Task 1: Parsing and Evaluation

After parsing all ten sentences in the test corpus, we got all of the results of the ten sentences as shown in the format.

	Sentence1	Sentence2	Sentence3	Sentence4	Sentence5	Sentence6	Sentence7	Sentence8	Sentence9	Sentence10
	0.00011	0.0000043	0.0000041	0.0014	0.0000064	0.000010	0.000037	0.000000063	0.00021	0.00013
	0.00058	0.00002….4	0.00071		0.0011	0.00017	0.00019	0.000001…5	0.0011	0.0022
		0.00002….7						0.000001…3		

For the ten sentences, six sentences assign the highest probability to the preferred parse tree, which marked as green label. Also there are four sentences assign wrong results, which marked as red label.

To analyze the error, I check all the sentences in test case and training case. It is easy to find there are two problems when we use PCFG parsing in Prolog.
First, because the possibility of rule s->v, np is smaller than the rule s->v,np,pp, when we meet sentences like “take the block on the green circle”, we prefer to choice rule s->v,np,pp, however, for the two different verb word – put, take, we prefer to choice “put” to parse according rule s->v,np,pp and “take” to parse according rule s->v,np. Therefore, we need to explicit our goal.

Second, for these sentences use “put” as the verb word, when we meet the nous phrase need to parse as rule np->det, a, n or np->det, a, n, pp like “put the blue cone on the red circle on the green circle”, we should use rule np->det, a, n, pp to parse the first nous phrase and rule np->det, a, n to parse the remaining, however, according the possibility we prefer to choice rule np->det, a, n as first.

Task 2: Grammar Transformation

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s(P0, s(V, NP)) --> v(P1, V), np(P2, NP), {V=v(take),P0 is P1*P2*0.35}.
s(P0, s(V, NP, PP)) --> v(P1, V), np(P2, NP), pp(P3, PP), {V=v(put),P0 is P1*P2*P3*0.65}.

np(P0, np(D, N)) --> det(P1, D), n(P2, N), {P0 is P1*P2*0.36}.
np(P0, np(D, A, N)) --> det(P1, D), a(P2, A), n(P3, N), {P0 is P1*P2*P3*0.46}.
np(P0, np(D, N, PP)) --> det(P1, D), n(P2, N), pp(P3, PP), {P0 is P1*P2*P3*0.13}.
np(P0, np(D, A, N, PP)) --> det(P1, D), a(P2, A), n(P3, N), pp(P4, PP), {P0 is P1*P2*P3*P4*0.05}.

pp(P0, pp(P, NP)) --> p(P1, P), np(P2, NP), {P0 is P1*P2*1.0, NP\=np(_,_,_,_)}.
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I change two sentences, first, we need to add explicit goal for the verb word. Second, we need to make sure the NP in PP is not combine with det, a, n and pp.