

Step into the Escalator's Fractal Behavior by Using the Poincare Map

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Abstract : Step band in an escalator moves in a cyclic periodic pattern. Similarly, most if not all of the components and sub-assemblies in the escalator operate in the same way. If you mark up one step in the step band of an escalator and stand next to the escalator, on the incline, to watch the marked-up step when it passes by, you ask yourself, does the marked up step behaves exactly the same way during each revolution when it passes you by again and again? We can say that; there is some similarity in this example and the example when an astronomer watches planets in the sky, and he or she asks himself or herself, does each planet intersects the plan of observation in the same position for every pantry rotation? For a fact, we know for the answer to the second example is no, because scientist, astronomers, and mathematicians have proven that planets deviate from their paths to take new paths during their planetary moves, albeit with minimal change. But what about the answer to the question in the first example? considering that there is increase in the wear and tear of components with time in the step, in the step band, in the tracks and in many other places in the escalator. There is also the accumulation of fatigue in the components and sub-assemblies. This research is part of many studies which we are conducting to address the answer for the question in the first example. We have been using the fractal dimension as a quantities tool and the Poincare map as a qualitative tool. This study has shown that the fractal dimension value and the shape and distribution of the orbits in the Poincare map has significant correlation with the quality of the mechanical components and sub-assemblies in the escalator.

Keywords : fractal dimension, Poincare map, rugby ball orbit, worm orbit

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