Classwork N°10
due to 4th May 2012

Exercise: "Application of combinators to natural language analysis: aspecto-temporal analysis"

1. Derived combinators

We introduce the powers of a combinator X^n and the deferred combinators X_n, where the X is a combinator.

Gave on the board during the classwork

(a) $B_5C_2B^2CB^2$ x y z f g

(b) $B_3(C_2B^2)$ x y z f g

(c) C_3B_2B x y z f

(d) $(B^2C_3)BB^2C$ x y z f g

2. Introduction of the aspecto-temporal operators.

Give the representation of the following discourses by using the aspecto-temporal operators; STATE(O), EVENT(F), PROC(J), I-SAY.

Dialogue a.

This morning, a car accident occurred (on a certain street intersection). A man hit someone with his red car and flew away. The police chase the red car (at this moment).

π1.1. This morning (reform: All that follows occurred last night): Temporal Framework, $STATE_{O1}$ (state)
π1.2. a car accident occurred : $EVEN_{F1}$ (event)
π2.1. A man hit someone with his red car: $EVEN_{F2}$ (event)
π2.2. and flew away: $EVEN_{F3}$ (event)
π3. The police chase the red car : $PROC_{J1}$ (incomplete process)

π1.1. $PROC_{J0}$ (I-SAY (& ($STATE_{O1}$ (All that follows occurred this morning)) [$\delta(O^1) < \delta(J^0)$])

π1.2. $PROC_{J0}$ (I-SAY (& ($EVEN_{F1}$ (occurred (a car accident)) [$\delta(F^1) < \delta(J^0)$])

π2.1. $PROC_{J0}$ (I-SAY (& ($EVEN_{F2}$ ((((with his red car)hit) (someone))(a man))) [$\delta(F^2) < \delta(J^0)$])

π2.2 $PROC_{J0}$ (I-SAY (& ($EVEN_{F3}$ ((away(flew)) (a man)))[$\delta(F^3) < \delta(J^0)$])

p3. $PROC_{J0}$ (I-SAY (& ($PROC_{J1}$ ((chase (the red car))(the police))) [$\delta(J^1) = \delta(J^0)$])

1/ a car accident occurred

2/ ((-ed occur)(a car accident))

3/ past-suffix P_1A^1

4/ COMPLETE-EVENT-PAST (P_1A^1)

5/ [COMPLETE-EVENT-PAST=X & ([$\delta(F^1) < \delta(J^0)$]) I-am-saying $EVEN_{F1}$]

6/ [X= $B_6C_3C_3CB^2$]

7/ I-am-saying (& ($EVEN_{F1}$(P_1A^1))([$\delta(F^1) < \delta(J^0)$]))

8/ [I-am-saying =**B** $PROC_{J0}$ (I-SAY)]

9/ $PROC_{J0}$ (I-SAY (& ($EVEN_{F1}$ (P_1A^1)) ([$\delta(F^1) < \delta(J^0)$])))

10/ $PROC_{J0}$ (I-SAY (& ($EVEN_{F1}$ (occur (a car accident)) [$\delta(F^1) < \delta(J^0)$])

1/ the police chase the red car

2/ ((chase (the red car))(the police)))

3/ ($prst_{-process}$ (P_2)) A^2A^1

4/ [**$prst_{-process}$** = déf B^2INC_PRST]

5/ B^2 INC_PRST P_2 A^2 A^1 int. B^2

6/ INC_PRST (P_2 A^2 A^1) rempl. 6, 5

7/ [INC_PRST=déf ∃ J^0 J^1{B^2(C_2 B) B^2 I-am-saying$_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$])}] int. ∃

8/ [INC_PRST $_{J1\ J0}$ =déf B^2 (C_2 B) B^2 I-am-saying$_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^y)$])] def.

9/ B^2 (C_2 B) B^2 I-am-saying$_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$]) (P_2 A^2 A^1) int. B^2

10/ C_2 B (B^2 I-am-saying$_{J0}$ &) $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$]) (P_2 A^2 A^1) int. C_2

11/ B (B^2 I-am-saying$_{J0}$ &) $PROC_{J1}$ (P_2 A^2 A^1) ([$\delta(J^1)=\delta()$]) int. B

12/ B^2 I-am-saying$_{J0}$ & ($PROC_{J1}$ (P_2 A^2 A^1)) ([$\delta(J^1)=\delta(J^0)$]) int. B^2

13/ I-am-saying$_{J0}$ (& ($PROC_{J1}$ (P_2 A^2 A^1)) ([$\delta(J^1)=\delta(J^0)$])) hyp.

14/ I-am-saying$_{J0}$ (& ($PROC_{J1}$ ((chase (the red car))(the police)))) ([$\delta(J^1)=\delta(J^0)$]))

Dialogue b.

Anna is explicating the reason for being late (to her boss): " I went to the garage. And I found that I forgot to put oil in the car. So I have taken the bus." (Lascarides and Asher, 1993)

π1. $PROC_{J0}$ (I-SAY (& ($PROC_{J1}$ ((is explicating (the reason for being late))(Anna))) [$\delta(J^1) = \delta(J^0)$])

π2. $PROC_{J0}$ (I-SAY (& ($EVEN_{F1}$ (((to the garage)went)(I))) [$\delta(F^1) < \delta(J^0)$])

π3. $PROC_{J0}$ (I-SAY (& ($EVEN_{F2}$ ((((in the car)(to put oil)) (forgot))(I))) [$\delta(F^2) < \delta(J^0)$])

π4. $PROC_{J0}$ (I-SAY (& ($EVEN_{F3}$ ((have taken(the bus)) (I)))[$\delta(F^3) < \delta(J^0)$])

1/ Anna is explicating the reason for being late

2/((((is -ing) explicat-) (the reason for being late))(Anna)))

3/ ($\underline{prst}_{-process}$ (P_2)) A^2A^1

4/ [$\mathbf{prst}_{-process}$ = déf B^2INC_PRST]

5/ B^2 INC_PRST P_2 A^2 A^1 int. B^2

6/ INC_PRST (P_2 A^2 A^1) rempl. 6, 5

7/ [INC_PRST=déf ∃ J^0 J^1{B^2(C_2 B) B^2 $\underline{\text{I-am-saying}}_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$])}] int. ∃

8/ [INC_PRST $_{J1\ J0}$ =déf B^2 (C_2 B) B^2 $\underline{\text{I-am-saying}}_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^y)$])] def.

9/ B^2 (C_2 B) B^2 $\underline{\text{I-am-saying}}_{J0}$ & $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$]) (P_2 A^2 A^1) int. B^2

10/ C_2 B (B^2 $\underline{\text{I-am-saying}}_{J0}$ &) $PROC_{J1}$ ([$\delta(J^1)=\delta(J^0)$]) (P_2 A^2 A^1) int. C_2

11/ B (B^2 $\underline{\text{I-am-saying}}_{J0}$ &) $PROC_{J1}$ (P_2 A^2 A^1) ([$\delta(J^1)=\delta()$]) int. B

12/ B^2 $\underline{\text{I-am-saying}}_{J0}$ & ($PROC_{J1}$ (P_2 A^2 A^1)) ([$\delta(J^1)=\delta(J^0)$]) int. B^2

13/ $\underline{\text{I-am-saying}}_{J0}$ (& ($PROC_{J1}$ (P_2 A^2 A^1)) ([$\delta(J^1)=\delta(J^0)$])) hyp.

14/ $\underline{\text{I-am-saying}}_{J0}$ (& ($PROC_{J1}$ (explicate (the reason for being late) (Anna))) ([$\delta(J^1)=\delta(J^0)$]))

1/ I have taken the bus

2/ ((have -en take)(the bus)(I))

3/ past-suffix $P_2A^2A^1$

4/ $\underline{\text{COMPLETE-EVENT-PAST}}$ ($P_2A^2A^1$)

5/ [$\underline{\text{COMPLETE-EVENT-PAST}}$=X & ([$\delta(F^3) < \delta(J^0)$]) $\underline{\text{I-am-saying}}$ $EVEN_{F3}$]

6/ [X= $B_6C_3C_3CB^2$]

7/ $\underline{\text{I-am-saying}}$ (& ($EVEN_{F3}$($P_2A^2A^1$))([$\delta(F^3) < \delta(J^0)$]))

8/ [$\underline{\text{I-am-saying}}$ =**B** $PROC_{J0}$ (I-SAY)]

9/ $PROC_{J0}$ (I-SAY (& ($EVEN_{F3}$ ($P_2A^2A^1$)) ([$\delta(F^3) < \delta(J^0)$])))

10/ $PROC_{J0}$ (I-SAY (& ($EVEN_{F3}$ (take (the bus)(I)) [$\delta(F^3) < \delta(J^0)$])

(1) Give the predicate-argument structure of the sentences

(2) Define the temporal relations between the sentences and formalize it

(3) Try to establish the enunciative schemes of the given dialogues