

論文 / 著書情報
Article / Book Information

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Title(English)	Study of Surface Wave Mechanisms Applicable to Thrusters for Watertight Mobile Robots
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Category(English)	Doctoral Thesis
種別(和文)	論文要旨
Type(English)	Summary

論文要旨

THESIS SUMMARY

専攻 : Department of	機械宇宙システム	専攻	申請学位 (専攻分野) : Academic Degree Requested	博士 (工学)	Doctor of (Engineering)
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要旨 (英文 800 語程度)

Thesis Summary (approx.800 English Words)

This research aims to develop a new propulsion mechanism, "Surface Wave Mechanism", which generates propulsive force by wavy motion. It features in large propulsion area, no exposed infinite rotating shaft, and water and dust proof structure. First, this study investigated present mobile robots relating to surface wave. Then, three types of Surface Wave Mechanism were proposed. After the basic motion experiments of each prototype, this research focused on the development of Rotary Surface Wave (RS-Wave) Mechanism, which has a novel and unique design. The basic concept, analysis of design parameters, and the experimental results of the prototype are presented in this thesis. In addition, a mobile vehicle applied RS-Wave mechanism was made and evaluated experimentally. The propulsion ability of RS-Wave mechanism was confirmed and it would probably find application in inspection robots. Furthermore, for improving the locomotion efficiency, a load-sensitive mechanism for RS-Wave mechanism was also proposed. Feasibility of load-sensitive RS-Wave mechanism was confirmed experimentally.

Chapter 1 Introduction gives an overview of the research background and motivation of this study. Some limitations of present propulsion mechanism for mobile robots are introduced, and for solving those problems, a new type of propulsion mechanism named "Surface Wave Mechanism" is proposed.

Chapter 2 Related Former Studies introduces and categorizes present propulsion mechanisms that are related to surface wave mechanism. In this study, the existing surface wave mechanisms are categorized by two methods. One is according to the type of wave, either travelling wave or stationary wave. The other is according to the allocation of driving shaft and proceeding orientation, either perpendicular type or parallel type. The pros and cons of each type are discussed.

Chapter 3 Development of Perpendicular Type Surface Wave Mechanism presents the development of surface wave mechanism PD-I and PD-II. PD-I generates propulsive motion by vibration, and PD-II utilized crankshaft for steady propulsive motion. The prototypes

design and experimental results are explained.

Chapter 4 Development of Parallel Type Surface Wave Mechanism presents the development of surface wave mechanism PL-I, which is also named Rotary Surface Wave (RS-Wave) mechanism. It possesses a novel structure which can generate propulsive motion on the whole cylindrical body using only a single actuator. The concept, mechanical design, and experiment result are presented. Besides, some important design parameters of RS-Wave mechanism are analyzed.

Chapter 5 Development of RS-Wave Mobile Vehicle introduces the first application of RS-Wave mechanism on a mobile vehicle. First, the modified RS-Wave mechanism with a more compact design is presented. Then, a mobile vehicle that composed of two RS-Wave units is designed. The vehicle succeeds in locomotion in narrow space as well as in the water.

Chapter 6 Load-sensitive RS-Wave Mechanism proposes a load-sensitive mechanism to improve the efficiency of RS-Wave mechanism. With load-sensitive mechanism, the propulsion mechanism may adjust thrusting force and velocity according to the environment condition. Design of experiment device and experiment result are explained

Chapter 7 Conclusions and Future Work gives final comments and conclusions to summarize the contents of this thesis and suggests methods for further modification or application of RS-Wave mechanism. Some possible application examples are discussed.

備考：論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。

Note : Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).