1. Summary
This paper presents an indexing method for moving objects, which is called velocity partitioning. Actually, to make it brief and clear, the idea is to use a bunch of new one dimensional coordinate systems or vectors, which are not necessarily orthogonal to each other, to index the moving objects. The one dimensional vectors are selected in a way to maximize the number of moving objects whose direction is parallel to it. Thus the velocity of the moving objects can be represented with one coordinate in terms of its parallel vector instead of two under the original x-y coordinate system. Since the objects moving in the same direction are partitioned in the same group and represented with one coordinate, the expansion of index is much cheaper compared to expanding in both directions.
Use PCA and K-means to iteratively calculate the principle component (the new coordinate vector).
They tested this “velocity partitioning” on two the-state-of-the-art moving object indexing techniques namely TPR*-tree and B∗-tree.

2. Positive
a. Nice method: add redundancy of coordinate systems to reduce the number of indexes for each moving objects and reduce the dimension to avoid the quadratic expansion.
b. extensive experiments showing the benefits of their velocity partitioning algorithm and many graphs making readers understand easily.
c. They explains in detail how to select the parameters.

3. Negative
a. Although it tries to convince the search space expansion for partitioned index is much smaller and gives formal inference in the paper, they don't explain how it influences the implementation of the underlying tree structures and how the query efficiency is affected.
b. Figure 6 is confusing and not professional. They should use dashed dots for the lines behind the facet in one perspective in order to present the three-dimensional effect. Typo in Figure 20 b. The last legend should be TPR*(VP)
c. They spent a large section to explain and present the inference of reduction of search space expansion. Personally, I think it should be more compact since the formulas, e.g. are quite simple and intuitive, something learned in high school. And in the last section of their testing results, redundancy is also a problem. Since they should avoid much repeat of same/similar explanation and make it succinct.

4. Research Questions and Points for Discussion
a. the idea is easy to understand. Given a specific data, we can make some analysis and design an algorithm that fits the real-world data well. Just like the restrictions of directions of moving objects in real world scenarios such as road networks and flights.
b. To some extent, this paper is application oriented. They design specific metric (the perpendicular distance to PC) for k-means clustering based on their specific application context.