movie from *Popeye the Sailor* Series which is entitled as *Insect to Injury* [21]. The length of the movie clip is 6 minutes 7 seconds. The authors asked the subjects to describe the movie scenes in the free text without any more direction. Then the authors gave a short lecture on the OOCM and asked them to do the same thing again but with referencing the OOCM. All the subjects are Indonesian and they describe the movie scenes either in English or in Bahasa Indonesia, which is the common language in Republic of Indonesia.

Descriptions by the subjects were transformed into the OOCM for comparison. Movie contexts included in a single sentence can vary significantly depending on forms on writing. A complex sentence with more modifiers can have more meaning than a simple sentence. It enables fair comparison in a normalized form to transform a sentence into the OOCM and compare them based on the associations included in the OOCM. In comparison, the authors checked if the same type of association exists in the OOCMs describing the same movie

TABLE II.   Survey on the Case Grammar [14]

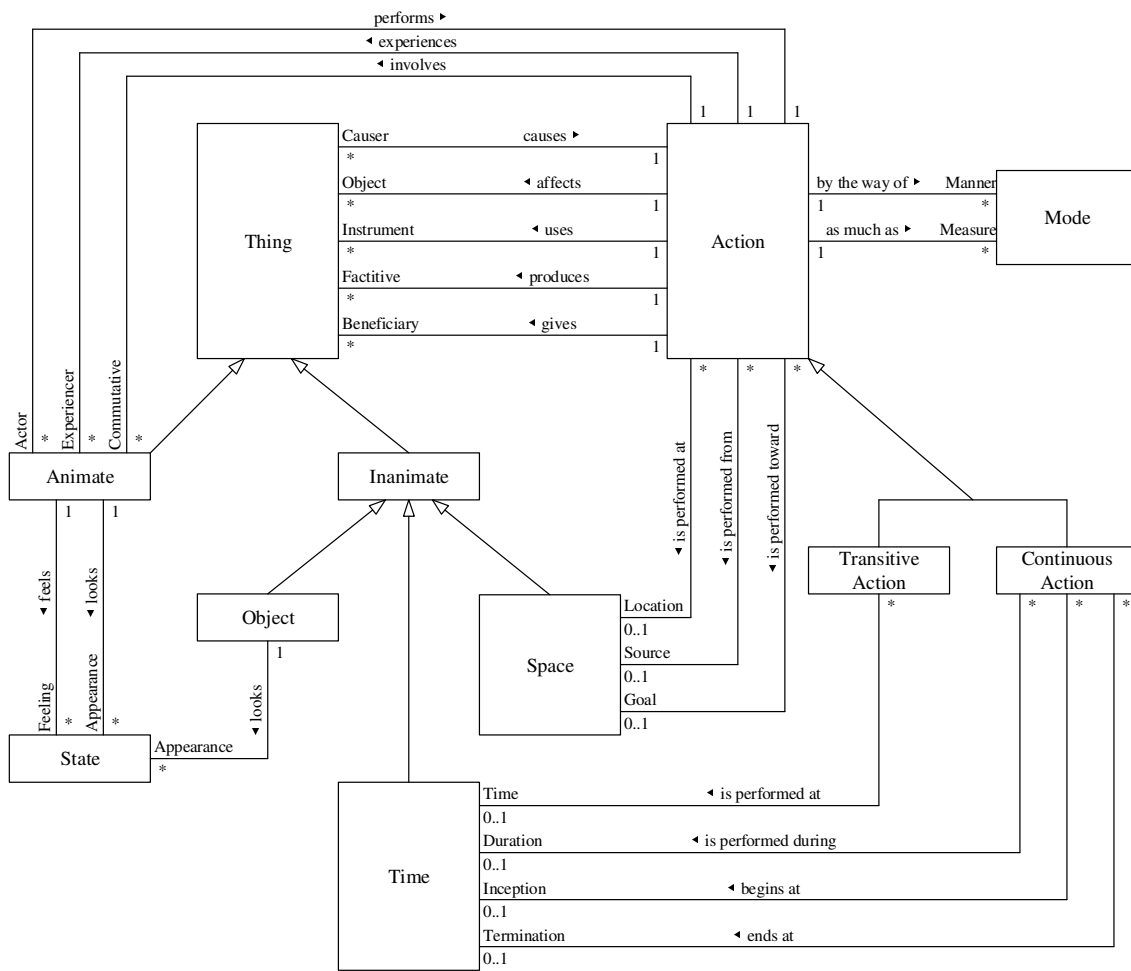| Cases	Fil. [15]	Long. [18]	Lar. [18]	Par. [17]	Berk. [18]	Jur. [16]
Agentive (A) / Agent	X	X	X	X	X	X
Instrumental (I) / Instrument	X	X	X	X	X	X
Dative (D) / Experiencer (E)	X	X	-	X	X	X
Factitive (F) / Result / Range	X	X	X	-	-	-
Locative (L) / Location	X	X	-	X	X	X
Objective (O) / Object / Patient / Theme	X	X	X	X	X	X
Goal (G)	-	X	X	-	-	-
Measure	-	X	X	-	-	-
Path	-	X	-	-	-	-
Source	-	X	-	-	-	-
Accompaniment / Comitative	-	-	X	X	-	-
Beneficiary / Benefacte	-	-	X	X	-	X
Causer / Force	-	-	X	-	-	X
Manner	-	-	X	-	-	-
Time	-	-	X	X	-	-
Recipient	-	-	-	-	X	X
Possessor	-	-	-	-	X	X
Content	-	-	-	-	-	X

Fig. 1.   Object oriented context model.

```
ContextScript
  = (InstanceDesc | ContextDesc)* .
InstanceDesc
  = ClassName
      "{" InstanceName "}"
      "{" WordDescList "}" .
WordDescList
  = WordDesc
  | WordDescList "," WordDesc .
WordDesc
  = LanguageCode "=" DQ Word DQ .
ContextDesc
  = "\context" "{" AssocDesc* "}" .
AssocDesc
  = AssocName
      "{" SourceInstance "}"
      "{" SinkInstance "}" .
SourceInstance = InstanceName .
SinkInstance = InstanceName .
InstanceName = [A-Za-z0-9]+ .
```

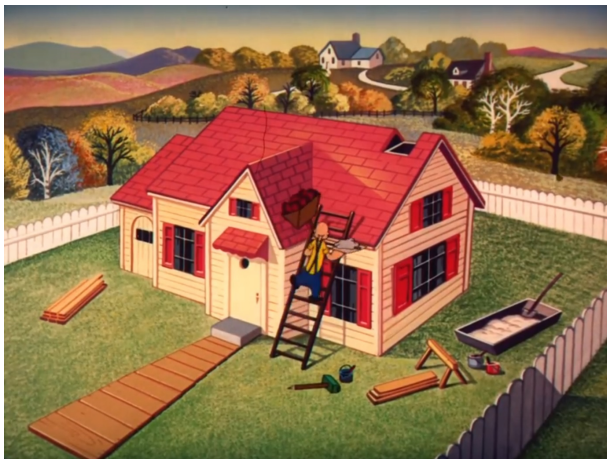Fig. 2.   Syntax of the context description language.

Fig. 3.   An example movie scene.

scene by the subjects with ignoring trivial difference of words. Rather, the authors focused on difference of meanings.

In this evaluation, the authors collected forty-two (42) equivalent sentences from different subjects. Eighty-five (85) OOCM associations were identified from these sentences. The sentences and associations are listed in the appendix. The authors checked if these OOCM associations appear in each subject's description one by one. Table III shows the results.

The subjects could identify more associations of the OOCM describing the movie scenes with referencing OOCM than without referencing the OOCM. That means the OOCM can guide the composer to enrich information included in the movie context; therefore, we can generate more types of quizzes based on the movie context.

TABLE III.   COMPARISON RESULTS

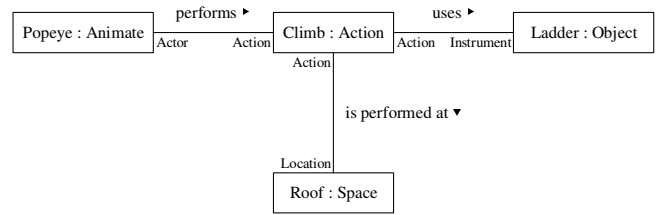| Approaches	Subjects		
	#1	#2	#3
Without Referencing OOCM	46	47	18
With Referencing OOCM	63	55	53

Fig. 4.   An example OOCM.

```
\context{
  \Actor{Popeye}{en="Popeye", id=Popeye}
  \Action{Climb}{en="climb", id=menaiki}
  \Space{Roof}{en="roof", id=atap}
  \Object{Ladder}{en="ladder", id=tangga}
  \performs{Popeye}{Climb}
  \isPerformedToward{Climb}{Roof}
  \uses{Climb}{Ladder}
}
```

Fig. 5.   An example CDL.

VI.   CONCLUSION

This paper presented the concept of the movie based context-aware learning (MBCAL). The learner learns something through quizzes generated depending on the movie context with replaying the movie. In contrast to context-aware ubiquitous learning, the MBCAL system does not require to develop learning applications interacting with physical sensors or smartphones as well as to operate physical systems. Language learning is a promising application of MBCAL.

MBCAL requires less effort for its development and operation than context-aware ubiquitous learning. On the other hand, it requires effort to describe the movie context by human work, since state-of-the-art image and phonetic recognition and understanding technologies can recognize a limited class of the movie context. The authors presented the object-oriented context model (OOCM) which was constructed based on the case grammar concept of natural language processing. The OOCM can guide us to enrich description of the movie context. In the evaluation conducted in this paper, with referencing the OOCM, the subjects can identify and describe more OOCM associations describing the contexts that occur in the movie. Moreover, the authors defined a textual context description language (CDL) that can describe an instance of the OOCM. We can describe movie contexts instantly by using the textual CDL.

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APPENDIX

In the evaluation conducted in Section V, the authors collected fourty-two (42) equivalent sentences from three subjects. Each item in the enumeration below shows an equivalent sentences in the first line and the OOCM associations derived from the sentence in the following line(s). The fourty-two equivalent sentences derives eighty-five (85) OOCM associations.

1) *The surroundings of the house looks shady and cool.*
   Object(*the surroundings of the house*) **looks** Appearance(*shady*)
   Object(*the surroundings of the house*) **looks** Appearance(*cool*)

2) *Popeye climbs to the roof by a ladder.*
   Actor(*Popeye*) **performs** Action(*climb*)
   Action(*climb*) **isPerformedToward** Goal(*the roof*)
   Action(*climb*) **uses** Instrument(*a ladder*)

3) *Popeye lays bricks very quickly.*
   Actor(*Popeye*) **performs** Action(*lay*)
   Action(*lay*) **affects** Object(*bricks*)
   Action(*lay*) **byTheWayOf** Manner(*quickly*)

4) *Popeye feels satisfied.*
   Animate(*Popeye*) **feels** Feeling(*satisfied*)

5) *Popeye slides down the stair.*
   Actor(*Popeye*) **performs** Action(*slide down*)
   Action(*slide down*) **isPerformedAt** Location(*the stair*)

6) *Popeye puts in the mailbox in front of the fence.*
   Actor(*Popeye*) **performs** Action(*put in*)
   Action(*put in*) **affects** Object(*the mailbox*)
   Action(*put in*) **isPerformedAt** Location(*in front of the fence*)

7) *Popeye wears a yellow T-Shirt.*
   Actor(*Popeye*) **performs** Action(*wear*)
   Action(*wear*) **affects** Object(*a yellow T-Shirt*)

8) *Popeye writes his name on the mailbox.*
   Actor(*Popeye*) **performs** Action(*write*)
   Action(*write*) **affects** Object(*his name*)
   Action(*write*) **isPerformedAt** Location(*on the mailbox*)

9) *The insects eat up the mailbox.*
   Actor(*the insects*) **performs** Action(*eat up*)
   Action(*eat up*) **affects** Object(*the mailbox*)

10) *Popeye closes the gate.*
    Actor(*Popeye*) **performs** Action(*close*)
    Action(*close*) **affects** Object(*the gate*)

11) *Popeye is in a panic.*
    Animate(*Popeye*) **looks** Appearance(*in a panic*)

12) *Popeye blocks the insects.*
    Actor(*Popeye*) **performs** Action(*block*)
    Action(*block*) **affects** Object(*the insects*)

13) *Popeye catches the insects into the trash can.*
    Actor(*Popeye*) **performs** Action(*catch*)
    Action(*catch*) **affects** Object(*the insects*)
    Action(*catch*) **isPerformedToward** Goal(*the trash can*)

14) *The insects escape from the trash can.*
    Actor(*the insects*) **performs** Action(*escape*)
    Action(*escape*) **isPerformedFrom** Source(*the trash can*)

15) *Popeye repairs the fence by the hammer.*
    Actor(*Popeye*) **performs** Action(*repair*)
    Action(*repair*) **affects** Object(*the fence*)
    Action(*repair*) **uses** Instrument(*the hammer*)

16) *Popeye looks stressful.*
    Animate(*Popeye*) **looks** Appearance(*stressful*)

17) *Popeye casts out the insects with wheels.*
    Actor(*Popeye*) **performs** Action(*cast out*)
    Action(*cast out*) **affects** Object(*the insects*)
    Action(*cast out*) **uses** Instrument(*wheels*)

18) *The insects run towards the river.*
    Actor(*the insects*) **performs** Action(*run*)
    Action(*run*) **isPerformedToward** Goal(*the river*)

19) *The insects ruin the bridge.*
    Causer(*the insects*) **causes** Action(*ruin*)
    Action(*Action*) **affects** Object(*the bridge*)

20) *Popeye falls into the river.*
    Experiencer(*Popeye*) **experiences** Action(*fall*)
    Action(*fall*) **isPerformedToward** Goal(*the river*)

21) *The insects rush for the house.*
    Actor(*the insects*) **performs** Action(*rush*)
    Action(*rush*) **isPerformedToward** Goal(*the house*)

22) *Popeye digs a trench by the shovel.*
    Actor(*Popeye*) **performs** Action(*dig*)
    Action(*dig*) **affects** Object(*a trench*)
    Action(*dig*) **uses** Instrument(*the shovel*)

23) *Popeye fills the trench with water.*
    Actor(*Popeye*) **performs** Action(*fill*)
    Action(*fill*) **affects** Object(*the trench*)
    Action(*fill*) **uses** Instrument(*the water*)

24) *The insects look angry.*
    Animate(*the insects*) **looks** Appearance(*angry*)

25) *Popeye feels secure.*
    Animate(*Popeye*) **feels** Feeling(*secure*)

26) *Popeye enters to the house.*
Actor(*Popeye*) **performs** Action(*enter*)
Action(*enter*) **isPerformedToward** Goal(*the house*)
27) *Popeye locks the door.*
Actor(*Popeye*) **performs** Action(*lock*)
Action(*lock*) **affects** Object(*the door*)
28) *Popeye reads a book.*
Actor(*Popeye*) **performs** Action(*read*)
Action(*read*) **affects** Object(*a book*)
29) *The insects cross the trench with a can.*
Actor(*the insects*) **performs** Action(*cross*)
Action(*cross*) **isPerformedAt** Location(*the trench*)
Action(*cross*) **uses** Instrument(*a can*)
30) *The insects enter to popeye's house.*
Actor(*the insects*) **performs** Action(*enter*)
Action(*enter*) **isPerformedToward** Goal(*Popeye's house*)
31) *Popeye looks shocked.*
Animate(*Popeye*) **looks** Appearance(*shocked*)
32) *The insects destroy the house.*
Causer(*the insects*) **causes** Action(*destroy*)
Action(*destroy*) **affects** Object(*the house*)
33) *Popeye falls into the bathtub.*
Actor(*Popeye*) **performs** Action(*fall*)
Action(*fall*) **isPerformedToward** Goal(*the bathtub*)
34) *The insects look satiate.*

35) Animate(*the insects*) **looks** Appearance(*satiate*)
Popeye eats spinach.
Actor(*Popeye*) **performs** Action(*eat*)
Action(*eat*) **affects** Object(*spinach*)
36) *Popeye looks strong.*
Animate(*Popeye*) **looks** Appearance(*strong*)
37) *Popeye rebuilds his house with the metal.*
Actor(*Popeye*) **performs** Action(*rebuild*)
Action(*rebuild*) **affects** Object(*his house*)
Action(*rebuild*) **uses** Instrument(*the metal*)
38) *Popeye rebuilds the house in a moment.*
Actor(*Popeye*) **performs** Action(*rebuild*)
Action(*rebuild*) **affects** Object(*his house*)
Action(*rebuild*) **byTheWayOf** Manner(*in a moment*)
39) *The insects look tired.*
Animate(*the insects*) **looks** Appearance(*tired*)
40) *Popeye triumphs over the insects.*
Actor(*Popeye*) **performs** Action(*triumph over*)
Action(*triumph over*) **affects** Object(*the insects*)
41) *The insects eat a cigar.*
Actor(*the insects*) **performs** Action(*Action*)
Action(*eat*) **affects** Object(*a cigar*)
42) *Popeye feels relieved.*
Animate(*insects*) **feels** Feeling(*relieved*)