

Appendix A: VBS tool

We take a simple serial system.

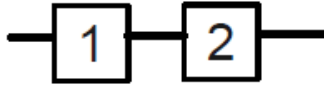


Fig 1. Serial system

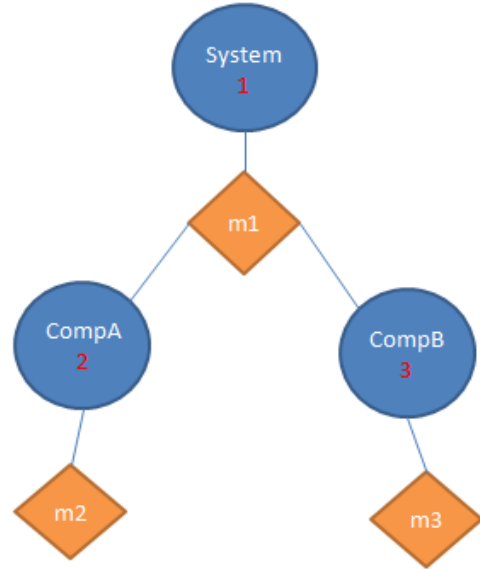


Fig 2. VBS

Fig 1 shows the structure of a serial system made up of two components. Fig 2 is its VBS model.

Step 1. Create the "SimpleExampleFrame.m" which contains all the variables and their frames. Here we think both components are binary. In this case, the whole system is also binary. So we need only one frame. 1 denotes "failed" and 2 denotes "working". There are 3 variables, "System", "CompA" and "CompB". Their frames are 1.

Step 2. Create the "SimpleExample.m". First of all, we should enter all the masses and rules.

```
%  
%CREATE MASSES AND RULES  
%%define variables and frame  
[nf,F,nv,V]=SimpleExampleFrame  
%%insert input beliefs  
[M,nm,rule,nir]=input_belief(F,V,'SimpleExample_mat',0);  
load SimpleExample_mat M nm rule nir  
%%insert time updating fot the beliefs  
[Mi,nmi,rulei,niri]=input_belief(F,V,'time_updating_seq',1);  
save SimpleExample_mat nf F nv V nm M rule nir
```

We enter the above code in Matlab command window, and then we have to enter some information by hand. The following two figures show all the information we have to type by hand. This truth table helps to enter the focal set of m_1 .

System	CompA	CompB
1	1	1
1	1	2
1	2	1
2	2	2

```

Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.

Insert the number of the beliefs 3
1
Joint belief or rule: 1 o 2 1
Joint Belief -> insert variables for this belief: 1 2 3
Insert num focal sets: 1

ans =

     1     1     1
     2     1     1
     1     2     1
     2     2     1
     1     1     2
     2     1     2
     1     2     2
     2     2     2

Focal element in this order
     1     2     3

Insert value es. a b c; d e f; g h i...: 1 1 1; 1 1 2; 1 2 1; 2 2 2
Insert mass for this focal set: 1
2
Joint belief or rule: 1 o 2 1
Joint Belief -> insert variables for this belief: 2
Insert num focal sets: 2

ans =

     1
     2
fx

```

```
Command Window
New to MATLAB? Watch this Video, see Demos, or read Getting Started.

Focal element in this order
    2

Insert value es. a b c; d e f; g h i...: 1
Insert mass for this focal set: 0.8
Focal element in this order
    2

Insert value es. a b c; d e f; g h i...: 2
Insert mass for this focal set: 0.2
3
Joint belief or rule: 1 o 2 1
Joint Belief -> insert variables for this belief: 3
Insert num focal sets: 2

ans =

    1
    2

Focal element in this order
    3

Insert value es. a b c; d e f; g h i...: 1
Insert mass for this focal set: 0.7
Focal element in this order
    3

Insert value es. a b c; d e f; g h i...: 2
Insert mass for this focal set: 0.3
fx >>
```

Step 3. We comment the part of code of entering masses and rules, and then we execute the file "SimpleExample.m" in Matlab command window. The following three figures are the simulation results.

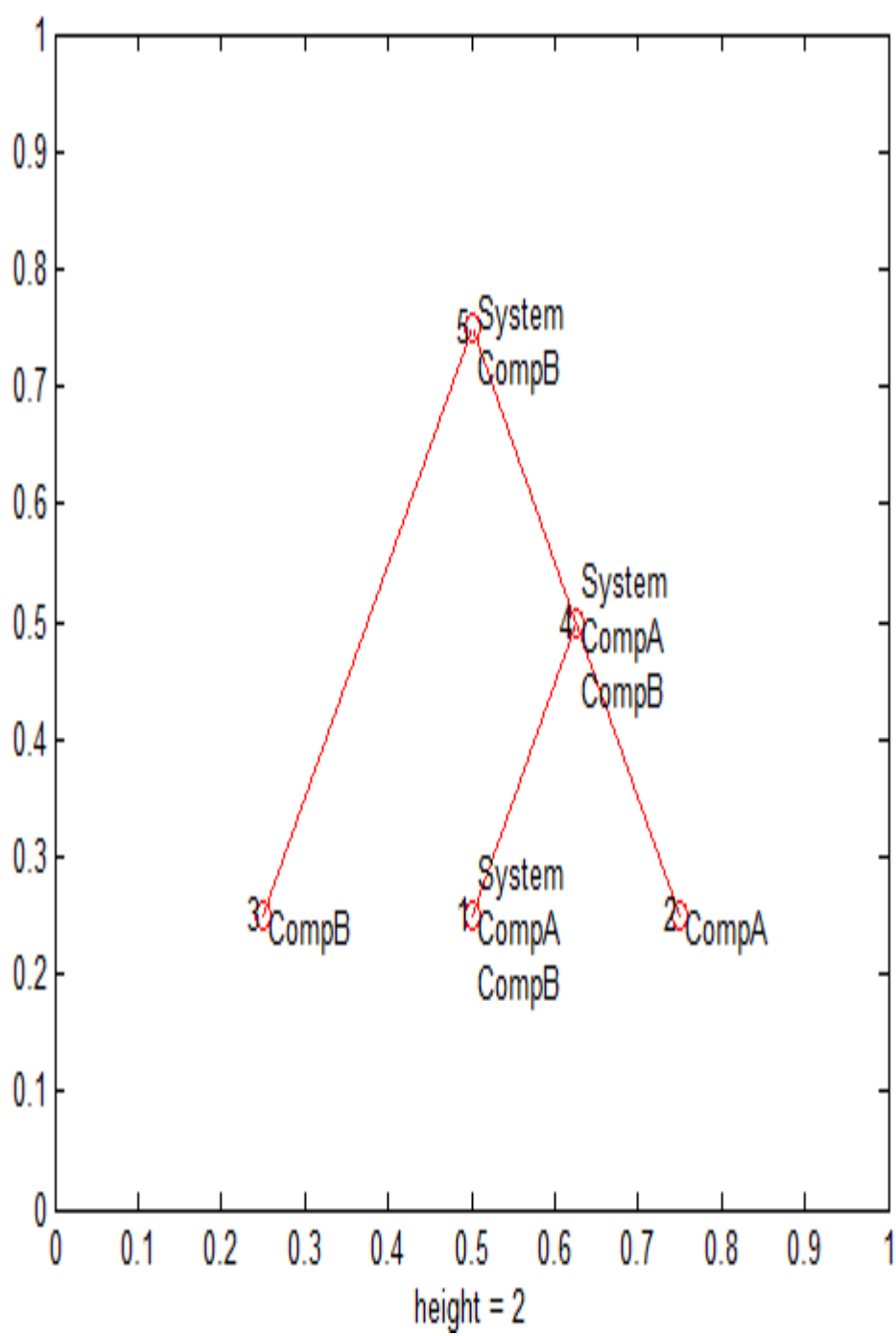


Fig 3. Binary joint three

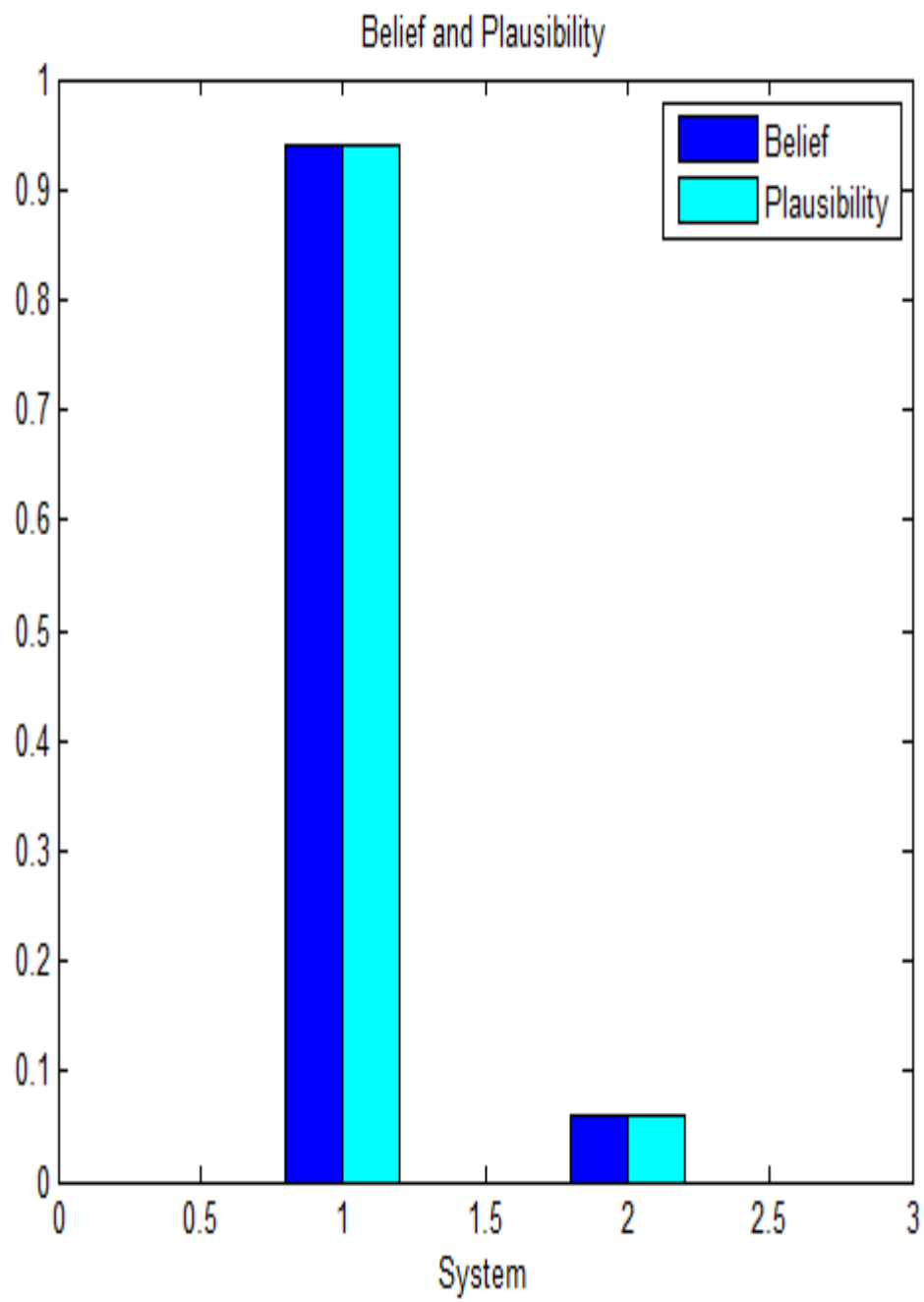


Fig 4. Belief and plausibility

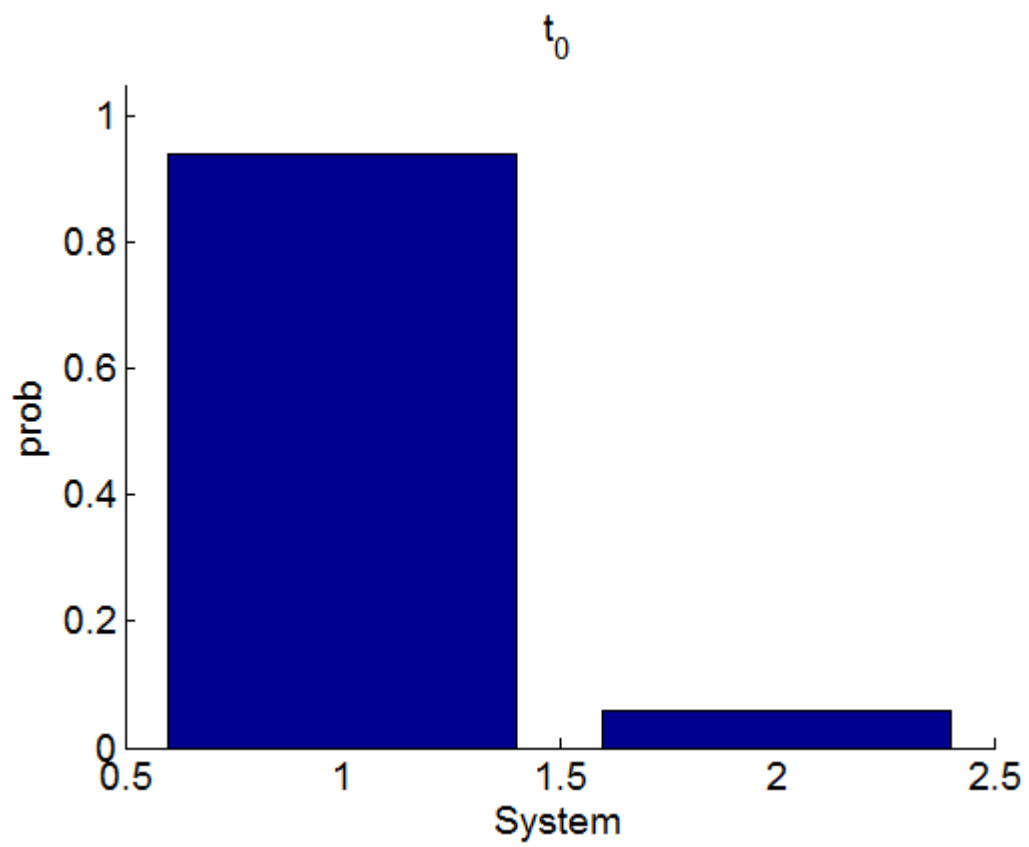


Fig 5. Pignistic probability