# Sliding of a Particle on The Horizontal Plane Under Oscillating and Rotary Movements

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Numerous engineering tasks, which are related to the interaction of the working bodies of machines with particles of technological material, require analytical dependencies of the particle movement on a rough moving plane. The reciprocating oscillations of the horizontal plane and the translational oscillations, when all points of the plane describe circles, are thoroughly investigated. In these cases of oscillations, there is no rotation of the plane. However, multitudinous details of machines and mechanisms carry out such movement. Against this background, the relative movement of a particle on a rough horizontal plane that performs complex oscillations is considered in the article. The plane moves in a circle with a constant angular velocity relative to the circle's center and simultaneously rotates with the same angular velocity in the opposite direction. Differential equations of the particle sliding are compiled and solved by numerical methods. The trajectories of the relative movement of the particle on the plane are constructed. A partial case of oscillations is considered when the lengths of the crank and the slider are equal to zero. The obtained dependencies significantly expand the theory of particle movement on the surface. In addition, it can be applied to the geometric designing of crank-type mechanisms, in which the length of the slider is equal to the length of the crank.