

Title: Angular and linear accelerations of a rolling cylinder acted by an external force

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Abstract: The dynamics of a cylinder rolling on a horizontal plane acted on by an external force applied at an arbitrary angle is studied with emphasis on the directions of the acceleration of the centre-of-mass and the angular acceleration of the body. If rolling occurs without slipping, there is a relationship between the directions of these accelerations. If the linear acceleration points to the right, then the angular acceleration is clockwise. On the other hand, if it points to the left, then the angular acceleration is counterclockwise. In contrast, if rolling and slipping occurs, the direction of the linear acceleration does not determine the direction of the angular acceleration. For example, the linear acceleration may point to the right and the angular acceleration clockwise or counterclockwise depending on the external force orientation and point of application.

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