Brachistochrone problem with liquid drops on a superhydrophobic surface

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A trajectory that will carry a particle from one place to another in the shortest time is called the brachistochrone curve. In 17th century, Johann Bernoulli posed the brachistochrone problem for the first time and discovered that the trajectory on a curve without friction is a cycloid. In most brachistochrone problems, a movable solid particle, especially a sphere, has been considered assuming its free movement. Generally, the transport of small liquid drops on a solid surface is not a simple process, because the nature of the contact between the two phases is complicated. However, liquid drops can easily roll off on a superhydrophobic surface. Thus, the drops can also be treated as an easily movable particle on the surface. In this study, the brachistochrone curves are discussed with water drops on a superhydrophobic surface. We expect that this study will be helpful for the applications in droplet transport technology and lab-on-a-chip systems where discrete droplets are manipulated.