Bionic Innovative Design of Pipeline Disinfection Robot Based on Biological Text Information

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Original Article

Keywords: Bionic design, Innovative design, TRIZ, Neural language processing, Product modeling

Posted Date: May 4th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-425081/v1>

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Abstract

The traditional bionic innovative design method relies too much on the designer's own experience and inspiration, and the design method could be limited by designer's own thinking. This paper presents a new bionic design method, proposing one kind of special model for the engineering design problem, through obtaining biological text information, after processing and storage in the database, combined with engineering design problems, obtains the corresponding bionic design prototype, and generates the bionic design scheme through bio-engineering mapping. This design method can effectively avoid trapping designers into their own thinking, and this method is helpful for the generation of innovative design scheme. Finally, the meta design of innovative pipeline disinfection robot is shown as an example to verify the feasibility of the method proposed in this paper.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

Figure 1

shows the framework of the bionic innovative design method, which consists of three parts: product design module, bio-database, engineering-biology mapping middleware.

Figure 2

Model structure of biLSTM

Figure 3

Engineering tree-base model

Figure 4

Initial program interface of “QBioDesign”

Figure 5

Creating tree model and config contradictions

Figure 6

Initialized tree model of novel table lamp design

Figure 7

Biological species through indexing

Figure 8

Mapping similarity of nouns and verbs

Figure 9

Summary of choose result

(a) Two dimensional structure

a-The moving part; b-The holding part; c-The disinfection part

1-Lead screw; 2-Adjusting nut; 3-Electromagnetic clutch;

4-Synchronous belt transmission pair; 5-Bevel gear pair; 6-Gear pair;

7-Body shell; 8-Reducer; 9-Motor; 10-Spring damping device;

11-Universal joint; 12-Brush base; 13-Disinfectant container; 14-Sprayer;

15-Cleaning brush

(b) Three dimensional structure

Figure 11

Novel pipeline disinfection robot based on earthworm, octopus, African elephant, sperm whale and cat mapping solution

(a) The moving part

(b) The holding part

Figure 12

The moving part and the holding part of the novel pipeline disinfection robot

Supplementary Files

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