

## The biomechanical computational simulation of the vestibular rehabilitation manoeuvres using data from video acquisition

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### ABSTRACT

Vestibular Rehabilitation is the most used procedure in cases of vertiginous syndrome like Benign Paroxysmal Positional Vertigo. The vertigo symptoms are commonly related with inner ear diseases and it affects 20%-30% of the world population [1], and its prevalence increases with age. Since the manoeuvres used in the rehabilitation process are based on a set of empirical moves, the present work aims to contribute to a better understanding on the biomechanics of the vestibular system.

In this work, a three-dimensional model of the semi-circular canal of the vestibular system, containing the fluids which promote the body balance, will be used. The smoothed-particle hydrodynamics method will be the numerical method used to simulate the fluid behaviour, in which the elements are represented by particles and have constant mass [2]. The other vestibular components will be discretized using the finite element method.

The movement performed by the audiologist expert during the rehabilitation process will be numerically obtained through video image acquisition. The data retrieved from the video frames, recorded during the therapy, will be used to identify and define analytically the spatial position along time of the interest region located near the inner ear.

Thus, the smoothed data obtained from the video acquisition will be the input in the simulation of the semi-circular model. The results will allow to understand the behaviour of the vestibular structures during the rehabilitation manoeuvres.

### REFERENCES

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