Study on Ship Design Information Integration Model

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Abstract. In the design phase of product, design information integration model is the important model. A novel design information integration model is proposed in the paper. Ship is used as the research object. Then, the model includes normal design data of ship, credibility design data of ship and maintainability design data of ship. Firstly, design information integration model is introduced, among which normal design data of ship, credibility design data of ship and maintainability design data of ship produced by the design information integration model are introduced. Finally, data structure of ship design information integration system is introduced.

Keywords: Information integration, Design information, Ship design integration model, Credibility design model

1. Introduction

Design information integration model is the important model in the design phase of ship[1,2]. In the paper, a novel design information integration model is proposed. The model includes normal design data of ship, credibility design data of ship and maintainability design data of ship[3,4].
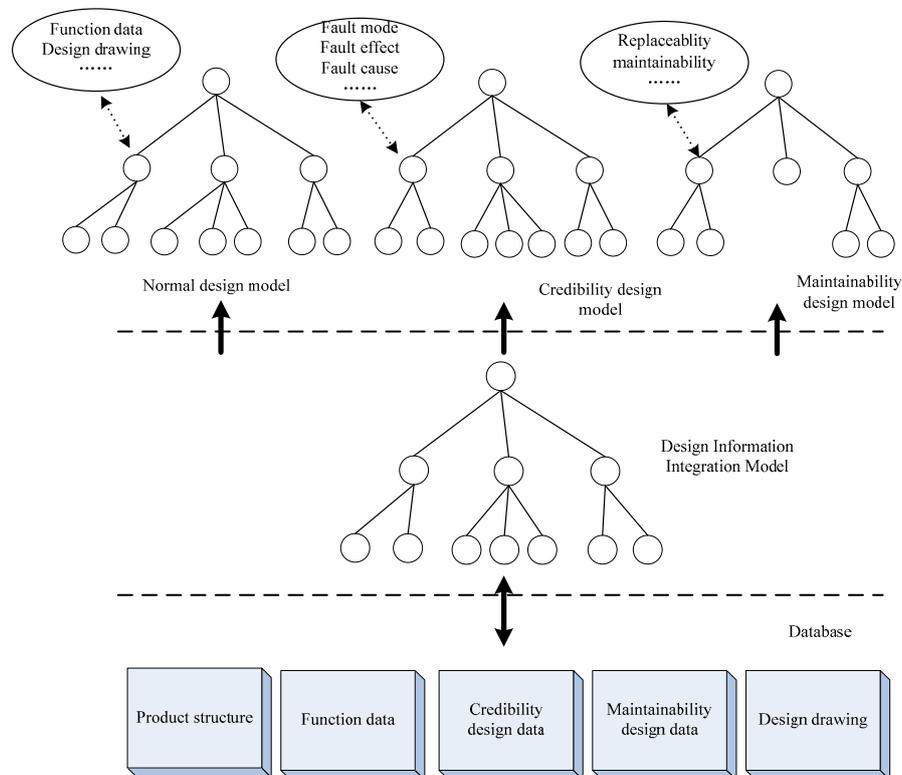

Fig. 1: Design information integration model

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The design information integration model can produce the three models including normal design model of ship, credibility design model of ship and maintainability design model of ship. The normal design model and credibility design model have the function structure tree which expresses the function relationship of different layers in the structure and maintainability design model has maintainability structure tree which expresses the assemblage relationship of different layers in the structure. Finally, data structure of ship design information integration system is introduced.

2. Ship Design Information Integration Model

Design information integration model of ship is shown in Fig.1, which mainly includes normal design data of ship, credibility design data of ship and maintainability design data of ship. Therefore, the design information integration model can produce the three models including normal design model of ship, credibility design model of ship and maintainability design model of ship. Design information integration model produces two kinds of structure tree, one is function structure tree and the other is maintainability structure tree. Among which normal design model and credibility design model have the function structure tree which expresses the function relationship of different layers in the structure and maintainability design model has maintainability structure tree which expresses the assemblage relationship of different layers in the structure.

2.1. Normal Design Model
Normal design model of ship includes the function structure of ship and normal design information of each node in the structure of ship. As show in Fig.2, the normal design structure of ship expresses the function relationship of different layers in the structure. The normal design information of each node in the structure of ship mainly includes function data, design drawing.

2.2. Credibility Design Model
Credibility design model of ship includes the function structure of ship and credibility design information of each node in the structure of ship. The credibility design structure of ship expresses the function relationship of different layers in the structure. The normal design information of each node in the structure of ship mainly includes function data and design drawing, which is shown in Fig.3

2.3. Maintainability Design Model
Maintainability design model of ship includes the maintainability structure of ship and maintainability design information of each node in the structure of ship. The maintainability design structure of ship also expresses the assemblage relationship of different layers in the structure. Replaceablity and reachabilty are main attributes of each node in the structure of ship, which is shown in Fig.4. Replaceablity means that the component can be replaced by spare component. Reachabilty means that the component can be repaired easily

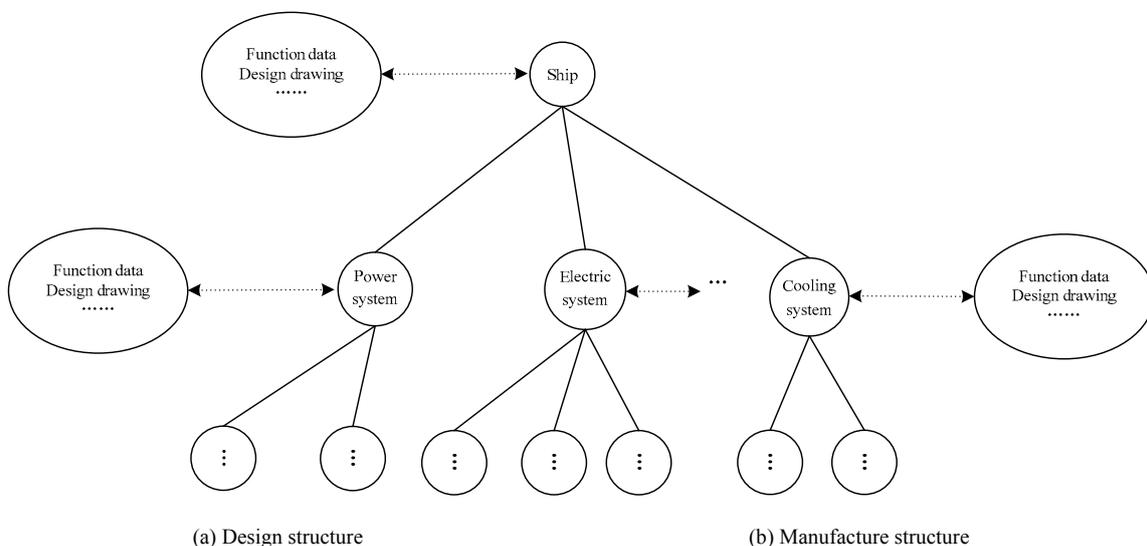(a) Design structure   (b) Manufacture structure
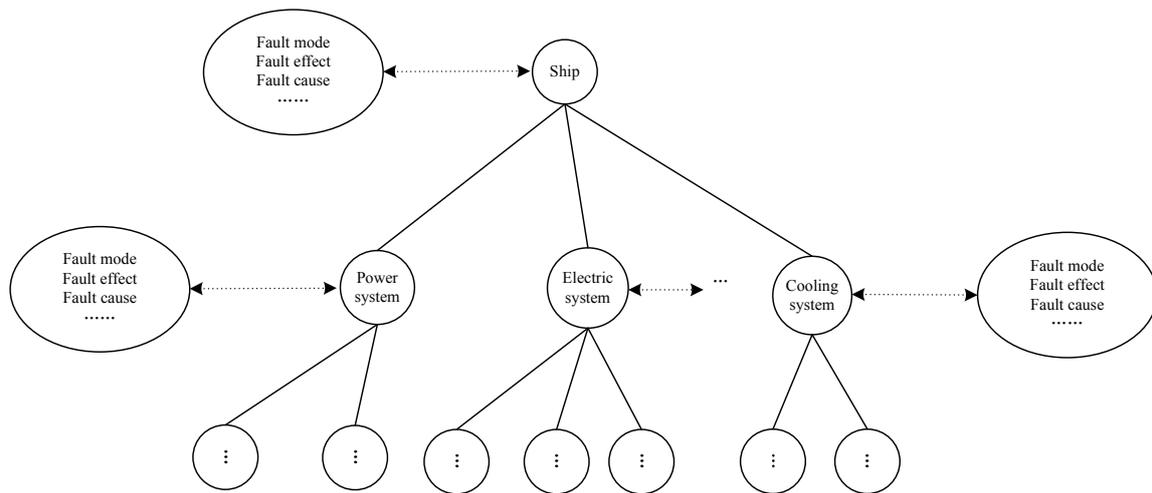
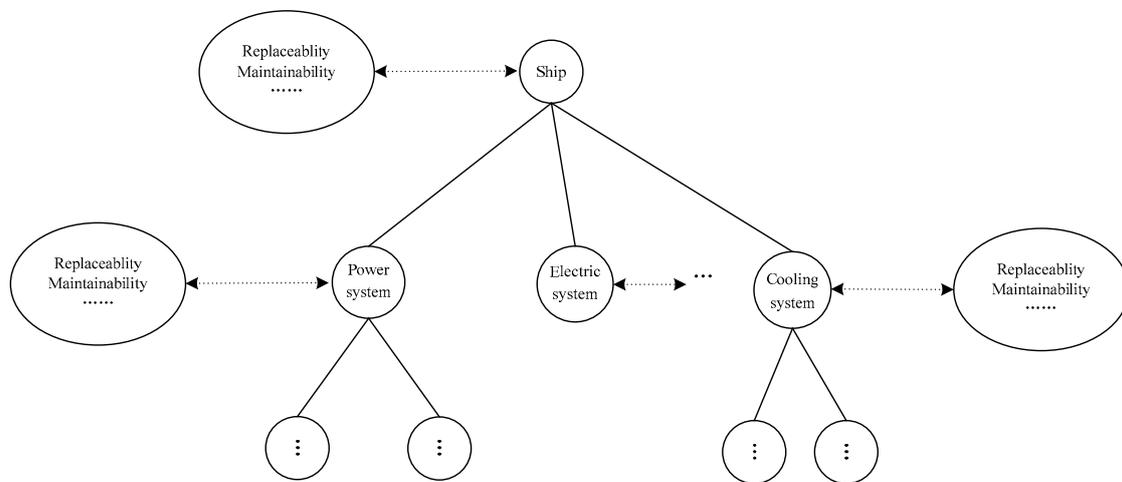Fig. 2: Normal design model

Fig. 3: Credibility design model

Fig. 4: Maintainability design model

3. Structure Of Ship Design Information Integration System

Data structure of ship design information integration system is shown in Fig.5.In the ship design information integration system, three kinds of design knowledge are included. There are normal design data, credibility design data and maintainability design data. As shown in Fig.5, data structure of ship design information integration system mainly includes four data sheets, which are structure data sheet of component, data sheet of normal design, data sheet of credibility design and data sheet of maintainability design. Structure data sheet of component mainly includes "ComponentID", "ParentID","ComponentDescription" and "ComponentName", which can produce two kinds of structure tree, one is function structure tree and the other is maintainability structure tree. Data sheet of normal design mainly includes "NormalDesignID","Function", "Design Drawing". Data sheet of credibility design mainly includes "CredibilityID", "FailureMode ", "FailureEffect", "Failure Cause". Data sheet of maintainability design mainly includes "MaintainabilityID", "Replaceablity", "Reachabilty".

4. Conclusion

A novel design information integration model is proposed in the paper. Ship is used as the research object. The model includes normal design data of ship, credibility design data of ship and maintainability design data of ship. The normal design data of ship, credibility design data of ship and maintainability design data of ship are produced by the design information integration model. Finally, data structure of ship design information integration system is introduced.
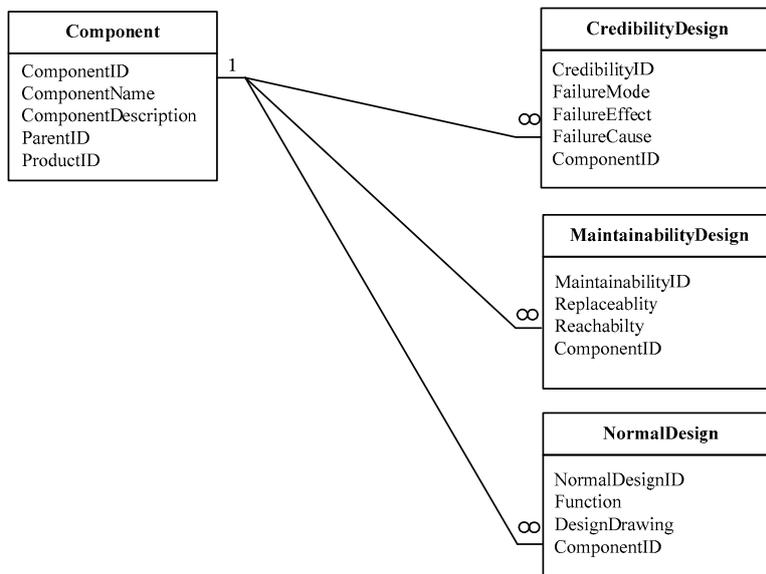
Component

ComponentID
ComponentName
ComponentDescription
ParentID
ProductID

CredibilityDesign

CredibilityID
FailureMode
FailureEffect
FailureCause
ComponentID

MaintainabilityDesign

MaintainabilityID
Replaceablity
Reachabilty
ComponentID

NormalDesign

NormalDesignID
Function
DesignDrawing
ComponentID

Fig. 5: Data structure of ship design information integration system

5. References

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