

$$=0.5304$$

$$H(\text{integrity})=0.5721, E(\text{availability})=0.6554$$

3) to calculate the information gain of attribute A. Obtained by the formula (3):

$$\begin{aligned} H(\text{confidentiality}) &= I(\text{value}) - H(\text{confidentiality}) \\ &= 0.9810 - 0.5304 \\ &= 0.4506 \end{aligned}$$

$$\begin{aligned} H(\text{integrity}) &= I(\text{value}) - E(\text{integrity}) \\ &= 0.9810 - 0.5721 = 0.4089 \end{aligned}$$

$$\begin{aligned} H(\text{availability}) &= I(\text{value}) - H(\text{availability}) \\ &= 0.9810 - 0.6554 \\ &= 0.3256 \end{aligned}$$

Comparing the above calculation results, information gain of "Confidentiality" is the largest, so it is chosen as a decision tree root. This property "Confidentiality" has three values, so have the three branches. Repeat the above steps, continue to split, then the decision tree will be generated. The results are shown in Figure 1.

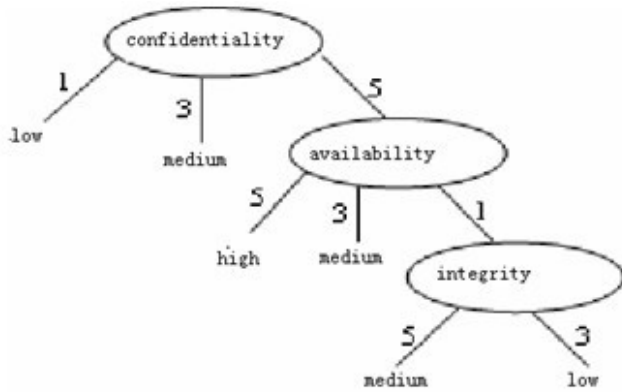


Figure 1. decision tree

C Extracting Classification Rules

The decision tree can be converted into the form of rules, in order to more clearly understand it, as follows:

- IF "confidentiality"="1" THEN "value"="low";
- IF "confidentiality"="3" THEN "value"="medium";
- IF "confidentiality"="5" AND "availability"="5" THEN "value"="high";
- IF "confidentiality"="5" AND "availability"="3" THEN "value"="medium";
- IF "confidentiality"="5" AND "availability"="1" AND "integrity"="3" THEN "value"="low";
- IF "confidentiality"="5" AND "availability"="1" AND "integrity"="5" THEN "value"="medium".

IV. Conclusions

The ID3 algorithm is a decision tree classification algorithm based on information entropy. The algorithm selects attributes with the largest amount of information gain as the test attribute of the current node. It makes the minimum amount of information needed by the data classification, and reflects the principle of minimum randomness. The ID3 algorithm is applied to the recognition of the value of information assets. Thus, we can get the value of the assets identification rules, and provide important support for information security risk evaluations.

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