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Experimental Study on Reentry Operation of a Flexible Marine Riser by Gain-scheduled Control

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Summary: The reentry operators of the flexible marine riser are required to connect its bottom end to the blowout preventer at the seabed with both its top connected angle and its deformation controlled. Because of the hydrodynamical drag forces and the flexibility of the riser, it is very difficult for them to operate it correctly. In the previous paper, for the problem, we have applied LPV (Linear Parameter Varying) control techniques and shown its effectiveness through numerical simulations. In the paper, we carry out the reentry experiment in the towing tank at the Research Institute for Applied Mechanics, Kyushu University. We control the upper end of the riser model which is made of polyethylene and Teflon (PTRE) using parallel mechanism type forced oscillator in order to move the bottom end of the riser to the target point. In the experiment, the riser model motion can be captured by 14 CCD cameras. These motion data are analyzed using image analyzer software "HALCON". Finally, the experimental results can certify the good effectiveness of the LPV techniques for the reentry operation, compared with the LTI (Linear Time Invariant) control.

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