Semantic Computation of the Propositional Model Composites in Enactment Logic.

Frank Appiah

July 30, 2021

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FRANK APPIAH.

KING' COLLEGE LONDON, ART & SCIENCE RESEARCH OFFICE, WATERLOO, ENGLAND, UNITED KINGDOM.

appiahnsiahfrank@gmail.com.

frank.appiah@kcl.ac.uk

Extended Abstract[+]. This research is on enactment logic modeled as propositional composites in a variable environment. Furthermore is semantic computations with truth-value interpretations that formulates true(T) or false(F) terms. Validity of possible model of the language is consequent of satisfiable models. This is determined in this research work.

Keywords. enactment, environment, semantics, composites, model, logic, satisfiability, validity.

Year of Study: 2013 **Year of Publication: 2020**

1 ***AFFILIATE. UNIVERSITY OF LONDON, KING'S COLLEGE LONDON, DEPARTMENT OF INFORMATICS, LONDON, UK.**

1 INTRODUCTION

The semantics of a logical language is defined in terms of truth-valued interpretation. In the case of propositional logic[3], an environment

$m: VARIABLES(\alpha) \rightarrow \{T, F\}$,

assigning the truth values to the variables of a formula α can be extended to α by the following:

m(T) = T and m(F)=F,

$m(\neg\beta)=T \, if \; m(\alpha)=F$

= F otherwise,

$m((\beta \cup \lambda))=F \quad if \quad m(\beta)=m(\lambda)=F$,

= T, otherwise,

$m((\beta \cap \lambda))=T \quad if \quad m(\beta)=m(\lambda)=F$

=F otherwise.

An interpretation is also known as a model[6]. α is satisfied in model environment, m if m(α)=T. It is valid if it is satisied in every possible model of language. Given formulas $\alpha_1 ..... \alpha_k$ and β, β is the consequence of $\alpha_1 ..... \alpha_k$, if for every m.

$m(\alpha_1)=1 ..... m(\alpha_k)=T$ implies $m(\alpha)=T$

Results of Work[1, 2, 3]:

The formulas of propositional enactment consist of:

(1) *propositional constants*; T and F.

(2) *propositional variables*; a , a_i , a_j , l , t , $rank_i$, $enact_E$ and $enact_L$.

(3) *propositional composites*;

Composites	Propositional
or-Composites	(i) $\neg enact_E \vee enact_L$ (ii) $\neg a_i \vee a$ (iii) $\neg a_j \vee l$ (iv) $\neg rank_i \vee t$
not-Composites	(i) $\neg enact_E$ (ii) $\neg a_i$ (iii) $\neg a_j$ (iv) $\neg rank_i$
and-composites	(i) $(a_i \rightarrow a) \wedge (a \rightarrow a_i)$ (ii) $(a_j \rightarrow l) \wedge (l \rightarrow a_j)$ (iii) $(enact_E \rightarrow enact_L) \wedge (eanct_L \rightarrow enact_E)$ (iv) $(rank_i \rightarrow t) \wedge (t \rightarrow rank_i)$
implies-composites	(i) $enact_E \rightarrow enact_L$ (ii) $a_i \rightarrow a$ (iii) $a_j \rightarrow l$ (iv) $rank_i \rightarrow t$

$\vee$ -composites are V-clauses of disjunctive literals. $\wedge$ - composites are $\wedge$ clauses of conjunctive literals. The literal is a logical constant or the negation of a constant or variable. Enactment logic[1] is the term for the formulas of the propositional enactment.

2 MODELS OF ENACTMENT LOGIC

The models of enactment logic are:

(1) $enact_E \rightarrow enact_L$

(2) $a_i \rightarrow a$

(3) $a_j \rightarrow l$

(4) $rank_i \rightarrow t$

(5) $enact_E \rightarrow (enact_E \rightarrow a_i)$

(6) $eanct_L \rightarrow (a_j \rightarrow l)$

(7) $a_i \rightarrow (a_j \rightarrow l)$

(8) $a_j \rightarrow (l \rightarrow rank_i)$

(9) $l \rightarrow (rank_i \rightarrow t)$

The propositional models[4] play a role in the automatic reasoning of enactment logic. Truth table is a simple approach to dertermining validity and possibly a satisfied model. There are 2^8 number of model lines where j is the number variables; 8 so the computations time will generally grow exponentially in j, 8.

3 CONSEQUENCE OF SEMANTICS

This will look at validity by truth-value interpretation and consequence of semantic by implication[6]. Series of question(9) will be asked in terms of semantic consequent and validation of question is given as answer.

Questions:

(1) Is $(enact_E \rightarrow enact_L)$ a consequence of $(\neg enact_E \vee enact_L)$?

Answer:

m	$enact_E$	$enact_L$	$\neg enact_E$	$\neg enact_E$ **or** $enact_L$
0	F	F	T	T
1	F	T	T	T
2	T	F	F	F
3	T	T	F	T

List of Satisfiable Models:

$m_2(enact_E)=T$, $m_3(enact_E)=T$

$m_1(enact_L)=T$, $m_3(enact_L)=T$

Valid Models: $m_3(enact_E)=m_3(enact_L)=T$

(2) Is $(a_i \rightarrow a)$ a consequence of $(\neg a_i \vee a)$?

Answer:

m	a_i	a	$\neg a_i$	$\neg a_i \vee a$
0	F	F	T	T
1	F	T	T	T
2	T	F	F	F
3	T	T	F	T

List of satisfiable Models:

$m_2(a_i)=m_3(a_i)=T$

$m_1(a)=m_3(a)=T.$

Valid Model:

$m_3(a)=m_3(a_i)=T.$

(3) Is $(a_j \rightarrow l)$ a consequence of $(\neg a_j \vee l)$?

Answer:

Truth table of (1) and (2) can be repeated with variables a_j and l .

List of Satisfiable Models:

$m_2(a_j)=m_3(a_j)=T$

$m_1(l)=m_3(l)=T$.

Valid Model: $m_3(a_j)=m_3(l)=T$.

(4) Is $(rank_i \rightarrow t)$ a consequence of $(\neg rank_i \vee t)$?

Answer:

List of Satisfiable Models: $m_2(rank_i)=m_3(rank_i)=T$

$m_1(t)=m_3(t)=T$

Valid Model: $m_3(rank_i)=m_3(t)=T$

(5) Is $(enact_E \rightarrow (enact_L \rightarrow a_i))$ a consequence of $((enact_E \rightarrow enact_L) \rightarrow (enact_E \rightarrow a_i))$? This solution's truth table is omitted for space available reason.

List of Satisfiable Models:

$m_0(enact_E)=m_2(enact_E)=m_3(enact_E)=T$;

$m_0(enact_L)=m_4(enact_L)=m_5(enact_L)=L$;

$m_0(a_i)=m_4(a_i)=m_2(a_i)=m_6(a_i)=T.$

Valid Models:

$m_o(enacts_E)=m_0(enact_L)=m_0(a_i)=T$

(6) Is $enact_L \to (a_i \to a)$ a consequence of

$(enact_L \to a_i) \to (enact_L \to a)$?

Answer:

Repeated Table(5) with variables $enact_L$, a_i and a in that order.

List of Satisfiable Models:

$m_0(enact_L) = m_2(enact_L) = m_3(enact_L) = T$;

$m_0(a_i) = m_4(a_i) = m_5(a_i) = T$;

$m_0(a) = m_4(a) = m_2(a) = m_6(a) = T$.

Valid Models:

$m_0(enact_L) = m_0(a_i) = m_0(a) = T$.

(7) Is $a_j \to (l \to rank_i)$ a consequence of

$(a_j \to l) \to (a_j \to rank_i)$?

Answer:

List of Satisfiable Models: Repeat Ans (6) t

Valid Models : $m_0(a_j) = m_0(l) = m_0(rank_i) = T$

(8) Is $a_j \to (a_j \to l)$ a consequence of $((a_i \to a_j) \to (a_i \to l))$?

Answer:

List of Satisfiable Models: Repeat Ans(7).

Valid Models: $m_0(a_i) = m_0(a_j) = m_0(l)$.

(9) Is $l \to (rank_i \to t)$ a consequence of $((l \to rank_j) \to (l \to t))$?

Answer:

LSM: Repeat Ans(8).

Valid Model: $m_0(l) = m_0(rank_i) = m_0(t)$.

4 CONCLUSION

In concluding remark, a model environment of enactment propositions are realized and achieved. Four composites of enactment logic were formulated. Afterwards, semantic computations are used to create both satisfiable model and valid models of propositional enactment. This research finds satisfiability and validity in enactment logic as proved by semantic consequents of 9 counter-examples.

Compliance with Ethical Standards:

(In case of funding) Funding: This is research is funded by King's Alumni Group, Association of Engineering with ISAreference grant number: 204424 20821845.

Conflict of Interest:

Author, Dr. Frank Appiah declares that he has no conflict of interest .

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