1. Advantages of StateCharts

What are the most important extensions of the StateChart model in comparison to an ordinary Finite state machine (FSM)?

Statecharts建模方法中同时包括了嵌套、状态层次化以及并发的概念, 并扩展了动作的概念。 另外在转移的事件、条件、动作元素中又加入了时间因素, 且其语法也是形式化的, 从而使这种模型的描述能力较之传统状态机大为增强, 适用的范围也更广。

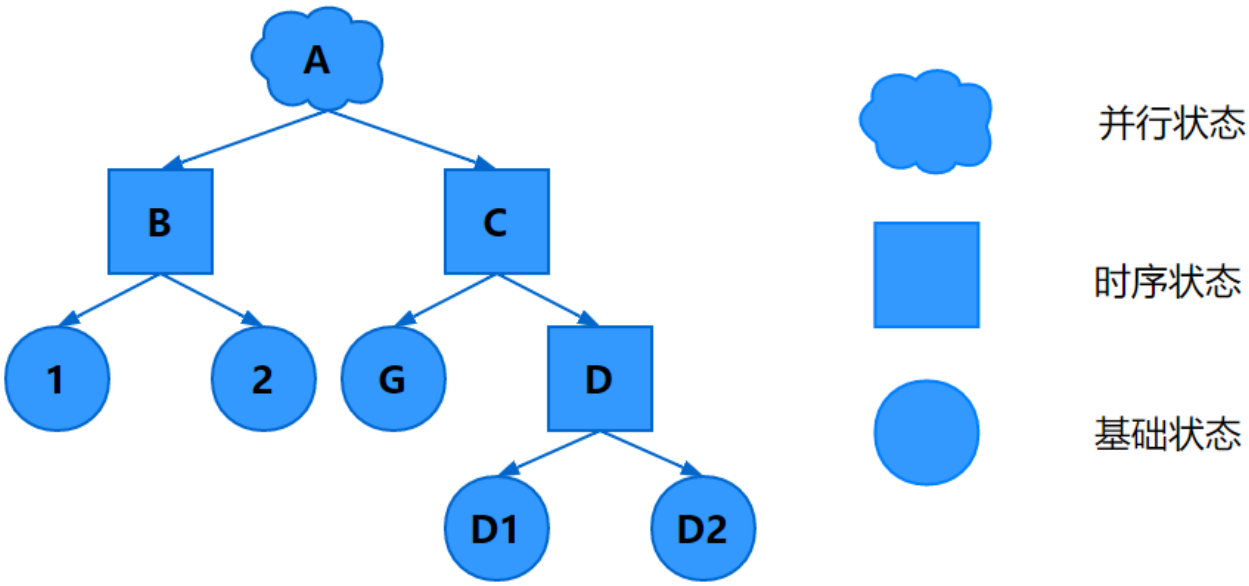
2.Disadvantages of StateCharts

What are the disadvantages of the StateChart formalism?

虽然StateCharts比普通的FSM更好，而且拥有比FSM更多的拓展，但是如果StateCharts过大会导致理解困难，而且状态信息从状态本身转移到变量，使系统分析困难。

3.Tree of states for StateChart

Given the StateChart in Figure 1. Draw the state space of the StateChart as a tree, which shows the hierarchy of states and denotes the state types (basic state, sequential states, and parallel states).Formal



4. Formal computation of state space

How would you formally compute the set of states? Compute the set of states for the hierarchical automata which is defined by the StateChart from Fig.1

$$Z_A = Z_B + Z_C$$

$$= (Z_1 \bigcup Z_2) \times (Z_G \bigcup Z_D)$$

$$= (Z_1 \bigcup Z_2) \times (Z_G \bigcup (Z_{D1} \bigcup Z_{D2}))$$

$$= (Z_1, Z_G) \bigcup (Z_1, Z_{D1}) \bigcup (Z_1, Z_{D2}) \bigcup (Z_2, Z_G) \bigcup (Z_2, Z_{D1}) \bigcup (Z_2, Z_{D2})$$

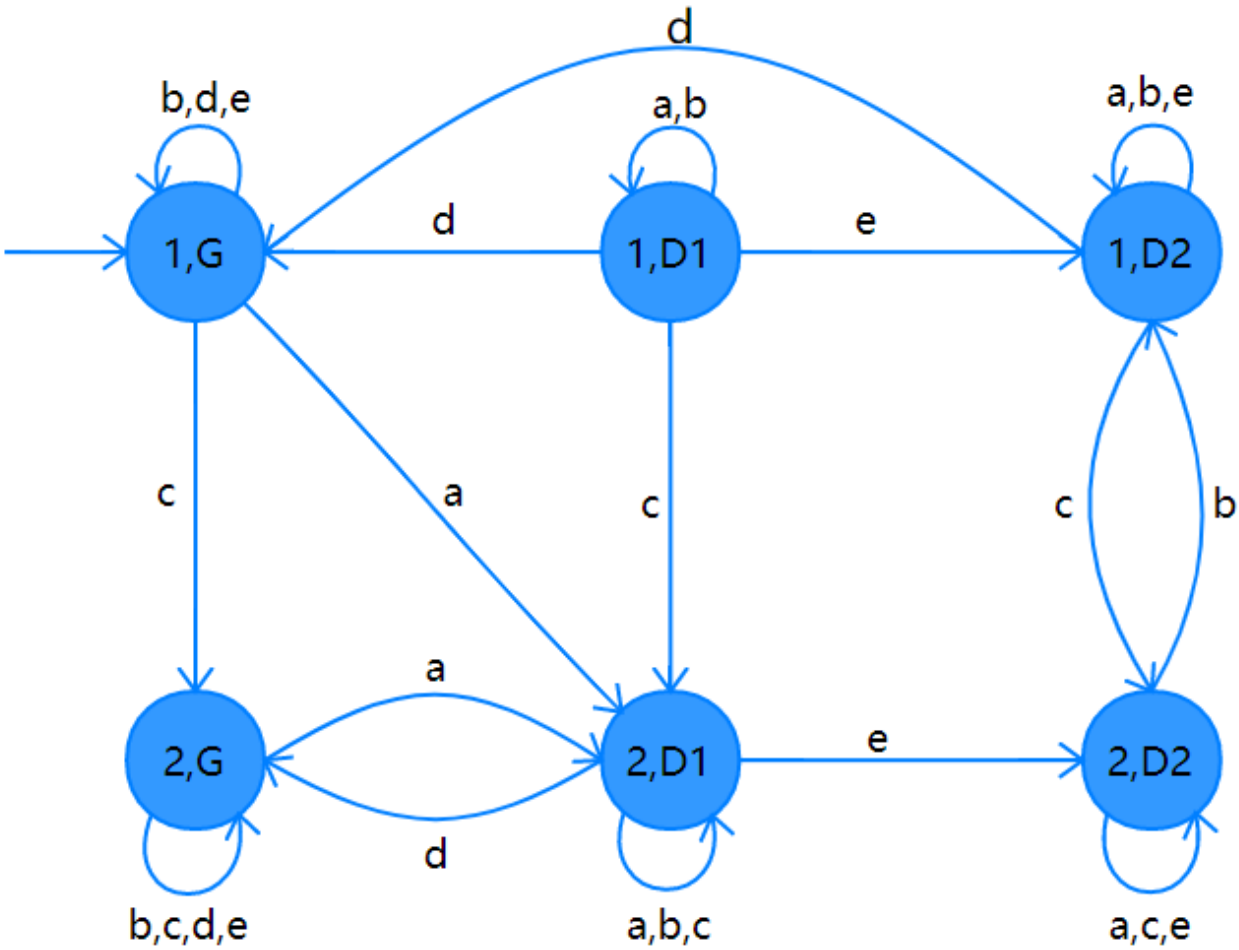
5. Analysis

The automaton defined by the StateChart from Fig. 1 passes through a number of states, when external events are applied. Show the sequence of state that are passed through, starting from the initial state, for the following sequence of events: a,b,e,b,d,b. Use a table notation.

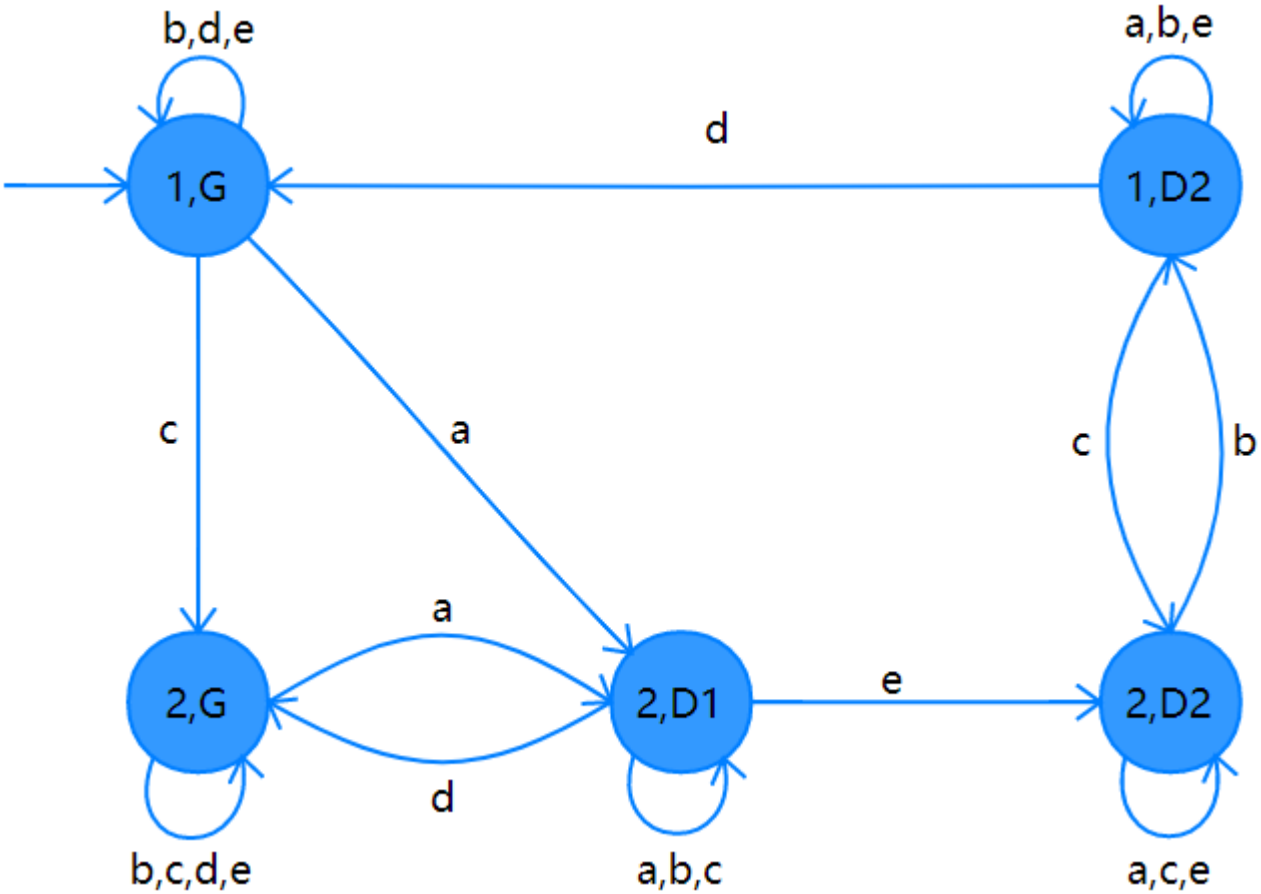
Events	状态A	状态B	状态C
初始	1,G	1	G
a	2,D1	2	D1
b	2,D1	2	D1
e	2,D2	2	D2
b	1,D2	1	D2
d	1,G	1	G
b	1,G	1	G

6.Conversion of StateChart to a finite state machine (FSM)

Draw a finite state machine which is equivalent to the StateChart from Fig. 1. Minimize the number of states.



化简后:



7. StateChart model of a vending machine

The StateChart model of a simplified vending machine is shown in Figure 2.

- **Describe the trace of transitions occurring when the user inserts a coin and orders a tea.**
- **The control of the vending machine has a bug that allows the user to cheat. Describe the trace of transitions that illustrate the bug.**
- **Draw the corresponding StateChart that fixes the bug.**

1.
   - A1-0 $\xrightarrow{coin\_in/ok}$ A1-1
   - A2-A $\xrightarrow{ok/}$ A2-B
   - A2-B $\xrightarrow{req\_tea/start\_tea}$ A2-D
   - A2-D $\xrightarrow{drink\_ready/done}$ A2-A
   - A1-1 $\xrightarrow{done/}$ A1-0
2. bug出现在如果按下req按钮之后在按下cancel之后此时硬币会退同时饮料还是会有。就上面的例子来说：
   - A1-0 $\xrightarrow{coin\_in/ok}$ A1-1
   - A2-A $\xrightarrow{ok/}$ A2-B
   - A2-B $\xrightarrow{req\_tea/start\_tea}$ A2-D
   - A1-1 $\xrightarrow{cancel/coin\_out;reset}$ A1-0
   - A2-D $\xrightarrow{drink\_ready/done}$ A2-A

所以我们要在按下req之后使得A1的取消不能使用，所以就需要使A2按下req之后使A1进入一个新的状态，此时只有等到done之后A1才会回到状态0

3. 此时的输入输出不变，增一个本地变量这里。

   (这个matlab自动加上了[]所以请无视，这里就不打Trigger/Action了反正matlab变量表不认)