Concrete syntax and related cases

1. The concrete BNF syntax of ***Scenario entity description module***:

ID	BNF 范式
1	*CH-Scenario* ::= “[” <*Map*> <*RoadNetwork*> <*Weather*> <*NeturalDisaster*> <*SpecialHighRisk*> <*Entities*> “]”
2	*Map* ::= “*map*:” <*String*>
3	*RoadNetwork* ::= “[” {*Road*} “]”
4	*Road* ::= “*name*:” <*String*> <*LeftBoundary*> <*RoadLines*> <*RightBoundary*>
5	*LeftBoundary* ::= {*Location*}
6	*RoadLines* ::= {*Location*}
7	*RightBoundary* ::= {*Location*}
8	*Location* ::= “(”<*float*>“, ”<*float*>“)”
9	*Weather* ::= “[” <*Cloudiness*> <*Wetness*> <*Air_pressure*> <*Precipitation*> <*Wind_intensity*> <*Visibility*> “]”
10	*Cloudiness* ::= “*cloudiness*:” <*float*>
11	*Wetness* ::= “*wetness*:” <*float*>
12	*Air_pressure* ::= “*air_pressure*:” <*float*>
13	*Precipitation* ::= “*precipitation*:” <*float*>
14	*Wind_intensity* ::= “*wind_intensity*:” <*float*>
15	*Visibility* ::= “*visibility*:” <*float*>
16	*NeturalDisaster* ::= “[” <*MeteorologicalDisaster*> <*GeologicalDisaster*> “]”
17	*MeteorologicalDisaster* ::= “[” <*Rainstorm*> <*Sandstorm*> <*Typhoon*> <*Tornado*> “]”
18	*Rainstorm* ::= “*rainstorm*:” <*boolean*>
19	*Sandstorm* ::= “*sandstorm*:” <*boolean*>
20	*Typhoon* ::= “*typhoon*:” <*boolean*>
21	*Tornado* ::= “*tornado*:” <*boolean*>
22	*GeologicalDisaster* ::= “[” <*DebrisFlow*> <*Landslide*> <*Collapse*> “]”
23	*DebrisFlow* ::= “*debrisflow*:” <*boolean*>
24	*Landslide* ::= “*landslide*:” <*boolean*>
25	*Collapse* ::= “*collapse*:” <*boolean*>
26	*SpecialHighRisk* ::= “[” <*Rough*> <*IceRoad*> <*SteepDescentAhead*> <*Muddy*> <*Wade*> “]”
27	*Rough* ::= “*rough*:” <*boolean*>
28	*IceRoad* ::= “*iceroad*:” <*boolean*>
29	*SteepDescentAhead* ::= “*steepdescentahead*:” <*boolean*>
30	*Muddy* ::= “*muddy*:” <*boolean*>
31	*Wade* ::= “*wade*:” <*boolean*>
32	*Entities* ::= “[” {*Entity*} “]”
33	*Entity* ::= “[” <*StaticEntity*> <*DynamicEntity*> “]”
34	*StaticEntity* ::= “*name*:” <*String*> <*Overview*>
35	*DynamicEntity* ::= “*name*:” <*String*> <*Timestamp*> <*Speed*> <*Acceleration*> <*Track*> <*Aim*>
36	*Timestamp* ::= “*timestamp*:” <*string*>
37	*Speed* ::= “*speed*:” <*float*>
38	*Acceleration* ::= “*acceleration*:” <*float*>
39	*Track* ::= “*track*:” <*string*>
40	*Aim* ::= “*aim*:” <*string*>

2. Concrete syntax related cases of ***Scenario entity description module***:

```
map [ import from MAP
      length : 400
      width : 50 ]

RoadNetwork [ road → name narrow_road
                     left boundary     center lines      right boundary
                     (0.0, 0.0)        (0.0, 25.0)       (0.0, 50.0)
                     (400.0, 0.0)      (400.0, 25.0)     (400.0, 50.0) ]

Weather [ cloudiness: 1.0
          wetness: 1.0
          air_pressure: 1.0
          precipitation: 1.0
          wind_intensity: 1.0
          visibility: 1.0 ]

NaturalDisaster [ MeteorologicalDisaster [ rainstorm: 0
                                           sandstorm: 0
                                           typhoon: 1
                                           tornado: 0 ]
                  GeologicalDisaster [ debrisflow: 0
                                       landslide: 0
                                       collapse: 0 ] ]

SpecialHighRisk [ rough: 0
                  iceRoad: 0
                  steepDescentAhead: 1
                  muddy: 0
                  wade: 1 ]

Entity [ StaticEntity1 [ name pedestrians
                         overview: little boy ]
         StaticEntity2 [ name traffic_light
                         overview: red light ]
         DynamicEntity1 [ name minibus
                          timestamp: 2022 年 1 月 30 日 17:30:42
                          speed: 45.0
                          acceleratiobn: 0.0
                          track: curve to the east
                          aim: The First People's Hospital ] ]
```

3. The concrete BNF syntax of ***Scenario specification module***:

ID	BNF 范式
1	*ConstraintList* ::= "[" {*Safety_Protocol*} {*Constraint*}"]"
2	*Safety_Protocol* ::= "*safety_protocol:*" <*Predicate*>
3	*Predicate* ::= <*p* | "*not*" *Predicate* | *Predicate*"*or*" *Predicate* | *Predicate*"*and*" *Predicate* | *Predicate*"*apply*" *Predicate*>
4	*Constraint* ::= "[" "*relate with*" <*Entity*> {*Event*} {*Action*} {*Guard*} {*Probability*} "]"
5	*Event* ::= "*event:*" "*when*" <*Guard*> "*do*" <*Action*>
6	*Action* ::= "*action:*" {*Statement*}
7	*Guard* ::= "*guard:*" <*LessThan* | *EqualTo* | *GreaterThan* | "*not*" *Guard* | *Guard*"*or*" *Guard* | *Guard*"*and*" *Guard*>
8	*LessThan* ::= <*Numeric*> " < " <*Numeric*>
9	*EqualTo* ::= <*Numeric*> "==" <*Numeric*>
10	*GreaterThan* ::= <*Numeric*> " > " <*Numeric*>
11	*Probability* ::= "*probability:*" <*double*>

4. Concrete syntax related cases of ***Scenario specification module***:

```
constraint list [ constraint1 [ relate with forward_vehicle, current_vehicle
                                safety_protocol: (wiper = true) && (lighton = true) && (hazardlighton = true)
                                event: when guard do action
                                action: position++
                                guard: first_car_parked == false || second_car_parked == false
                                probability: 0.2 ]

                  constraint2 [ relate with currentvehicle, edge
                                safety_protocol: ((dist > safedistance) = true) && (emergencybreak = false)
                                event: when guard do action
                                action: parked = false
                                guard: wait > 5
                                probability: 0.8 ] ]
```