PIV에 의한 코 호흡 시 기도 내 주기적 공기유동에 관한 연구

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An investigation on oscillatory airflow in human airway during nose breathing by tomographic PIV

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Key Words: PIV(입자영상유속계), Airway(기도), CT(단층촬영), Rapid Prototyping(급속성형기)

Abstract : The mean and RMS velocity field in the sagittal plans of human airway was studied experimentally by particle image velocimetry (PIV). Some researchers investigated the airflow of mouth breathing both experimentally and numerically. But it is very rare to investigate the airflow of nose breathing in a whole airway due to its geometric complexity. We established a procedure to construct a transparent rectangular box containing a model of the nasal cavity for PIV measurement by combination of the RP and the curing of clear silicone. We extend this to make whole airway including nasal cavities, larynx, trachea, and 2 generations of bronchi. The CBC algorithm with window offset (64*64 to 32*32) is used for vector searching in PIV analysis. The phase averaged mean and RMS velocity distributions in Sagittal and coronal planes are obtained for 7 phases in a respiratory period. Some physiologic conjectures are obtained. The main stream went through the backside of larynx and trachea in inspiration and the frontal side in expiration. There exist vortical motions in inspiration, but none in expiration.

운동량 적분법을 이용한 비선형 Ekman 분출모델

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A Non-Linear Ekman Pumping Model Using a Momentum-Integral Method

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Key Words: rotating flow(회전유동), Ekman pumping model(에크만분출모델), momentum-integral method(운동량 적분법)

Abstract : In this study, rotating flows in a rectangular container is investigated numerically and experimentally. The rotating flows are generated by changing the speed of rotation periodically in addition to a constant rotating speed so that a time-periodic body force produce the unsteady flows while the characteristics of the rotating flows is preserved. For the formulation of two-dimensional numerical computation including the Ekman pumping velocity, we used the momentum integral method to solve the Ekman layer equations near the bottom wall. We will compare our results with those given from the classical Ekman pumping model. Flow visualization and PIV measurement are also performed to obtain the velocity field of the core flow.