Dynamic Stiffness Enhancement of Inspection Robot Frame using Plate-rib

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1.

,

4~18 m/s   0.5~10 Hz   ,

(1)

(2)

(3)

,

.

,

.

2.

3 mm   .

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.   ,   ,

82 kg

.

Fig. 1(a)

9.9 Hz

Fig. 1(b)

11.3 Hz
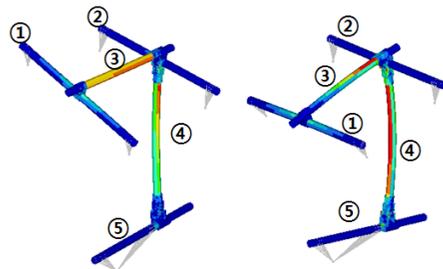
3, 4
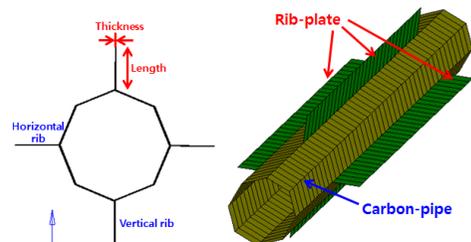
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(a) First torsion mode   (b) First bending mode
Fig. 1 Vibration mode shape of robot frame

(a) Cross-sectional shape   (b) Carbon pipe
of the pipe
Fig. 2 Plate-rib shape on carbon pipe

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, Fig. 1

3,   4   Fig. 2

.   3,

4   3 mm,   10 mm   ,

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3.

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,   .

1 mm   ,

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20 mm   10 mm

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10%   ,

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1 , 4
, 3

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16.1 %   24.8 %

.   82 kg

,   Table 1

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Table 1 Result of optimization

	Base model	Optimal model	Difference
Mass	82 kg	82 kg	0
Torsional frequency	9.9 Hz	11.5 Hz	16.1 %
Bending frequency	11.3 Hz	14.1 Hz	24.8 %

4.

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,

,

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10%

.

,

16.1%,

24.8%   .

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(3) Lee, J. Y., Lim, J. Y., Kim, C. H., Lee, T. J. and Yim, H. J., 2013, A Study on Dynamic Stiffness Design of Frame Structure for Inspection Robot, Proceedings of the KSME Annual Autumn Conference, pp. 482~486.